Nature and values of coping and adaptation

An evaluation of response mechanisms to changing water-related risks in rural areas of the Vietnamese Mekong Delta

by Maria Schwab

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[1] Water-Related Information System for the Sustainable Development of the Vietnamese Mekong Delta (www.wisdom.caf.dlr.de)

[2] United Nations University – Institute for Environment and Human Security (www.ehs.unu.edu)

Abstract

Drivers, characteristics and barriers of beneficial and adapted response mechanisms to water-related risks in the Vietnamese Mekong Delta (VMD) are at the centre of this PhD research. These subject matters owe their importance to a manifold range of factors. Water is at the fore as the most formative element for landscapes and societies in the VMD – not only in its function as a vital source of livelihood but also as a threatening natural hazard. Water-related hazards have changed and will continue to change amidst a vibrant socio-economic setting and a fundamentally changing climate. These looming threats and the ongoing changes require action if the prospering character of Vietnam's rice bowl is to be maintained. Long-term and short-term-oriented response mechanisms have thus aroused a great deal of interest in science, practice and in the public debate. Strategic assessments of the nature and values of risk-related measures have, however, rarely been addressed in the Mekong Delta context. This research has therefore brought evaluation of coping and adaptation in the context of water-related risks into focus.

Quality judgements are at the centre of interest in the international community of evaluation research and practice. Within this community, evaluations commonly revolve around the identification of the most efficient strategy for a specific target group. Quality is, however, a measure of basic normative considerations on divergent implications and distinct values – aspects which cannot always be measured by a mere effectiveness assessment which judges "good" responses in seemingly absolute terms. A more comprehensive evaluation in combination with a profound understanding of the local context and individuals' decision-making processes is an essential prerequisite for identifying barriers to "good" adaptation and coping. This is, in turn, a vital requirement for promoting more sustainable development pathways for the Mekong Delta. This thesis therefore aims at a holistic assessment of "good" risk-related response mechanisms, an identification of more than just economic barriers to the successful implementation of these strategies, and an exploration of context-specific and actor-oriented ways of overcoming the barriers.

The study consequently develops an innovative and adaptable evaluation framework which takes a multi-disciplinary perspective of risk-related strategies. This concept draws on three different schools of thought and combines them in an integrative approach. Firstly, it takes a social-ecological system perspective. In contrast to most of evaluation research and practice, this framework thereby explicitly addresses the risk context. It allows actors at various scales to be addressed and considers multiple dimensions. Vulnerability, as a concept arising from this line of thought, provides an expedient baseline to judge the relevance of taking action, grasp the complexity of strategy outcomes, and identify barriers emerging from the overall risk context. Secondly, the vulnerability concept is linked with an actor-oriented perspective derived from a socio-cognitive model of adaptation decision-making. This provides a, widely neglected, actor-oriented perspective to evaluation. It explains why decisions to adapt or cope are taken and involves a subjective and actor-specific evaluation component. Thirdly, the framework involves a more structured analysis of the actual adaptation/coping process along the lines of so-called "theories of change". It comprises the assessment of strategy implementation, outcomes and impacts on the vulnerability of different groups and can therefore facilitate outcome- and process-oriented evaluations. Such a multi-faceted analysis entails quite a number of methodological challenges such as empirically unfolding implicit preference structures, revealing underlying interconnectivities across scales, and facing difficulties specific to doing field research in Vietnam. A mixed-methods paradigm was used to address many of these challenges. A deliberately chosen set of methods in combination with a conscientious and flexible process created thereby the foundation for a more encompassing empirical assessment of risk-related strategies in the VMD.

The data demonstrate that the risk context was diverse and varied, most notably with regard to the geographic location of the production area and the agro-economic indicators. Rice producers were the least exposed group, but experienced the largest production losses. This was mainly due to the fact that the farmers raised their susceptibility significantly by introducing winter-spring rice in 2011. In addition, the vulnerability of rice farmers was reinforced by low risk-specific capacities to cope and adapt. Aquaculture and sugarcane producers were more experienced in dealing with water-related hazards and/or produced less susceptible commodities. Nevertheless, the hydrological and geophysical characteristics as well as the location with regard to the hydraulic infrastructure made these farmers more exposed to water-related hazards than rice producers. The analysis also shows that these vulnerability patterns have and will most likely gather momentum as the sea level rises and socio-political changes lead to agricultural modernisation and rural industrialisation. How far and why the past and the future risk context induces "good" coping and adaptation actions depended, however, not only on the actual but also on the individually perceived risks.

A social-psychology perspective motivated and guided by the social-ecological vulnerability concept indicates why intentions to act were formed and how different actors evaluated the quality of strategy options. The analysis of risk perception shows, for instance, that the perceived threats (i.e. hazard exposure and susceptibility) could differ substantially from the revealed threats. This became most apparent in the example of the individuals' appraisal of salinity threats. Rice producers perceived a low hazard exposure in a year of high salinity values and also seemed to have misjudged their susceptibility. This was a major reason for their producing winter-spring rice in the season with the highest salinity exposure, i.e. an action which increased the susceptibility substantially. The perceived capacity of response and the subjective quality judgement of the acknowledged adaptation and coping options were also of central importance for forming an intention to act. The empirical data suggest that households had a clear preference for protective infrastructural measures, despite the subjectively perceived high costs and low income effects. This seemed to be due to the positively judged long-term effects. Corresponding to this finding, negative long-term effects were a major factor restraining the application of many strategies, most notably taking children out of school, selling assets and buying on credit. Income effects were, thus, of less importance to people than expected from the weighting of quality criteria in group discussions. Migration was, for example, rarely preferred over other strategies although it was perceived to have the most positive income effect of all strategies (in addition to the judgement that it is easily implementable and comes at a comparatively low cost). This is only one of many examples which show that subjective evaluations cannot always be explained with common evaluation criteria, are often context-specific and represent in many cases more of an intuition than a structured quality judgement.

Still, structured and "objectivity"-based approaches from evaluation research are essential elements in a more holistic judgement and analysis of risk-related response mechanisms and were therefore taken into consideration. They describe the revealed characteristics of the strategies, indicate their implications for the risk context, and provide a valid basis of comparison to the subjective evaluations. A theory-of-change-led assessment of the most common household strategies shows that strategies which induced a change in the exposure of the household were rarely applied in the context of flood and salinity risks. Households hardly ever sold exposed land although buyers were easily found and land prices were comparatively high. Moreover, strategies which caused a susceptibility reduction played only a minor role. Susceptibility-reducing strategies, such as the construction and maintenance of dikes and a change of crops, were either rarely put into practice or had merely a short-term impact. Most of the measures were intended to strengthen the coping and adaptive capacity. Raising the short-term availability of financial capital by buying on credit or taking a loan were the most common measures. However, these strategies often reduced the capacity of response in the long-term. Measures which were intended to strengthen the stock of capital endowment, in contrast, came at a high cost in the short-run but had positive effects on the capacity of response in the long-run.

At the government level, the responsibilities with regard to flood- and salinity-related risk management were allocated hierarchically based on the centrally planned and highly technocratic

Vietnamese state system. Protective and productive infrastructural measures were the most influential strategies from governmental side. The strong preference for the construction and management of dikes and sluice gates was largely based on their role in protecting a large number of people in the areas inside the dike. Nevertheless, these infrastructure-related measures had detrimental effects such as an increased flood risk outside the dike and strengthened the motivation to apply susceptibility-increasing strategies inside the dike (growing winter-spring rice, in particular). These aspects turn the construction and management of protective infrastructure into the most controversially judged measures in the research area. Susceptibility reduction seemed to play a merely minor role. Only the regular dredging of a canal had a substantial impact on the vulnerability of a large share of the population. The majority of strategies were applied in order to strengthen the capacity of response. The short-term oriented strategies, i.e. compensation payments and flood and salinity warnings, seemed to have had only a short-term effect, if any, on the capacity to cope. Agricultural training and public loan schemes were, in contrast, more common, had a longer-term effect, and were more positively judged. Overall, analyses of strategies along the lines of theories of change have been shown to facilitate a better understanding of the quality of certain strategies. In an integrative analysis with the previously outlined risk context and decision-making processes, this evaluation perspective provides innovative findings about evaluations of and barriers to "good" coping and adaptation at a region-specific, methodological and conceptual level.

The analysis of the risk context enabled an identification of many context-specific barriers and recommendations for action. The data, for instance, show that several of the geo-physical and ecological *limits* may not be limits in "real" terms - at least not when they are taken up at higher-level arenas. Without mitigation action on a global level, sea level rise may turn most other barriers into limits and make adaptation on site impossible. Further geo-physical and ecological characteristics constitute barriers which can be overcome by "better" infrastructural planning and coordinated international and inter-regional water-resource management. Most of the *economic barriers* have been shown to emerge from agricultural modernisation and rural industrialisation. De-industrialised and diversified forms of income generation could clear many of these barriers and provide a basis for more sustainable livelihoods. *Cognitive and knowledge-related obstacles* were identified at the level of individuals' decision-making processes. Knowledge barriers arose mainly at the level of non-agricultural employment. A more adapted vocational education system could help seize the opportunities that rural industrialisation policies provide. Knowledge barriers to the implementation of "good" risk-specific strategies could be addressed by a more explicit inclusion of salinity-and flood-specific content in agricultural training. A participatory approach would, in this context, be conducive in strengthening the trust in expert know-how, involve local knowledge, develop context-specific solutions, and convey an understanding for diverging interests and implications. Many of the cognitive barriers emerged from too strong a reliance on the actions of other actors, most notably on governmental measures. In addition, cognitive processes converted some barriers into perceived limits. Too strong a hierarchical thinking and an often subordinate mentality made people believe that an order from the respective higher level is inviolable. It has thus been shown to be of particular importance to raise awareness with regard to the fallibility of infrastructural measures in addition to a reinforcement of the household's belief in its own capability to implement "good" response mechanisms.

At the *institutional level*, the multifaceted approach revealed that a lack of official demand for evaluations, an unclear structure of responsibilities, vaguely defined criteria and insufficient control mechanisms inhibited an expedient evaluation practice. These barriers (as well as several other obstacles identified before) often relate to general institutional barriers such as prevailing elitism, a lack of participatory decision-making and the technocratic nature of the system. Many barriers thus have to be defeated at the level of national regulations and can be supported by technical cooperation from international partners. At the local level, stronger cooperation between NGOs, development organisations, researchers and the local government would provide a pertinent basis for more evaluation-based data exchanges and appraisals. Besides this lack of evaluation activities, the analysis has revealed methodological shortcomings in existing evaluation practice. It has been shown that there is a need to include more than just economic criteria, improve the competences of local evaluators in participatory and qualitative methods, specify and enforce the evaluation guidelines, and increase local participation in evaluation practice.

In conclusion, the concerted analysis of risks and risk-related strategies on multiple levels and a comparison of revealed and perceived realities have been shown to put the often assumed "objective" vulnerability into perspective. At the same time, a vulnerability-centred lens in a socio-cognitive decision-making model has added agency to the often one-sided reflection of risk perception as a mere function of the individuals' appraisal of probability and magnitude of an event. It has also been demonstrated that the identification of "good" strategies is highly complex and specific to the evaluation method, the stakeholder, the spatial-scale and the time-scale. Many drivers, opportunities and barriers would therefore have remained uncovered if the conceptual framework had not included multiple scales and actor groups; single data sets had suggested a less reliable evaluation result; and an analysis based on a single evaluation approach would have depicted a merely one-sided judgement of a strategy's quality.

In the end, this thesis has *not* presented the "ultimate" strategy in response to water-related risks in rural areas of the Mekong Delta. On the contrary, it is argued that such absolute judgments are neither achievable nor desirable. The suggested context-specific and actor-oriented evaluation approach, instead, has acknowledged and grasped the distinct nature and diverse values of risk-related strategies and has thereby made a contribution to promoting flexible and adapted measures for more sustainable development pathways for the Vietnamese Mekong Delta.

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PART I - RATIONALE, CONTEXTUAL LITERATURE REVIEW AND RESEARCH CONCEPT

1 Introduction

1.1 Framing the research

In the Vietnamese Mekong Delta, water resources and life evolve continuously amidst a vibrant socio-economic setting and a fundamentally changing environment.

The waters of Mekong River are the lifelines of the "Dong Bang Song Cuu Long"[3], i.e. the *delta of the nine dragons*. They have created a distinct topography and hydrology. Having been the foundation for the development of Vietnam's "rice bowl", they have shaped the livelihoods of millions of people. However, the *nine dragons* are powerful not only in their life-giving function but also in their role in severe water-related hazards. Water pollution jeopardises human and environmental health, water scarcity and saline intrusion put agricultural production at risk, and storm surges and flooding pose a threat to the lives of people. In the rainy season of 2011, riverine flooding damaged 24,000 ha of rice production and caused a total loss of nearly 800 billion VND (ca. 28 million Euro[4]; CFSC 2011). In the following years, "salt water plague[d] the Delta" (VNN 18.02.2013) and households had to "face water shortage" and exceptional saline intrusion (VNN 01.04.2014). Provincial authorities in the Northern Delta reported in the dry season of 2012/2013 the lowest flood levels in the last decades leading to saline intrusion which advanced as far as 70 km inland (VNN 28.11.2012). In a continuously changing climate, such hazards will most likely increase in intensity and severity. The Ministry for Environment and Natural Resources (MONRE) estimates that a sea level rise of one meter would inundate 39% of the whole VMD (MONRE 2012)[5]. In combination with altered temperature and precipitation patterns, climate change will have a detrimental effect particularly on rural areas in the Vietnamese Mekong Delta. The World Bank (2010: 19), for instance, assumes that saline intrusion would threaten 70% of the agricultural production area in the Delta by 2100 – without intense efforts towards adaptation.

It is not certain that adaptation will be able to bring a complete about-turn to this situation, but it is certain that it is the prerequisite for maintaining a prospering Delta system. The demand for adaptation has therefore aroused a great deal of interest in science, practice and public debate. At the government level, the construction of hydraulic protective and productive infrastructure has been at the centre of adaptation efforts since the 1970s (Käkönen 2008; Hashimoto 2001; World Bank 1999). Accordingly, water resources have not only changed as the *environment changes* but have also been subject to human control in a *vibrant socio-economic setting*. In scientific discourse, water- and climate change-related hazards in the VMD have increasingly been observed from a more holistic perspective which extends beyond a mere reduction of the hazard itself. In line with a rising recognition of vulnerability approaches in the conceptual literature, the scientific debate in the Mekong Delta has focused increasingly on vulnerability. This line of thought, according to UNU-EHS (2004 in Thywissen 2006: 34), revolves around the assumption that "vulnerability is the intrinsic and

[3] The Vietnamese call the Mekong Delta the "Dong Bang Song Cuu Long", i.e. the "Nine Dragon River Delta". This name refers to its nine tributaries which fan out over most of South-Western Vietnam.
[4] At an average exchange rate of 2011.
[5] The Ministry for Environment and Natural Resources (MONRE 2012) predicts a sea level rise of 70-105 cm for 2100 in the high emission scenario.

dynamic feature of an element at risk (community, region, state, infrastructure, environment, etc.) that determines the damage/harm resulting from a given hazardous event and is often even affected by the harmful event itself". The scientific perspective has accordingly changed from merely trying to control the hazard towards "living with risk" (UN-ISDR 2004). The recent IPCC[6] special report on extreme events (IPCC 2012) thereby argues that vulnerability positions itself at interface between disaster risk reduction, climate change, and development (Birkmann 2013: 17).

In the VMD, Adger and his colleagues had already initiated elementary vulnerability-related research by the end of the 1990s and thereby addressed adaptation from a different viewpoint than in the previous decades (see e.g. Adger 1996, 1998; Sneddon, Nguyen Thanh Binh 2001). At a time when the government and international donors (most notably the World Bank) were strong advocates of large hydraulic control projects, they argued for adaptation as part and parcel of institutional and socio-economic transformation (Adger 1996). A vulnerability-oriented view of natural hazards also allowed for a better integration of risk-related response mechanisms at the household level. In this context, several scholars outline the larger relevance of coping strategies, i.e. direct short-term oriented responses (Chinvanno et al. 2008b; Birkmann 2011a; Phong Tran et al. 2008). Adaptation also takes place at the household level and has been taken up as an important topic in public debate. However, the dynamic interplay between state and private actors rarely aroused the attention of scientists and practitioners. Although many of the household-led strategies may have been autonomously applied, they were ultimately influenced by the strong socialist state. Overall, the extensive literature around both governmental and household response mechanisms agrees at least on one thing - the fact that coping and adaptation are essential for *maintaining a functioning Delta system*.

Adaptation should, however, not only *maintain* a functioning Delta system but also facilitate a "better" grasping of the opportunities water offers by at the same time providing a basis for "good" coping in the context of the hazards that water brings about. An analysis of the quality and outcomes of risk-related measures is therefore a matter of the moment. Evaluations, i.e. "careful, retrospective assessment[s] of merit, worth, and value" (Vedung 2008: 2) of risk-related practices, have, however, rarely been applied in the VMD. Monitoring and evaluation (M&E)[7] are most common and established in international development projects (e.g. JANI[8] - CECI 2010; UNEP[9] - Christoplos, Bach Tan Sinh 2004; Oxfam 2008, Australian Red Cross, German Red Cross 2012). They followed a broad band of approaches and integrated qualitative and quantitative elements. Nevertheless, M&E often only accounted for the target population and neglected a broader perspective on other actor groups and interconnectivities. The Vietnamese government has also increasingly acknowledged the relevance of M&E – this seems to be a reaction to an increasing demand for evaluations from international partners. M&E is integrated in the National Strategy on Natural Disaster Prevention, Control and Mitigation (NS-DPCM) and it is part of the National Target Program to Respond to Climate Change (NTP-RCC) (MONRE July 2008: 55f; GoV May 2001, April 2011). Furthermore, Environmental Impact Assessments (EIA) have gained in importance in recent years. However, most of the approaches are technocratic, not transparent, and lack public involvement (Hostovsky et al. 2010; Clausen et al. 2011). Moreover, evaluations are still predominantly one-dimensional (i.e. focusing on economic, environmental, or social aspects) and neglect central context-specific aspects. In the scientific debate, comparatively few evaluation studies have been conducted (Fortier 2010; Vo Thanh Danh, Mushtaq 2011; Pham Cong Huu 2011). Where evaluation studies have been conducted, they merely accounted for a single measure and/or only considered the governmental level.

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[6] Intergovernmental Panel on Climate Change (IPCC).
[7] Monitoring "tracks key indicators of progress over the course of a program as a basis on which to evaluate outcomes of the intervention" (Khandker et al. 2010: 7); evaluations assess projects, strategies and programs systematically and objectively at the end of a given timeframe (Khandker et al. 2010: 7f).
[8] Joint Advocacy Networking Initiative in Vietnam (JANI).
[9] United Nations Environment Programme (UNEP).

In the international debate, evaluation is a long established area of interest among scientists and practitioners. Evaluation studies have found their way into the fields of development and poverty reduction (see e.g. BMZ 2011; Brooks et al. 2011; McKenzie Hedger et al. 2008), disaster risk management (see e.g. Bruijn 2005; Gamper et al. 2006; IEG 2008), and natural resource management (see e.g. Evers, Lange 2011; Mendoza, Martins 2006; Meinke et al. 2009; Pahl-Wostl et al. 2010). With the rise of climate change adaptation, evaluation activities have, more recently, also started to gain importance in this community (see e.g. Anderson 2011; Debels et al. 2009; Jacob, Mehiriz 2012). However, basic ethical considerations on divergent implications and distinct values of adaptation for different social groups have rarely been addressed (Snorek et al. in review). Many scholars evaluate adaptation based on assumptions such as that the most cost-efficient alternative for the target group at a given time- and spatial scale is also the “right” one to choose. However, there exists a large variety of notable criteria and it is debatable as to how far “right” can be measured in such absolute terms. “Good” adaptation for one person might be “bad” for someone else which is why individual values and priorities are important issues to be considered.

A more actor-oriented perspective and an analysis of decision-making processes can shed light on these aspects. This viewpoint can uncover the drivers of subjective evaluations and convey an understanding of how individual actors judge the quality of strategies. Knowing the preferences of different actor groups is, in turn, a vital prerequisite for identifying locally acceptable measures and revealing potential stakeholder conflicts. Moreover, the assessment of decision-making provides answers to the question why people act in the first place - i.e. it provides the basis for arriving at a more strategic and effective promotion of the *implementation* of “good” adaptation and coping measures. Socio-cognitive models of decision-making address these issues by considering social factors which exert influence on the actor and cognitive mechanisms which process this information. These concepts have arisen from cognitive psychology and influenced scholars in the field of risk management and climate change adaptation. Based on Rogers’ *Protection Motivation Theory* (PMT) (Rogers 1975, 1983; Rippetoe, Rogers 1987) a range of scholars argue that decision-making depends most notably on the perception of threats and competences (see e.g. Mulilis, Lippa 1990; Krömker, Mosler 2002; Grothmann, Patt 2005; Grothmann, Reusswig 2006; Krömker et al. 2008; Kuruppu, Liverman 2011; Frank et al. 2011; Bubeck et al. 2012). The quality judgement of strategies is integrated in the individuals’ competence appraisal whereby the perceived threats explain the hazard-related motivation to take actions. Some scholars also focus on risk perception in the field of natural hazards and climate change adaptation in the Vietnamese Mekong Delta (Abery et al. 2009; Le Thanh Sang 2010; Völker et al. 2011; Hoa Le Dang et al. 2013; Lebel et al. 2013). They have not, however, addressed the perceived capabilities and the individuals’ judgement of risk-related strategies. Moreover, concrete implications for decision-making processes were, as in the case of most other studies in an international context, not integrated.

The previous paragraphs outline the substantial interest in the VMD. They illustrate the idea that risk-related strategies make *water resources and life evolve continuously admidst a vibrant socio-economic setting and a fundamentally changing environment*. In addition, this initial conceptual and contextual framing revealed indispensible subject matters which have been neglected so far - not only in the VMD but also in the conceptual debate. Firstly, most of the studies focus on either governmental strategies or private household strategies and neglect the interplay and mismatches between measures undertaken by the different actors - in the VMD and in the international debate. Secondly, evaluations of these strategies have received little attention in the regional scientific community and in policy making. Thirdly, the evaluation studies which exist mainly address merely a single strategy, are one-dimensional with a strong focus on economic aspects, address only one actor-group, or neglect interconnectivities across different temporal and spatial scales. This is not only the case in the Mekong Delta but applies to most of the studies in evaluation research and practice. Fourthly, subjective actor-oriented analyses are still rare in the Mekong Delta context. Fifthly, the international scientific community has not acknowledged the relevance of evaluations which take a vulnerability-centred lens by at the same time accounting for decision-making processes and subjective evaluations. Sixthly, comprehensive methodologies for evaluating and analysing risk-related practices on multiple scales and dimensions have rarely been developed.

1.2 Research goals and questions

It is the overarching goal of this research to assess "good"[10] risk-related response mechanisms of households and governmental actors, outline the barriers to a successful implementation of these strategies, and find context-specific ways of overcoming the barriers. The research therefore aims to develop an evaluation framework which takes a multi-disciplinary perspective of risk-related strategies. This approach is not meant to be developed merely from a literature analysis in the forefront of field research but shall also emerge throughout the process of data collection and analysis. In that way, it is possible to arrive at a research concept which is innovative and adapted to the current research context. Vulnerability-related aspects shall be addressed in order to single out barriers which arise from the overall risk context and provide a pertinent basis for judging the complexity of strategy outcomes. The concept of vulnerability shall consequently be linked with an actor-oriented perspective in an integrative framework. In this way, socio-cognitive barriers related to the perception of threats and competences can be pinpointed and compared with the revealed vulnerabilities. Moreover, this actor-centred view aims to grasp the subjectively perceived quality of a strategy and make it possible to measure effectiveness against individuals' goals. The research shall finally also account for the quality of implementation by households and government authorities as well as the outcomes and vulnerability-related impacts of public and private strategies. A structured outcome- and process-oriented evaluation approach shall therefore be integrated in a consistent framework of analysis. In conclusion, an integrative analysis of these three research components aims at providing innovative findings on a region-specific, methodological and conceptual level. The framing and the goals of this study consequently lead to the overall research question:

"How and why can rural stakeholders in the Vietnamese Mekong Delta cope with and adapt to changing water-related risks in a beneficial way?"

This question comprises a set of three sub-questions each linked to further subsidiary questions:

1. **How are coping and adaptation processes on site interrelated with differential vulnerabilities to water-related hazards?**
   1.1. What determines the vulnerability of households to water-related hazards in the research area and how do differential vulnerability patterns influence the coping and adaptation strategies on site?
   1.2. What influences the decision-making of different stakeholders in the context of water-related risks?
   1.3. What are the effects of local coping and adaptation processes on current and future vulnerabilities?
   1.4. How can social-ecological and cognitive interrelations between vulnerabilities and coping and adaptation be conceptually and theoretically depicted?

2. **How can different strategies be evaluated?**
   2.1. How can coping and adaptation options be characterised by different evaluation approaches?
   2.2. Which quality criteria and evaluation approaches are important to different stakeholder groups and how do they evaluate household and government strategies?
   2.3. Which evaluation-based mismatches arise?

[10] "Good" is in the following used as an attribute which stands - similar to the term "good governance" - for a set of criteria describing the beneficial nature of a strategy. These criteria depend on the agent, scale and context.

3. **What are the barriers of and limits to "good" adaptation and coping and how can they be identified and overcome?**
   3.1. How can "good" adaptation and coping strategies be identified for different stakeholders and timescales?
   3.2. What hampers "good" adaptation and coping in coastal areas of the VMD?
   3.3. How can major barriers be overcome?

1.3 Foci of this research

The conceptual and contextual framing of this research in combination with the given research goals and questions lead to the following research foci. Firstly, the study centres on response mechanisms in the context of water-related risks. Tidal flooding and salinisation will serve as examples for water-related natural hazards. They are among the most important threats in the Mekong Delta and represent different types of natural hazards, i.e. different characteristics, processes and impacts (Huu Ninh Nguyen 2007). The regional focus of this study will accordingly be on the coastal zones which are influenced by tidal flooding and salinisation. Secondly, this study will focus on strategies in a rural agrarian context. Rural livelihoods are highly dependent on water resources and are very sensitive to water-related disturbances and destruction (Binh 2010; Adger et al. 2001). Thirdly, this research accounts for a multitude of government- and household-led processes and perceptions. Both the formal and the informal level are highly influential in the context of water-related risks and cannot be portrayed in isolation from each other – particularly not in the Vietnamese context where the state exerts influence on all spheres of daily life and where public-private connections are pronounced (see e.g. Chinvanno et al. 2008a; Nguyen Thi Phuong Loan 2013; ADPC, FAO 2003). Fourthly, the study focuses on the disparities between different actor groups at the household level. In this way, specific and general social drivers of risk-related response mechanisms and subjective decision-making can be assessed. Fifthly, both climate and socio-political changes are considered. This is due to the fact that Vietnam is not only a global hot spot for predicted climate change impacts (Dasgupta et al. 2007; Chaudhry, Ruysschaert; Stern 2007), but is a country which has experienced significant political and social transformation in its recent history (McCargo 2004; Dalton, Ong 2005). Overall, the study will accordingly take a multi-disciplinary perspective and consider actors and strategies across different spatial and temporal scales.

1.4 Structure of the thesis

In order to achieve the research goals mentioned above and answer the research question, the thesis is structured as follows:

The study's point of departure is a compendium of the theoretical and conceptual developments which is laid out in *chapter 2*. This chapter starts with a review of the most influential literature. The first section of this chapter addresses vulnerability and its interdependent relationship with social practices. It reviews the concepts of risk and vulnerability in diverse bodies of literature, outlines the most important definitions and classifications in this thematic context, and depicts the role of social practices in vulnerability research. The second section of chapter 2 extends beyond a conceptualisation of the objective world and introduces ways of systematically characterising subjective realities. It thereby reviews scientific literature in the context of human behaviour and outlines conceptualisations of decision-making processes and subjective evaluations. While sections 2.1 and 2.2 were mainly concerned with concepts which explain the determinants of risk-related practices, section 2.3 introduces scholarly works which revolve around the assessment of the character and quality of practices. It outlines the field of evaluation in science and practice and summarises the most prevalent types of evaluation approaches and methodologies for strategies in the context of disaster risk reduction, climate change adaptation and sustainable development. The review of existing literature in the fields of risk, decision-making and evaluation serves as a foundation for understanding the conceptual framework of this study. This approach is, however, not only developed based on a literature review but emerged and was continuously revised in the course of data collection and analysis as grounded theory suggests. In this way, it was possible to come up with an innovative framework which can add to the scientific and practice-oriented discussion. An anatomy of risk-related response mechanisms based on Smit et al. (2000) provides the overall framing of this concept. The anatomy comprises, firstly, an analytical component to describe "who responds to what". This component is represented by a social-ecological vulnerability framework inspired by Turner et al. (2003). Secondly, the anatomy addresses "why act" and introduces a decision-making model which is mainly based on Grothmann and Patt (2005). Thirdly, a concept for analysing risk responses in relation to implementation and outcomes is introduced as part of the *anatomical* question "what do practices look like". This concept builds on process-and outcome-oriented approaches in evaluation research. Fourthly, an integrative framework is developed which brings the previous three components of the anatomy together. In that way, a fourth *anatomical* question is addressed, i.e. "how good are the practices". The fifth and final component of the anatomy addresses "why good practices occur" and introduces a systematic identification of barriers to "good" coping and adaptation based on the integrative framework presented as part of the fourth *anatomical* question.

Consequently, this integrative and adaptable conceptual framework facilitates the systematic identification, understanding, and overcoming of barriers to "good" adaptation and coping. Grasping "good" practices and their barriers in the specific regional context of the Vietnamese Mekong Delta, however, requires a depiction of the geographical and thematic setting. *Chapter 3* therefore reviews the existing literature around the selected research foci in the Vietnamese Mekong Delta context. Firstly, rural livelihoods are described in the light of ongoing transformation processes. The section comprises a geophysical and ecological characterisation of the VMD, a sketch of the recent history of rural transformation and the current state of agriculture, as well as an outline of the development-related challenges and opportunities. Secondly, the characteristics and impacts of flooding and saline intrusion will be depicted against the background of current and future trends. The third section of chapter 3 addresses water-related risks, vulnerabilities and response mechanisms. It reviews, firstly, the literature around vulnerability to water-related hazards and climate change in the Mekong Delta context. In a subsequent section, the relevant transforming political structures and processes are described and discussed. Decision-making processes have not been explicitly addressed in the Mekong Delta context. However, some studies concerned with risk perception were undertaken and are therefore introduced in section 3.3.3. In section 3.3.4, the literature around coping and adaptation processes is summarised. The last section of chapter 3 deals with evaluations of risk-related practices in the scientific community, in public policy making and in development practice (section 3.4).

Subsequently, it is important to describe how the selected research questions can be empirically answered. *Chapter 4* therefore introduces pertinent methodological concepts and outlines the methodology of the current research project. The conceptual and thematic framing draws on multiple disciplines and addresses aspects and actors at various scales. An empirical foundation for answering the research question therefore demands a multi-faceted and versatile methodological approach. A mere qualitative or solely quantitative approach cannot meet this requirement. Section 4.1 therefore outlines mixed-method approaches and depicts their relevance for the given research context. The subsequent sections assess the methodological implications of the central research questions (section 4.2) and describe the research process (section 4.3). The research foci delineate the criteria for the selection of the research sites which is described in section 4.4. Section 4.5 addresses major general drawbacks and challenges of this research and the last section of chapter 4 deals with the peculiarities, challenges and limitations of doing fieldwork in a Vietnamese context.

The empirical findings are presented in *part II*. They are described along the lines of the conceptual framework. Based on the research foci, different production types as well as socio-economic and ethnic groups are thereby contrasted with each other. The first chapter of this part (chapter 5) outlines empirical findings in accordance with the social-ecological vulnerability concept presented in section 2.4.2. It characterises tidal flooding and saline intrusion in the light of ongoing and future changes and depicts the prevalent vulnerability patterns in the research area. In this context, hazard exposure, susceptibility and the capacity of response are outlined. This provides the basis for understanding the overall risk context and the essential stimuli for taking action. Risk-related stimuli are, however, perceived and understood in distinct ways. To grasp why certain actions are taken and how strategies are evaluated subjectively, chapter 6 describes household decision-making processes along the lines of socio-cognitive models of decision-making (see section 2.2). This analysis comprises two major components, i.e. the individuals' appraisal of water-related threats and the appraisal of competence, which are both assessed against the background of social-ecological variables and cognitive determinants. In the vein of vulnerability research, perceived threats are delineated as perceived hazard exposure and perceived susceptibility. The competence appraisal includes the awareness of adaptation and coping actions, the perceived self-efficacy, and the perceived household response efficacy. A combined analysis of the appraisal of threat and competence allows a derivation of the individuals' adaptation and coping intention and provides important insights in the subjective evaluation of different stakeholder groups. Chapter 7 investigates the government- and household-led response mechanisms in relation to their implementation and outcomes. In this context, the applied strategies (including the most relevant institutions in the part around government strategies) are firstly outlined and secondly evaluated. This analysis is based on the evaluation framework presented in section 2.4.5 and presents selected strategies in relation to asset exchange, outcomes and vulnerability impacts. Like the perceived household response efficacy, the government-led strategies are additionally assessed from a subjective actor-specific viewpoint.

Chapter 8 summarises, interprets and discusses the empirical findings against the background of the literature review presented in part I. The first section of this chapter juxtaposes revealed risks against perceived realities. Linking social-ecological system analyses and socio-cognitive decision-making processes, provides a conceptual and empirical basis for understanding the overall context of "good" response mechanisms. This facilitates an identification of locally more adapted ways of overcoming the barriers to "good" adaptation and coping. Section 8.2 discusses the applied strategies in relation to their revealed and perceived quality to assess what "good" coping and adaptation actually means. This analysis aims to grasp the disparities across different actors, timescales and regions. In addition, a contrasting analysis along the lines of different evaluation approaches puts the terms "good" and "bad" into relation and allows conclusions for future evaluation research to be drawn.

Part III provides a discussion, a synthesis and recommendations for action. It builds on the interpretation of findings provided in chapter 8 and presents the argumentation in a condensed way to draw concise conclusions. Chapter 9 identifies the major barriers to "good" adaptation and coping and provides context-specific and actor-oriented recommendations for overcoming these. The obstacles comprise limits as well as socio-economic, knowledge-related, cognitive and institutional barriers. Chapter 10 elaborates on the merits and challenges of the theoretical and methodological approach. It conclusively deals with the vulnerability centred lens for evaluation approaches, the integration of a socio-cognitive model, the adaptable and context-specific evaluation concepts, and the mixed-method approach. The final chapter 11 provides key conclusions and an outlook for future research along the lines of the most important research questions and goals of this study.

2 Theories and concepts of evaluating risk-related strategies

Facts do not 'speak for themselves.' [...] Facts divorced from theory or visions are mere isolated curiosities

-- Thomas Sowell (2007: 6), *A conflict of visions*

This thesis begins with theories and concepts, i.e. abstractions of the "real world". It is this "intelligent ignorance", as Krakowski (1976) terms it, that makes facts not only understandable but also provides a foundation for interpreting them so that they are no longer "mere isolated curiosities" (Sowell 2007: 6)[11].

This thesis seeks a systematic reasoning to scrutinise "how and why rural stakeholders in the Vietnamese Mekong Delta cope with and adapt to changing water-related risks in a beneficial way" (see research questions in section 1.2). Therefore, it is important to firstly position the central research topics in the existing theoretical and conceptual literature and assess the merits, challenges and drawbacks of different lines of thought for a strategic and analytical understanding of the present research context. Section 2.1 aims at a review of scholarly work focusing on '*coping with and adapting to changing water-related risks'*. In the subsequent section, the '*why*', i.e. the reasoning behind actions and evaluations, will be addressed by scoping the literature around socio-cognitive decision-making. Consequently, an introduction to evaluation research will show how the '*beneficial*' nature of strategies can be assessed. Finally, section 2.4 will present a unique theoretical and conceptual framing for this research project. The development of this framework has been inspired but not exclusively drawn from the existing literature. Instead, the theory has - in the style of grounded theory (see Glaser, Strauss 1967: 4 and chapter 4.1 for more details) - been intimately linked to the empirical data. Accordingly, the framework has incrementally emerged in the process of data collection and analysis. In this way, phenomena specific to the given research context can be explained and abstracted. An adapted conceptual framework consequently makes it possible to guide the empirical analysis (see chapter 5, 6 and 7) and provides a basis for interpreting the findings against the background of the existing literature (see chapter 8).

2.1 Scientific discourses about risk, vulnerability and related practices

One of the three central research questions of this thesis concerns the vulnerability of households and its interdependent relationship with social practices (see section 1.2). It aims to understand how water-related risks influence coping and adaptation processes on site and how social actions impact vulnerability. In order to find meaningful answers to this question, a theoretical and conceptual "verbal world" (Watt, van den Berg 1995: 12), which systematically represents the "real world", can be drawn by looking at the scientific debates on risk, vulnerability and related practices.

[11] Theories explain the "real world" building on concepts, i.e. abstraction resulting from the objective observation of several particular cases (Watt, van den Berg 1995: 11). It is a "verbal world" which embodies, according to Watt and van den Berg (1995: 12), three components: a label, a theoretical definition and an operational definition. "The theoretical definition specifies the verbal meaning which is attached to the concept label. [...] The operational definition translates the verbal meaning provided by the theoretical definition into a prescription for measurement" (Watt, van den Berg 1995: 12).

2.1.1 The concepts of risk and vulnerability in diverse bodies of literature

Risk, which stands at the centre of this research, is a concept which has been addressed by many disciplines. Klinke and Renn (2002: 1071) define risk as "the possibility that human actions or events lead to consequences that harm aspects of things that human beings value". This "possibility" has been assessed from different perspectives. Many scientists describe risk as a function of the probability and magnitude of different impacts (IPCC 2001a). The hazardous events which are linked to these impacts can take many forms of appearance and can have different origins. It can be natural stemming from geological, hydro-meteorological, biological, technological and environmental circumstances or it can be induced by economic, social or political phenomena. Often, it is also the interaction of one or more hazards brought about by the interplay of social and natural processes (UN-ISDR 2004). These hazard-centred views do not pay much attention to the conditions which can turn the occurrence of a hazardous event or action into a crisis or catastrophe (Cardona 2004; Felgentreff, Glade 2008).

Therefore scholars increasingly incorporate the notion of vulnerability into their definition of risk (see e.g. Bohle 2008a; Müller-Mahn 2007; Brooks 2003). "Vulnerability is the intrinsic and dynamic feature of an element at risk (community, region, state, infrastructure, environment, etc.) that determines the damage/harm resulting from a given hazardous event and is often even affected by the harmful event itself" (UNU-EHS 2004 in Thywissen 2006: 34). It most commonly comprises exposure, sensitivity and capacity of response (Gallopin 2006: 295 ff), whereas many of the previously introduced definitions of risk comprise exposure and sensitivity only (Dietz et al. 2002). According to McLaughlin and Dietz (2008), vulnerability adds the concept of resilience[12], meaning coping and adaptive capacity, to risk approaches. Bohle (2007b: 9) even sees "social vulnerability as social practice and human agency". It is therefore an appropriate approach to look at social practices in a risk-prone environment, as is the case for this research.

Stressing the importance of the societal component of risk also highlights the significance of addressing social practices in the context of risk. These were prominently integrated in sociological risk research (see e.g. Douglas 1994; Giddens 1994; Luhmann 1993; Beck 1986). For Luhmann (1993) risk even defines itself through agency. In contrast to a hazard, whose outcome cannot be influenced, a risk only exists if there is a possibility of influencing the negative consequences of a decision/event[13]. Abramovitz (2001: 123) argues from a similar point of view that "while we cannot do away with natural hazards, we can eliminate those we cause, minimise those we exacerbate, and reduce our vulnerability to most". Social science risk research has therefore receded from focusing on the elimination or reduction of the hazard itself towards a more risk-management oriented perspective (Taylor-Gooby, Zinn 2006). The focus on "Living with risk", citing the title of a renowned study by the International Strategy for Disaster Reduction (UN-ISDR 2004), has therefore gained increasing attention (Bohle 2008b: 435).

Vulnerability has played a considerable role in different research fields for more than 40 years now. Birkmann (2013: 12) argues that the concept of vulnerability emerged from (i) geographic development and poverty research, (ii) hazard and disaster risk reduction/management (DRM), and (iii) climate change (CC) science and adaptation. It is thereby positioned at the interface between those schools of thought and adds a more integrated perspective to the debates. The concept of

[12] Resilience is a highly debated and connotative term. Resilience as a concept emerged within ecology where it was most commonly defined as the ability of "systems to absorb changes of state variables, driving variables, and parameters, and still persist'' (Holling 1973: 17). Other scholars perceived it as a flipside of vulnerability (IPCC 2001b; Buckle 1998) and still others perceived it as a function of coping and/or adaptive capacity (Adger 2000; Turner et al. 2003).

[13] Luhmann argues that the hazard of getting wet in a rain shower turns into a risk if you do not take your umbrella with you. Nevertheless, if you take an umbrella you run the risk of forgetting the umbrella somewhere (Luhmann 1993).

vulnerability in geographic development and poverty research arose as part of the debate on food security and entitlements (see e.g. Sen 1983; Chambers 1989; Ellis 2000). It was mainly centred on drought and other slow-onset hazards in developing countries. Within the disaster risk reduction community, research on vulnerability emerged in the 1980s, particularly in the context of naturally induced disasters. Scholars in this field argue in favour of seeing risk as a function of the hazard and vulnerability (Risk=Hazard*Vulnerability) (Birkmann 2013: 14). Over the years, a stronger focus on the social production and causes of risk was incorporated (see e.g. Blaikie et al. 1994; Hewitt 1983; O'Keefe et al. 1976; Wisner 2004) and a more integrated view of the social and ecological dimensions of vulnerability was taken up (see e.g. Turner et al. 2003; Birkmann, Fernando 2008; IPCC 2012; Bogardi 2004). In the last two decades research on vulnerability to climate change has aroused increasing attention. The IPCC (Intergovernmental Panel on Climate Change) has played a central role in this context on the international stage (Birkmann 2013). Since the third assessment report in 2001, there is an IPCC working group that focuses explicitly on vulnerability-related issues (IPCC 2001a, 2007, 2014). It initially took on a predominantly impact-oriented view of vulnerability. This perspective has developed towards an understanding where vulnerability is defined as independent of the physical event, as argued in the recent IPCC special report on extreme events (IPCC 2012) and the fifth assessment report (AR5) (IPCC 2014). It describes vulnerability at the interface between disaster risk reduction and climate change (Birkmann 2013: 17). This is a perspective which had already been acknowledged by several other researchers in previous years (see e.g. Thomalla et al. 2006; Adger 1999; Buckle et al. 2010).

All these lines of thought play a central and influential role for this research. Taking place in the context of developing countries and focusing on water-related hazards in the light of climate change, this study positions itself at a crossing point between these three lines of research within which vulnerability research has been the most influential.

2.1.2 Classifications and definitions of social practices in vulnerability and risk research

Not risk and vulnerability themselves but risk-/vulnerability-related practices are at the centre of this research. For this reason, the following sections will take a closer look at them. Aiming to enable a better understanding of these strategies, classifications have played a significant role in the literature. Risk-related practices were categorised according to: the agent responding (e.g. formal or informal), purposefulness (e.g. autonomous or planned), timing (e.g. anticipatory or reactive), goal/motivation (e.g. risk minimisation or immediate needs), temporal scope (e.g. short-term or long-term), spatial scope (e.g. local or global), form (e.g. storage or mobility), type of outcome (e.g. impact or change) or performance (e.g. adaptation or maladaptation) (see Table 2.1).

Table 2.1: Classifications of risk-related response mechanisms

Classification according to:	Examples of strategy types	Scholars advocating these classifications
Agent responding	Government (Formal) Civil Society/Households (Informal)	Dolan et al. (2001), Birkmann et al. (2010)
Purposefulness	Autonomous Planned	Fankhauser et al. (1999)
Timing	Anticipatory Reactive	Devereux (2007)
Goal/motivation	Risk minimisation Immediate needs	Adams et al. (1998)
Temporal scope	Short-term Long-term	Smit and Wandel (2006)
Spatial scope	Global Local	Smit et al. (1999)
Form	Mobility Diversification	Agrawal (2010)
	Hard measures Soft measures	McElwee (2010)
Sectors	Agriculture Energy	Birkmann (2011a)
Resources needed	Common property-based Reciprocally-based	Davies (2009)
Type of outcome	Impact Change	Birkmann et al. (2010)
	Resilience Transition Transformation	Pelling (2011)
	Erosive Non-erosive	De Waal (1989); Devereux (1999)
	Sensitivity-reducing activities Exposure-reducing activities Resilience-increasing activities	McElwee (2010)
Performance	Adaptation Maladaptation	Grothmann and Patt (2005)

An important differentiation, also in this research context, is the one between **formal and informal strategies**. Particularly in countries where strong links exist between the state and the people, as is the case in Vietnam, this is a highly relevant topic for discussion. Formal strategies refer to governmental actions, whereas informal strategies relate to the practices of private actors such as households or individuals (Birkmann et al. 2010). Formal strategies have received much attention, also and especially in the context of global environmental and climate change as part of the adaptation debate (see e.g. Füssel 2007; Gagnon-Lebrun, Agrawala 2006; Klein 2010). Adaptation has also been researched in the context of informal household level strategies, yet to a lesser extent (see e.g. Agrawal 2010: 178ff; Adger 2003: 388). More short-term and reactive formal strategies were commonly addressed from humanitarian aid perspectives after naturally induced disasters or food crises (see e.g. Albala-Bertrand 2000; Naqvi, Sobiech 2010). At the private household level, important strands of literature around short-term oriented strategies arose with regard to coping with food crises (see e.g. Davies 2009; Maxwell et al. 2003), conflicts (see e.g. Korf 2002; Bohle 2007a) or adverse natural events (see e.g. Birkmann et al. 2010; Few 2003). The interplay between formal and informal strategies, addressing policies and household-level reactions at the same time, has rarely been researched. However, this has been shown to be a crucial point in gaining a more integral and multi-scale understanding of coping and adaptation. Birkmann (2011a) identified it as one of the biggest challenges to arrive at a more integrated perspective on both sides of human risk responses. Sociological approaches such as Giddens' theory of structuration or Bourdieu's theory of practice can help shed light on these dynamic interplays (Haan, Zoomers 2005; Sakdapolrak 2007; Bohle 2008c); but structuration theory in particular has rarely been applied in empirical research. Helmke and Levitsky (2004: 727) further show that an integrated perspective on formal and informal strategies has important implications for evaluation research. They see the compatibility of formal and informal goals as one of the most important prerequisites of good governance and Carina and Keskitano (2004) argue that this goal compatibility is a central element of more democratic and sustainable decision-making at both the household and the policy level. Focusing on an evaluation of risk-related response mechanisms, an integrated analysis of formal and informal strategies takes on substantial importance in the current research context.

Another highly important and relatively complex differentiation is the one between coping and adaptation. Adger (1999: 250) even advocates that an improved understanding of **adaptation and coping** processes is "one of the most important research issues within the area of global environmental change". According to Korf (2002), adaptive strategies "denote processes of change which are more or less conscious and deliberate in the way people adjust livelihood strategies to long-term changes and challenges (trends)" whereas coping refers to "short-term responses to periodic stress or sudden shocks of both natural and political hazards". Several other scholars use these terms synonymously. Agrawal (2010), for example, focuses on how risks affect livelihood capabilities[14] rather than making a distinction between coping and adaptation (see Table 2.1). Downing et al. (2004: 5) see adaptation as "a specific response that an actor can implement", comprising both coping and adaptation processes. Wisner (2004: 114) also has a more integrated understanding of coping and adaptation. He sees coping as a series of adaptive strategies in the face of threat and argues for differentiation mainly according to the outcome of a certain strategy (e.g. building up stores of food and saleable assets or diversifying production) (Wisner et al. 2004: 115 ff).

Birkmann (2011a) and Schipper (2009), in contrast, argue that coping and adaptation processes are not synonymous terms and that it is essential to treat them differently. The differentiation is a comparatively complex one which involves several of the distinguishing features listed in Table 2.1. Birkmann (2011a) and Schipper (2009: 3) highlight that it is not only the timescale[15] in which coping and adaptation differ, but that they imply different notions of outcome. Schipper (2009: 3) argues that "too much coping implies that livelihoods are not sustainable". And Adams et al. (1998: 265) find that "even those who had initially coped successfully may find themselves less and less able to fulfil their various objectives without increasingly detrimental trade-offs". Accordingly, many scholars see coping strategies as a forced response to a critical situation which has a relatively negative notion. Adaptation, on the other side, is more intentional and reflective aiming at a positive outcome (Korf 2002: 3). Moreover, Birkmann (2011a) argues that coping implies impacts rather than changes as they refer to processes occurring within existing institutional frameworks. Adaptive strategies, in contrast, require changes in the institutional setting and are thus linked to change (see Figure 2.1; a similar argumentation can be found in Moser 2009a; Gore 1992). Pelling further differentiates between adaptation for "resilience (maintaining the status quo), transition (incremental change) and transformation (radical change)" (Pelling 2011: 3). The IPCC AR 5 (Abeysinghe et al. 2014 mainly referring to O'Brien, Sygna 2013) states that transformational change is most effectively changing sustainability when derived from a change of beliefs, values, worldviews and paradigms. These classifications go beyond seeing adaptation merely as intentional long-term oriented strategy by adding a qualitative notion to the extent of change induced by adaptation actions. They thereby point at the necessity to demand for more than 'just' adaptation in areas where vulnerability and risks are so substantial (as is the case in the Mekong Delta) that transformation rather than incremental change is required (Alam et al. 2014; Kates et al. 2012; O'Brien 2012).

[14] He distinguishes between mobility, storage, diversification, communal pooling and market exchange (Agrawal 2010: 182).

[15] Adaptation strategies are most commonly proactive and positive, whereas coping strategies are rather reactive and defensive (Devereux 1999: 8).

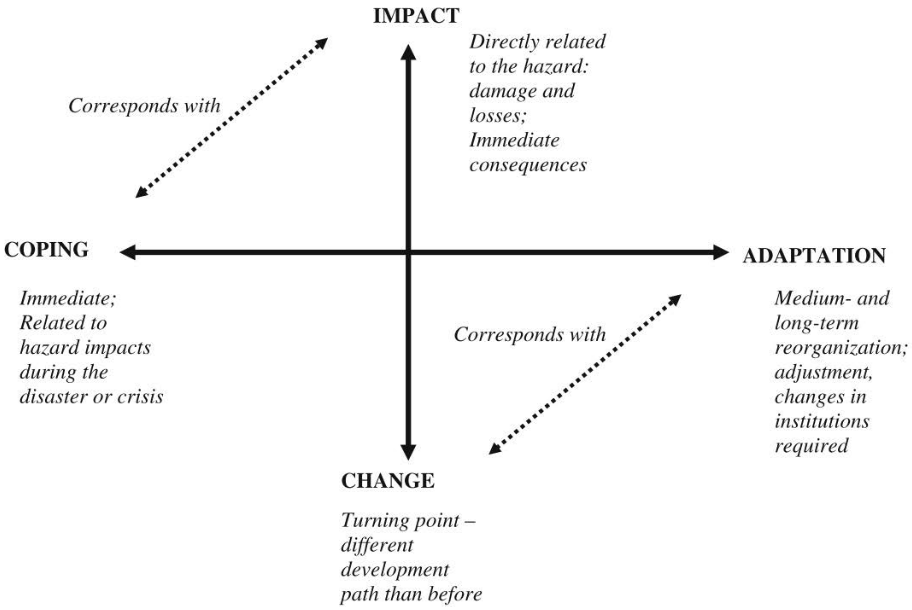


Figure 2.1: Birkmann's conceptualisation of coping and adaptation against the background of impact and change (Source: Birkmann 2011a: 817)

The relevance of differentiating between coping and adaptation in this research context becomes apparent when considering that the main research questions revolve, amongst other things, around what outcomes strategies have and which values are ascribed to them (see section 1.2).

2.1.3 The role of social practices in established vulnerability frameworks

Within the different schools of thought, introduced in section 2.1.1, a substantial range of conceptual vulnerability frameworks have been developed. As it is risk-related practices on which the current research focuses, the following section will draw on those frameworks against the background of selected vulnerability frameworks. Thereby, only influential conceptualisations which are relevant to the present research foci, i.e. formal and private actions, coping and adaptation, the evaluation of strategies, rural development, disaster risk reduction and climate change, will be presented (see Table 2.2). Table 2.2 reveals in this respect that not only is vulnerability an important linking concept between different research communities, but that it is also a promising anchor point for conceptualising risk-related strategies from different viewpoints. Each of the schools of thought and their specific perspectives on risk-related strategies will therefore be depicted in more detail in the following sections.

Table 2.2: Conceptualisations of risk-related strategies in different vulnerability frameworks

Conceptual vulnerability frameworks	Conceptualisation of risk management	Formal / informal	Coping/Adaptation	Field of research
1. *Causes and dynamics of vulnerability* Watts, Bohle (1993); Korf (2002)	Interplay of coping/adaptation and vulnerability	Focus on informal household strategies. Formal strategies only in their function as structures influencing informal strategies.	Watts and Bohle (1993) and Adams et al. (1998) mainly concerned with coping. Korf (2002) integrates adaptation	Poverty and development research
2. *Sustainable Livelihood approaches* DFID (1999); Ellis (2000)	Livelihood strategies	Focus on informal strategies; formal strategies as external factors structuring informal strategies.	Coping and adaptation as potential livelihood strategies; no explicit differentiation	Poverty and development research
3. *Pressure-and-release* Blaikie et al. (2003); Wisner et al. (2004)	PAR-model: not explicitly addressed Access-model: coping explained by access to resources	PAR-model: Dynamic pressures address formal strategies. Access-model: explains informal and formal strategies	PAR-model: Dynamic pressures address adaptation strategies. Access-model: explains coping and adaptation	DRM research
4. *Vulnerability of coupled social-ecol. systems* Turner et al. (2003)	Coping and adaptation as part of local resilience and socio-ecological processes outside the place	Formal and Informal strategies inside and outside the place; not explicitly addressed	Coping/response, impact/response and adjustments & adaptation/response	DRM and CC research
5. *IPCC SREX framework* *IPCC (2012)*	Adaptation to CC and DRM as part of development component	Can be applied to both formal and informal strategies but neither is explicitly addressed	Focus lies on adaptation in a CC and DRM context. Coping implicitly included as part of DRM	Integrated DRM and CC research
6. *Anatomy of Adaptation* Smit et al. (1999)	Framework to analyse adaptation to CC and variability	Can be applied to the analysis of both formal and informal adaptation	Adaptation at the centre of interest. Coping is not addressed	CC research
7. *Barriers and limits of adaptation* Moser, Ekstrom (2010); Dow et al. (2013)	Framework for a systematic identification of barriers and limits	Can be applied to identify barriers to both informal and formal adaptation	Focus on adaptation; not applied in the context of coping	CC research

Dynamics of vulnerability

In development and poverty research, important conceptualisations were developed which attempt to include the dynamics of vulnerability. This is of particular interest when dealing with change, as is the case in this research (see section 1.3). Adams et al. (1998) conceptualise coping processes along a continuum which represents a deterioration of a household's situation with progressive crisis. A household's location along this continuum describes the strategies being applied starting with adaptation practices to minimise risk in normal times, via coping in times of crisis, to coping in case of failure and calamity (Cekan 1994). In a decision-making context, this indicates that preferences for certain actions and immediate goals change with the occurrence of a hazard. Proceeding along this continuum, risk minimisation objectives are displaced by strategies aimed at fulfilling immediate needs (Adams et al. 1998). The succession of different strategies depends on factors such as costs, reversibility and effectiveness of strategies. Devereux (1999: 9) argues, in this context that a household shifts from one set of behaviours to others, most commonly less preferred strategies, or intensifies a "normal" behaviour (Korf 2002: 3). Corbett (1988) and Watts (1983) refer to 'last resort' strategies. These stand at the end of the continuum and indicate a looming crisis and a failure to cope which can result in a calamity (Adams et al. 1998). Watts and Bohle (1993) conceptualise the continuum of vulnerability in their dynamic framework for hunger famine vulnerability (see Figure 2.2). They assume that there exists a baseline-vulnerability for each household (corrugated line at the bottom of Figure 2.2). Coping in times of crisis increases the intensity of deprivation (depicted on the y-axis) and can bring this baseline vulnerability to a higher level (social space of vulnerability II in the left half of the figure). Both approaches, however, do not consider adaptation explicitly as a process which can decrease baseline vulnerability and initiate a regression along the continuum of coping. Korf (2002) therefore includes adaptation in his conceptualisation of the interplay of livelihood strategies and vulnerability by assuming that agents undergo phases of adaptation and coping; whereby adaptation can lead to a decrease in vulnerability and coping can imply an increase in vulnerability.

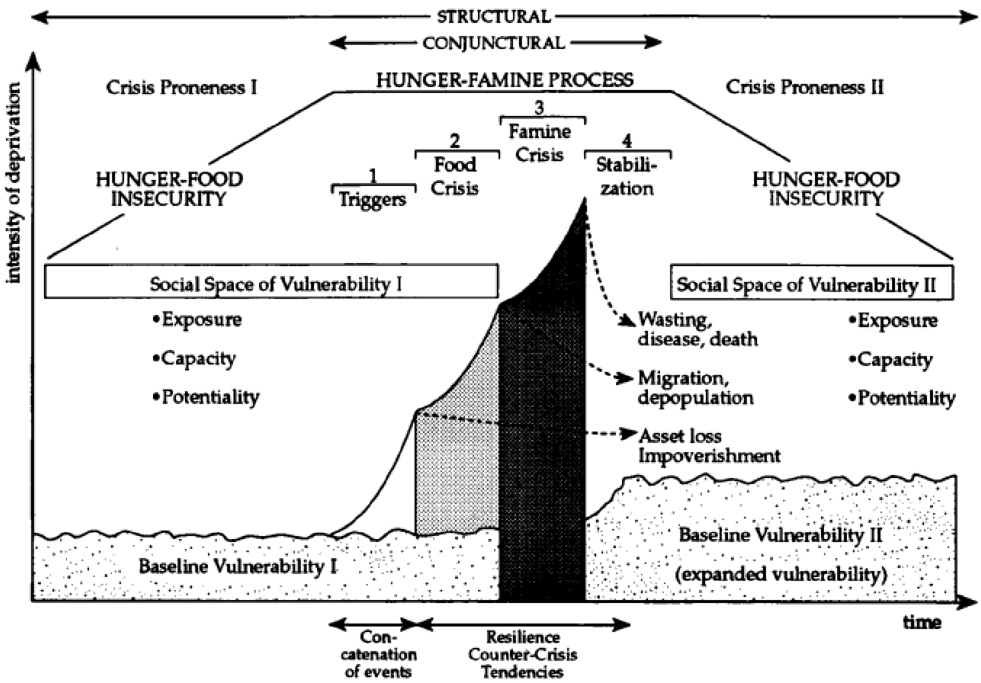


Figure 2.2: Watt's and Bohle's framework for hunger-famine vulnerability (Source: Watts, Bohle 1993: 64)

In general, these approaches, however, mainly concern informal strategies and include formal strategies only as an external determinant of baseline vulnerability and coping capacity. Despite the neglect of formal strategies, they can address aspects pertinent to this research. They capture, in contrast to most other approaches, the consequences of coping and, at least in Korf's approach, of adaptation to vulnerability. This provides not only a more dynamic perspective of vulnerability but also accounts for vulnerability-related outcomes of coping and adaptation – both aspects of high relevance to the first research question (see section 1.2). These approaches also account for decision-making processes, individuals' evaluations and hazard-dependent shifts in preferences – issues particularly relevant to the second research question (see section 1.2).

Sustainable Livelihoods Framework

The Sustainable Livelihood Approach was introduced by Chambers and Conway (1991) in the beginning of the 90s and has, since then, heavily influenced theoretical as well as practical discourses in poverty and development research. It was most commonly applied to rural areas in developing countries, as is also the case in the current research project. The concept acts on the assumption that the poor operate in a vulnerability context. Within this milieu, the capital endowment, i.e. human, social, physical, natural and financial assets (see pentagon in the centre of Figure 2.3), of a household serves as a so-called ‘livelihood platform’ (Ellis 2000: 30). Access to this platform is mediated by transforming structures and processes. Together they shape agency and livelihood vulnerability towards shocks, trends and variability and form an overall environment for decision-making (Bebbington 1999: 2022). This approach therefore provides a good foundation for analysing social practices and understanding why and how strategies can be implemented. The livelihood assets and transforming structures and processes are the basis for the coping and adaptation strategies of an actor (mainly informal ones represented by the livelihood strategies box), i.e. the wealth in terms of access to assets determines the capacity to act. Formal strategies are seen as external factors structuring processes (grey box of transforming structures and processes).

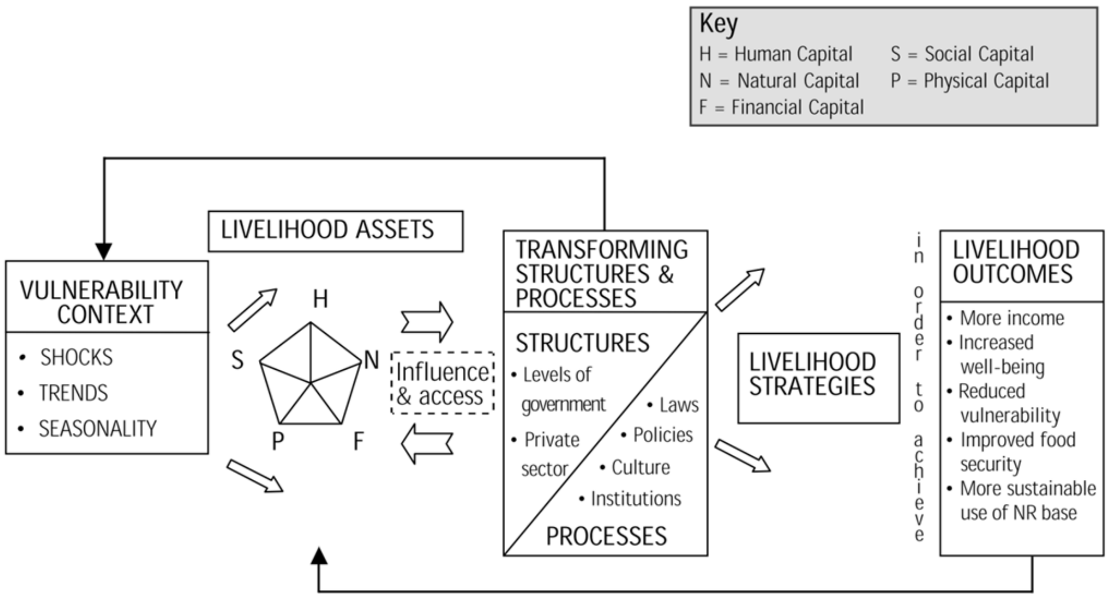


Figure 2.3: The sustainable livelihoods framework (Source: DFID 1999: 2.1)

The framework therefore provides important impulses for this research project: Firstly, aiming to give a comprehensive picture of local living conditions in rural areas of developing countries, it can provide a pertinent basis for identifying indicators of household vulnerability (particularly important for answering the first research question). Nevertheless, the perception of hazards and vulnerabilities and how the subjective dimension of livelihoods feed into decision-making for livelihood strategies is not addressed in this framework. These are aspects of central relevance in a study which aims at a more in-depth analysis and evaluation of risk-related strategies as is the case in this research. Secondly, the interplay of informal and formal processes and structures is addressed as part of the framework. How exactly formal strategies influence local livelihoods is kept in a black box, however, and should be more explicitly conceptualised. Thirdly, the framework directly looks at the impacts of private strategies on local livelihoods and therefore implicitly takes on an integrated evaluation perspective which has been outlined as a central interest of this research. It does not consider which outputs have caused the given livelihood outcomes, though, and neglects to address how far these outcomes would lead to longer-term impacts on the livelihood system.

Pressure-And-Release Model (PAR)

The pressure-and-release model (PAR) was introduced by Blaikie et al. (2003) in their influential book "At risk". Being a decisive framework in the disaster risk community, it addresses the natural hazard and disaster risk side of vulnerability research. The PAR model conceptualises the risk of natural disasters as a function of vulnerability and the hazard. The model wants to link "discrete risks with political economy of resources and normative disaster management and interventions" (Adger 2006: 275). Vulnerability is depicted in its progression from root causes, via dynamic pressures towards unsafe conditions (see arrows on the left in Figure 2.4). Root causes can be found in power and resource distributions, or in political and economic ideologies. They are therefore closely related to the good governance discussion, which strongly influences formal risk management strategies. Root causes are an "interrelated set of widespread and general processes within a society and the world economy" (Wisner et al. 2004: 52); examples for root causes are political and economic systems or unequal access to resources and power. Dynamic pressures mediate and transform root causes into unsafe conditions (Wisner et al. 2004). They include, besides macro-forces (e.g. population changes) and deficient structures (e.g. institutions or education), formal strategies in the risk context (e.g. structural adjustment programs). Informal practices come into the picture with the access model which has gained less attention in scientific debates. It deals with the "amount of 'access' that people have to the capabilities, assets and livelihood opportunities that will enable them (or not) to reduce their vulnerability and avoid disaster" (Wisner et al. 2004: 87). It therefore addresses people's agency, their interactions as well as their coping and adaptation strategies. This makes it possible to link it to merits and challenges relevant in the sustainable livelihood debate.

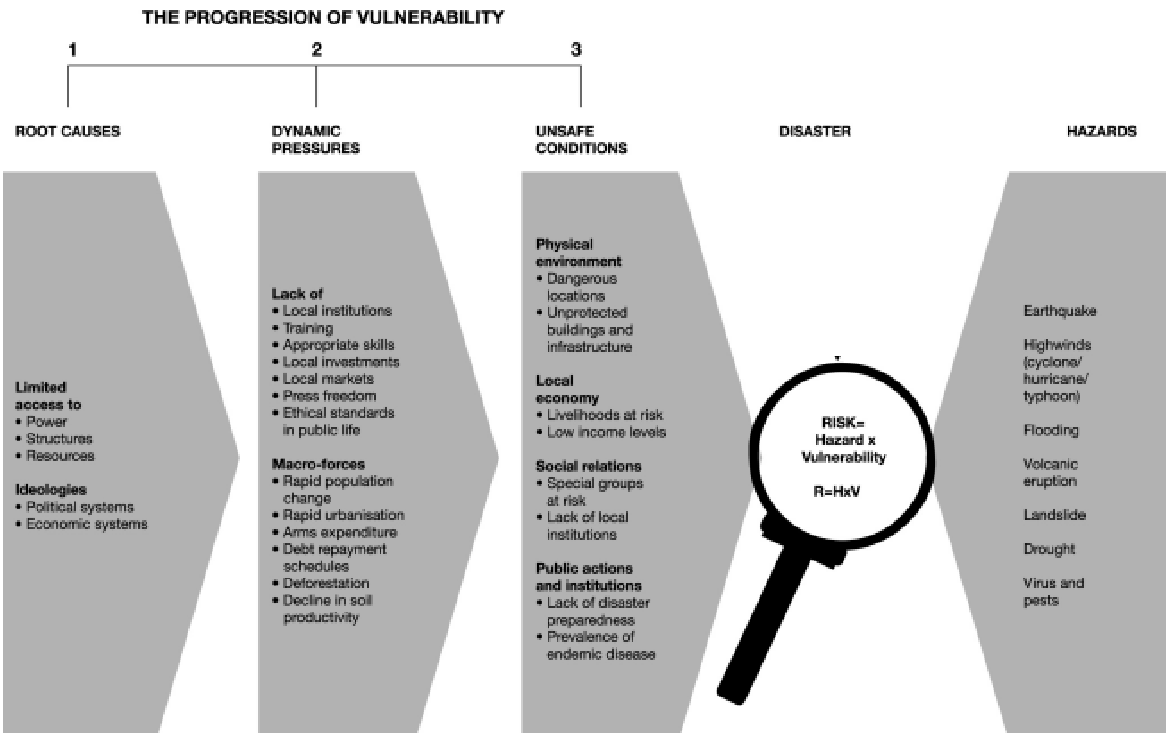


Figure 2.4: Pressure and Release Model of Disaster Risk Reduction (Source: Wisner et al. 2004: 51)

The ideas around root causes and dynamic pressures are of substantial relevance to countries undergoing transformation. For this reason it is highly relevant to the present research which centres on Vietnam – a country which underwent substantial changes in root causes in the recent past and will probably continue to do so in future. In addition, the PAR model can provide approaches to conceptualise government-related aspects in the context of disaster risk. The interplay with informal strategies is not explicitly addressed, though.

Vulnerability of Coupled Social-Ecological Systems Framework

One of the most prominent models in integrated and interdisciplinary vulnerability research in the field of disaster risk reduction and in the climate change community is the framework for coupled social-ecological systems developed by Turner and his colleagues (Birkmann 2006, 2013). Turner et al. (2003) define and conceptualise vulnerability from a place-based perspective, but also by considering influences outside the place on a regional and global scale (depicted as overlapping layers in Figure 2.5). The vulnerability of a local system (inner layer) comprises exposure, susceptibility and resilience and is influenced by human and environmental factors outside and inside the place. Having a relatively strong focus on social and ecological coupling processes, it is most pertinent to research in rural areas, such as in the present research, where the interconnectedness of both systems is often more apparent than in urban areas. Human and environmental influences, variability and changes outside the place generate, in their interplay, hazards (boxes on the left in Figure 2.5) which affect the local system. It is therefore possible to integrate a dynamic and change-oriented perspective, as is also required in this research context which is concerned with climate change and socio-political transformation in the Vietnamese Mekong Delta. Similar to the 'livelihood platform', the conditions on a local scale comprise, on the social side, social, economic and human capital. Environmental conditions include natural capital, i.e. the access to biophysical characteristics such as ecosystem services. Risk-related strategies are addressed comprehensively in the resilience component of vulnerability inside the place and occur in the form of response mechanisms outside the place. They are not only seen in their formal and informal appearance (response boxes on the outer region and world layers vs. boxes on the inner local layer in Figure 2.5) and as coping and adaptation processes but are also perceived in their interaction with each other, their effects on each other and their effects on other components of the system. Coping mechanisms can, for example, facilitate adaptation which can itself lead to substantial system-wide changes in the social-ecological system.

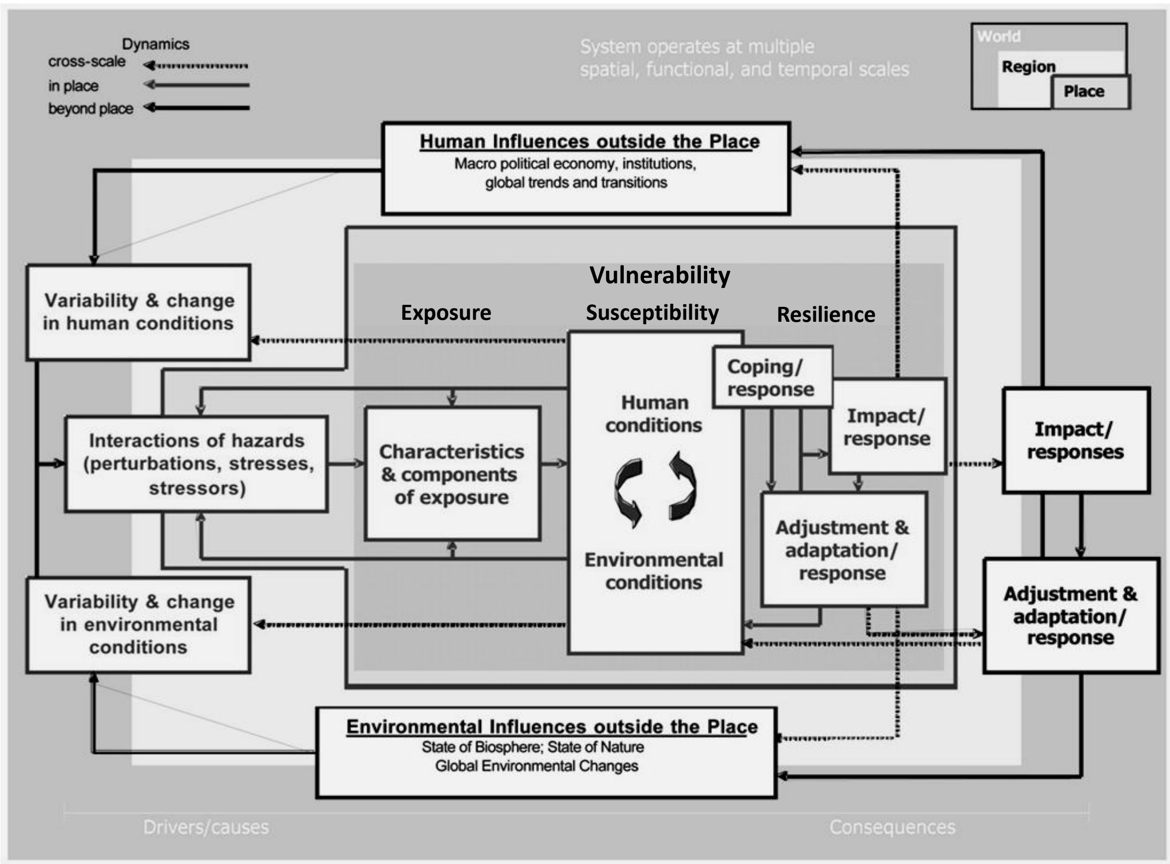


Figure 2.5: Vulnerability framework as proposed by Turner et al. (2003: 8076)

The framework is highly relevant to an analysis of most of the central research foci. It is expedient to research in a rural development context and addresses multiple scales. Moreover this conceptualisation encompasses not only structure-influenced practices but also considers action-influenced structures. It thereby provides an integrated view of formal and informal strategies (although not a very distinct one). The integration of feed-back effects and coupling processes strengthens this dynamic perspective and adds a good entry point for vulnerability-based evaluations in consideration of climate and socio-political changes, as is intended in the current research context.

IPCC SREX Framework

The recently published IPCC SREX (IPCC 2012) and the fifth assessment report - AR5 (IPCC 2014) argue for bringing the development, disaster risk reduction and climate change communities together and propose an integrated framework. (Disaster) Risk is at the interface between hazardous events, vulnerable social conditions and exposed elements (IPCC 2012: 32; IPCC 2014: 43). Vulnerability is accordingly independent of the physical event; and exposure is, as opposed to what the Turner framework argues, not part of vulnerability (see circle at the centre of ovoids in Figure 2.6). This socially determined view of vulnerability stands in contrast to a previous IPCC report which defined the “character, magnitude, and rate of climate change and variability” (IPCC 2007: 883) as integral parts of vulnerability. The components shaping disaster risk are influenced by both changes in climate and by development (left and right end of Figure 2.6). Social practices are addressed as part of development comprising disaster risk management and climate change adaptation. Accordingly, a focus lies on adaptation whereby coping is only implicitly included as part of disaster risk management. In contrast to the previous IPCC report, adaptation can only be anticipatory when undertaken by a human system. Natural systems can only adjust to actual climate and its effects. Both disaster risk management and adaptation to climate change aim to reduce vulnerability and exposure, increase capacities to better respond, prepare and recover, transfer and share risks, and bring about transformative changes (IPCC 2012: 4f).

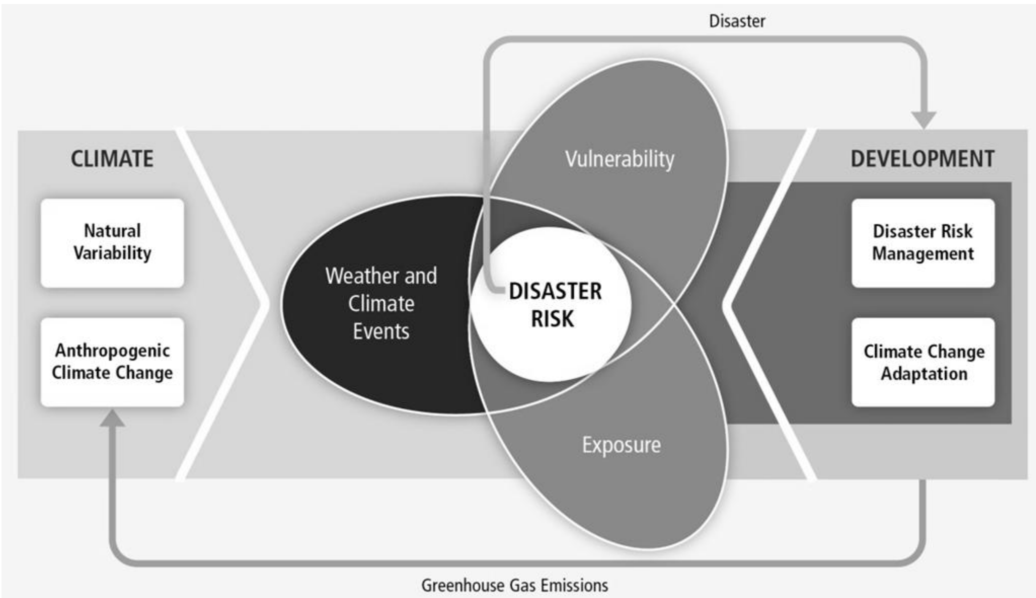


Figure 2.6: Conceptualisation of disaster risk in the IPCC SREX report (Source: IPCC 2012: 31)

The contribution which the framework can make to this research context is mainly owed to the integrative perspective on disaster risk as a function of climate change and development. It brings together the three big conceptual schools of thought on which this research relies. Moreover, the degree to which risk reduction is achievable or achieved by DRM and CCA as well as the influential character of disaster risk on development via modified DRM and CCA, can provide an interesting evaluation perspective for the research context.

Anatomy of adaptation

Several scholars in the climate change community have put adaptation at the centre of their research, considering vulnerability and risk in a more contextual role (see e.g. Downing et al. 2004; Adger et al. 2005; Berkhout et al. 2006; Brooks et al. 2011). For these scholars, the main interest was to answer the question of what adaptation actually is. Smit et al. (1999: 204) attempts to find answers to this question by building on a so-called anatomy of adaptation. In the literal sense of anatomy, it breaks adaptation down to its major components in order to understand the overall system. Four major questions represent these components (see Figure 2.7): “Adaptation to what?”, “Who or what adapts?”, “How does adaptation occur?” and “How good is the adaptation” (Smit et al. 1999: 204; Smit et al. 2000: 230). The ‘to what’ seeks the stimuli which bring about a response; these stimuli can, for instance, be sea level rise or an increasing intensity of extreme events which would, obviously, have different implications. ‘Who or what system’ refers to the agents in a relatively wide sense; it “can be people, social and economic sectors and activities, managed or unmanaged natural or ecological systems, or practices, processes or structures of systems” (Smit et al. 1999: 203). Another important factor in the anatomy of adaptation is the question of ‘how adaptation occurs’. This refers to the way in which adaptation varies with regard to its processes and outcomes. Finally, having a picture of what adaptation is provides an opportune entry point to raise the question ‘how good is this adaptation’.

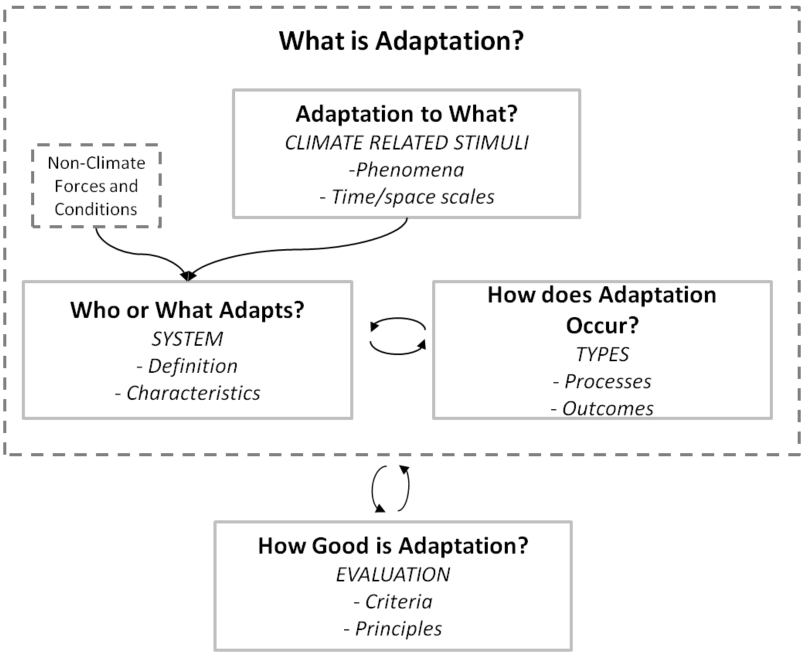


Figure 2.7: Anatomy of adaptation to climate change as proposed by Smit et al. (1999: 204)

Smit et al. (1999: 204), accordingly, asks most of the questions that are also asked in this research context. An anatomy could therefore provide pertinent means to systematically analyse many of the research components. It is, for instance, one of the few vulnerability-related approaches which address evaluation explicitly. Moreover, the question for the system which adapts allows a clear distinction between the adaptation of formal and informal actors and makes it easier to address the specific regional context of rural Vietnam. Nevertheless, this anatomy does not consider why certain adaptation actions are taken and why “good” adaptation occurs. These are, however, important aspects to be addressed not only in the present but also in other research contexts which are concerned with the character and implications of risk-related response mechanisms.

Barriers and limits of adaptation

In recent years, a growing debate around barriers and limits of adaptation has emerged in the climate change adaptation community (see e.g. Adger et al. 2007; Adger et al. 2009; Dow et al. 2013; Hulme et al. 2007; Inderberg, Eikeland 2009; Jones 2010; Moser 2009b: 33; Moser, Ekstrom 2010) - a topic which is also addressed in the research questions of this study. In the recently published fifth assessment report of the IPCC, this topic was prominently addressed with an own chapter on constraints (widely equivalent to the terms barriers and limits; Alam et al. 2014). Some scholars use the terms limits and barriers interchangeably (see Jones 2010) while others make a clear distinction (see e.g. Dow et al. 2013; Moser 2009b: 33; Hulme et al. 2007). Barriers are most commonly defined as obstacles that can be overcome, requiring, according to Moser and Ekstrom (2010: 22027), “concerted effort, creative management, change of thinking, prioritisation, and related shifts in resources, land uses, institutions, etc.”. Limits, in contrast, are defined as absolute and insurmountable obstacles which relate to a set of immutable thresholds beyond which existing systems, states, valued objects and activities cannot be maintained or secured (Alam et al. 2014: 3; Dow et al. 2013: 306; Moser, Ekstrom 2010: 22026; Adger et al. 2009: 335). Traditionally, they are analysed as ecological, physical, and technological thresholds which are absolute in a real sense (Moser, Ekstrom 2010: 22027; Adger et al. 2009: 335). In the IPCC fourth assessment report, barriers are grouped into financial barriers, social and cultural barriers and informational and cognitive barriers (Adger et al. 2007: 733). Jones (2010), in contrast, distinguishes social and human/informational barriers. She argues that social barriers are composed of normative, cognitive and institutional obstacles; whereas knowledge, technology, and economic barriers constitute human and informational barriers. Adger et al. (2009) see social barriers as endogenous to the society, depending on goals, values, risks and social choice. These barriers to adaptation are accordingly “mutable, subjective and socially constructed”.

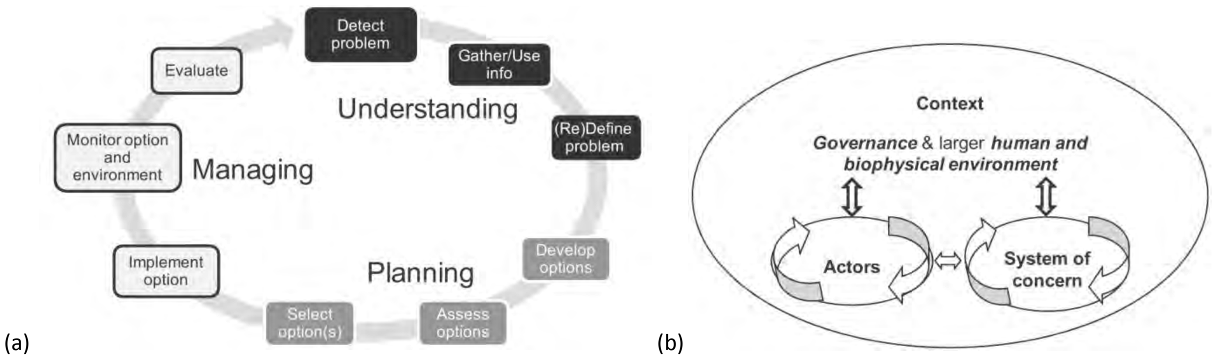


Figure 2.8: Systematic approach for barrier identification based on an analysis of (a) an idealised adaptation process and (b) structural elements (Source: Moser, Ekstrom 2010: 22026f)

Moser and Ekstrom (2010: 22026) suggest a comprehensive, systematic approach for identifying and organising barriers and limits to adaptation. The framework consists of three sets of components: First, an idealised adaptation process and related stages of decision-making are illustrated and analysed (see Figure 2.8a); second, the structural elements are considered, i.e. the actors, the larger context in which they function (e.g. institutions, governance), and the exposed system upon which they act (see Figure 2.8b). Accordingly, the first and second step make it possible to identify which obstacles could occur at each step in the adaptation process and facilitate a depiction of how the structural elements contribute to each barrier. In a third step, opportune points of influence and intervention can be located in a matrix representing the temporal (contemporary vs. legacy) and spatial/jurisdictional (remote vs. proximate) scope of action (Moser, Ekstrom 2010).

A systematic identification of barriers and limits of adaptation, as is suggested by Moser and Ekstrom (2010: 22026), can also provide an important contribution to this research context. So far, most of the previously introduced vulnerability frameworks mainly focused on a characterisation of vulnerability and related practices; this approach provides a basis for making use of the information and translates it systematically in strategic points of intervention.

In summary, section 2.1 introduced the most relevant theoretical and conceptual lines of thought around risk, vulnerability and related practices for this research context. Each of these concepts was introduced against the background of its merits in finding an innovative and appropriate conceptual framework to analyse and evaluate coping and adaptation strategies in the context of changing water-related risks in the VMD. These insights inform, most notably, the conceptualisation of household vulnerability and its co-dependent links to social practices (see sections 2.4.1 and 2.4.2).

2.2 Social-cognitive models of decision-making and risk perception

Considering that it is individuals who decide on whether or not to take actions and as it is they who determine whether these actions lead to a better or worse situation, it is also important to address this topic from a more actor-oriented perspective. A vulnerability lens alone which considers mainly hazard characteristics and social vulnerabilities would not enable a profound understanding of decision-making processes, individuals' evaluations and resulting actions. The livelihood framework may implicitly address the reasons for undertaking certain actions, the "dynamics of vulnerability" concept may broach shifting priorities of individual actors, and the PAR model may provide an analytical framework for public decision-making, but these concepts only address decision-making, subjective evaluations, and risk perception implicitly or independently from each other, respectively link it to transforming structures at a macro scale (especially the PAR model) and not on a micro scale (see section 2.1). In the current research context, an in-depth understanding of these aspects is of central importance, however, particularly for answering the research questions which revolve around how decisions are made and how strategies are evaluated. Different systems and actors perceive and value stimuli differently and will take, based on that, different decisions for or against various types of actions. The question of how good an adaptation is can also only be comprehensively understood when seen against the background of individual or institutional goals reflected in the decision-making rational and process. In the following section, selected approaches to decision-making and subjective evaluation which are most relevant to the research will therefore be presented.

2.2.1 Human behaviour and cognitive models in the context of risk-related practices

For a long time, decision-making has mainly been explained by rational choice approaches from economic theory and behaviourist concepts such as stimulus-response models (Grothmann, Patt 2005). However, since the second half of the 20th century, scholarly works considering the influence of social and cognitive factors on the decision-making of actors with bounded rationality have increasingly been acknowledged, especially by cognitive psychologists (e.g. Tversky, Kahneman 1974; Rogers 1975; Bandura 1982; Slovic et al. 2000; Paton 2003). Despite its potential relevance for researching vulnerability, disaster risk management and climate change adaptation, decision-making processes have gained comparatively little attention in these fields so far (Acosta-Michlik, Espaldon 2008: 1; Rose et al. 2012: 106f).

There are, nevertheless, some scholars in these areas who share a common interest in understanding human action and consider both social and cognitive factors in their analyses of risk-related response mechanisms. Rogers's "Protection Motivation Theory" (PMT) (Rogers 1975, 1983; Rippetoe, Rogers 1987) is the basis for one important strand of this literature (see e.g. Mulilis, Lippa 1990; Krömker, Mosler 2002; Grothmann, Patt 2005; Grothmann, Reusswig 2006; Krömker et al. 2008; Kuruppu, Liverman 2011; Frank et al. 2011; Bubeck et al. 2012). Protection motivation is judged to be the foundation for taking risk-related measures. As initially proposed by Rogers (1975), it is aroused by three cognitive processes "(a) the magnitude of noxiousness of a depicted event; (b) the probability of that event's occurrence; and (c) the efficacy of a protective response" (Rogers 1975: 93). Based on Bandura's (1978; 1982) considerations of the importance of self-efficacy, Rogers (1983) also included later on the capability to adopt a recommended measure in his model (Mulilis, Lippa 1990: 620).

Grothmann and his colleagues amended the model of PMT and came up with a socio-cognitive model of individual adaptation and coping. Grothmann and Patt (2005) applied it first as basis for explaining climate change-related adaptation; later on Grothmann and Reusswig (2006) adopted the model to analyse flood-related precautionary actions. In these models risk appraisal (Grothmann, Patt 2005) later referred to as threat appraisal (Grothmann, Reusswig 2006) and adaptation appraisal (Grothmann, Patt 2005) later termed coping appraisal (Grothmann, Reusswig 2006) are judged to be the two variables with the most power to explain an agent's intention to act and his/her avoidant maladaptation (see grey box of individual cognition in Figure 2.9). These reflections on one's own action and risks are influenced by cognitive variables such as reliance on public measures, risk experiences and cognitive biases/heuristics (see boxes on the left side of the grey box in Figure 2.9). Social factors also affect the individual cognition. Among the social factors are adaptation incentives/barriers, social discourses on risks or potential measures, and the actual adaptive capacity of an agent (see boxes external to the grey box of individual cognition in Figure 2.9). The works of Grothmann and his colleagues formed the basis for several other empirical studies such as climate adaptation in the context of water management in Kiribati (Kuruppu, Liverman 2011), adaptation to climate risk in the Mexican coffee sector (Frank et al. 2011), flood protective behaviour in Vietnam (Reynaud 2012; Bubeck et al. 2012), and climate change adaptation in the Mekong Delta (Hoa Le Dang et al. 2014).

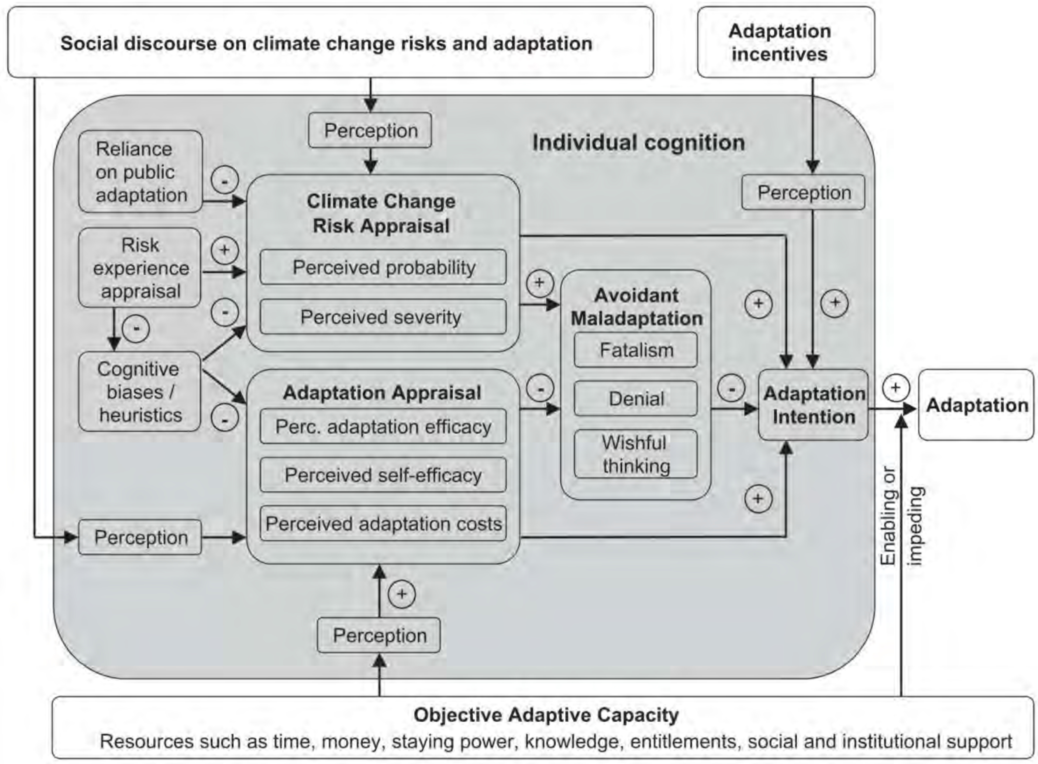


Figure 2.9: Process model of private proactive adaptation to climate change (MPPACC) (Source: Grothmann, Reusswig 2006)

Describing the drivers of decision-making for risk-related practices in the context of natural hazards and climate change, these approaches directly address many of the specific challenges arising from the research questions. To gain a better understanding of the conceptual challenges and potential contributions to the present research context, the following section will take a closer look at the two central terms in these models: perceived threats and perceived adaptive capacity.

2.2.2 Perception of threats and adaptive capacity

The acknowledgement of the decisiveness of hazard **risk perception** is long-established, including in vulnerability and natural hazard-related research (see e.g. Burton, Kates 1963; Kasperson et al. 1988). Although risk cannot be perceived as such (it cannot be smelled, tasted or heard), it became a prominent term in the scientific debate (Rohrmann 1999: 5). It expresses according to Dessai et al. (2004: 13) an "internal" definition of what is dangerous. This stands in contrast to the "external" definition which comes from experts or science and is based on "psychological, social, moral/institutional and cultural processes that influence perceptions of individuals and societies about what constitutes danger and significant impact". An agent's assessment of risk is often described by the perceived probability of being exposed to threats and the perceived damage potential to things which are of value to the agents (Frank et al. 2011: 67; Grothmann, Reusswig 2006: 104; Sjöberg 2006; Weinstein 2000; Rogers 1975). Accordingly, this definition widely coincides with the common characterisations of risk in vulnerability research (see section 2.1.1). In general, risk perception is expected to provide the motivational energy for a response, i.e. the higher the perceived risk, the more likely it is that an adaptation or coping strategy will be adopted. Klinke and Renn (2012: 232; 2002: 1079) argue in this context that actors will put risks, depending on their objectives, into one of three areas: into the acceptable area where risks do not justify taking actions, into the tolerable area where adaptation is necessary to avoid unacceptable levels of risks, or into the intolerable area where risks detrimentally threaten what people value and therefore require actions. Risk perception alone, even in the case of intolerable risks, does not determine whether an adaptation measure is actually taken, though (Grothmann, Reusswig 2006: 107; Rogers 1975). Even if people see themselves at a high risk, they might think that they do not have the capability and options to respond in a beneficial way (Cervone 1989; Bandura 1982).

In the scientific discussion on the perception of risk, an often neglected aspect which can shed light on this subject is the notion of **perceived adaptive capacity** (Kuruppu, Liverman 2011; Grothmann, Patt 2005) or perceived competence, as Krömker et al. (2002) term it. This notion has not found much attention in the conceptual reflections around adaptive capacity, or in the debate around decision-making in the context of environmental shocks and change. Rogers's "Protection Motivation Theory" includes a so-called adaptation appraisal in his cognitive model to comprehend this perceived adaptive capacity (Rogers 1975). Adaptation appraisal means that "a person evaluates his or her ability to avoid being harmed by the threat, along with the costs of taking such action (Grothmann, Patt 2005: 203)". It takes place only after a certain threshold of threat or risk is perceived by potential agents. Other scholars have also argued for such an appraisal of adaptive capacity (Kuruppu, Liverman 2011; Grothmann, Patt 2005)/perceived competence (Krömker, Mosler 2002). It commonly comprises perceived response efficacy, perceived self-efficacy and perceived costs. In psychological research, especially perceived self-efficacy was addressed, most prominently by Bandura (2002; 1982). He defines it as "people's judgements of their capabilities to organise and execute courses of action required attaining designated types of performances. It is concerned not with the skills one has but with judgements of what one can do with whatever skills one possesses" (Bandura 2002: 94). He argues that it has an impact on thought patterns which can be both self-aiding or self-hindering (ibid.) and determines the persistence in efforts and also the success of a measure (Bandura 1989: 1176). He, as well as other scholars, differentiates self-efficacy from outcome expectations (ibid.) which is later termed response efficacy by Grothmann and Reusswig (Grothmann, Reusswig 2006: 107; Rogers 1975: 99; Krömker, Mosler 2002), i.e. subjective valuation of whether a strategy option can produce beneficial outcomes or protect oneself or others effectively from being harmed by a hazard (Rogers 1975). Scholars such as Grothmann (2006: 107) and Krömker (2002) also include the perceived costs more explicitly. It is emphasised that it is not only monetary but all sorts of costs which shall be included (Grothmann, Reusswig 2006; Grothmann, Patt 2005). Overall, it is assumed that the higher the perceived self- and adaptation-efficacy and the lower the perceived costs, the higher the chances that a measure is taken up.

The previous reflection on the perception of hazard risk and the perception of adaptive capacity has not only provided more details of the two most central aspects in socio-cognitive decision-making models but has also shown that it is compatible with the terminology and concepts used in the previously introduced risk research. Like vulnerability, it basically comprises hazard exposure and susceptibility (termed as threat/risk) as well as capacity of response (termed as coping/adaptive capacity or competence). This provides substantial potential to combine this actor-oriented perspective with the more systemic thinking on vulnerability – an aspect highly important to the current research goals. To gain a more in-depth understanding of the drivers of threat and competence perception, it is important to take a closer look at social and cognitive determinants. A large body of literature, especially from cognitive psychology and sociology, has been dealing with these issues. In the following some of the most influential strands of this literature will be presented.

Social and cultural determinants of risk and adaptation perception

Scholars, mainly from sociological and anthropological risk research, argue that perceptions are socially constructed which is why it is important to consider institutions, culture and individual characteristics. They shape an individual's framing of risk. Zinn and Taylor-Gooby (2006), for instance, argue that the "norms, habits, and personal characteristics of the decision-maker" influence a decision-maker's conceptualisation of a current or future problem.

Grothmann and Patt (2005) argue that the actual or **objective adaptive capacity** probably plays the most important role in this respect. Judgements are often relatively reliable as most people know about their access to resources such as financial assets, access to natural resources or social and political capital (ibid.). Krömker and Mosler (2002) particularly point to endowment with institutional entitlements, social support and knowledge about potential strategy options as determining factors. The perceived response efficacy is according to Krömker and Mosler (2002) also dependent on characteristics of the situation and particularly on cause-effect knowledge. The latter increases the range of options from which a person can chose.

One important strand of literature focuses on the **disparities between different socio-economic groups or nation states**. Rohrmann (Rohrmann 1999: 9) reviewed the so-called cross-cultural risk perception research and distinguishes the literature in terms of the level of comparison (intra-national vs. inter-national), the unit of study (professional/ideological sub-groups of society vs. countries or cultures) and the core variables (beliefs and attitudes towards perceived risk sources vs. culturally embedded values of safety and risk). This review thereby reveals that the body of empirical literature in this context is vast. Bastide et al. (1989), for instance, found that people with lower levels of education and lower incomes have a higher perception of risk whereas people from large cities have a lower risk perception. In the case of climate change risk perception in the Mekong Delta, a more recent study by Le Thanh Sang (2010) found that people aged over 45 had a slightly better understanding of the problem; and females seemed to be a little less aware and less concerned than men. There was a major difference in the perception of climate change risk in terms of ethnicity and it has been found that urban residents were more concerned about climate change than rural residents. Many of these differences were explained by educational differences. The higher the education level, the higher the awareness of climate change.

A prominently addressed issue surrounding the social determinants of risk perception relates to **social discourses in the context of risks and adaptation** (Nicholls 1999). One influential line of thought stems from Kasperson and his colleagues (2005) in their discussion of the social amplification of risk. They argue that "the experience of risk [...] is not only an experience of physical harm but the result of processes by which groups and individuals learn to acquire or create interpretations of risk" (Kasperson, Kasperson 2005: 15). It aims at explaining how events, which might objectively be judged to be of relatively low risk, can become a major concern to agents in a social system (risk amplification), whereas other, maybe more serious, events receive little attention (risk attenuation).

Risk signals (images, symbols, signs) "interact with a wide range of psychological, social, institutional, or cultural processes in ways that intensify or attenuate perceptions of risk and its manageability" (Pidgeon et al. 2003: 15). Dessai and his colleagues (2004) add that it is not only social discourses influencing the perception of what is dangerous but that also the individual definition of risk determines what issues are addressed by science or the media. This concept has also been applied in the field of vulnerability, natural hazards and climate change. Poumadere et al. (2005), applied it for instance to the 2003 heat wave in France and Ortwin Renn looked at its contribution to climate change research (Renn 2011). In the empirical study of climate risk perception in the Mekong Delta Le Thanh Sang (2010) found that it is mainly the television and radio which influence the understanding and attitude of people with regard to climate change.

Risk experiences and cognitive drivers in the context of risk and adaptation perception

Nevertheless, social determinants alone cannot explain if, how or why people perceive risks or adaptation differently. As human agents "construct reality from their own experiences in which schema are linked together, imposing constraints on each other and limitations on anticipatory behaviour" (Kuruppu, Liverman 2011: 659), risk experiences play an important role in the decision-making of individual actors. Different experiences with hazards in terms of frequency, severity or type will accordingly lead to differences in the perception of risk (Rohrmann 1999; Barnett, Breakwell 2001).

These experiences can impinge on cognitive biases, meaning irrational misjudgements of adaptive capacity and risks which are particularly severe when uncertainties are high (see e.g. Norgaard K.M. 2009: 34; Nicholls 1999; Slovic et al. 2000). In psychology research on risk-related behaviour this aspect has played a significant role. Overall, many studies indicate that risk and adaptive capacity are most commonly underestimated (Kahneman, Tversky 1979; Gardner, Stern 2002). These misjudgements result from **cognitive biases and heuristics** which generally occur because "perceptions differ among individuals depending on their needs, cultural values and preconceptions of a particular stimulus" (Kuruppu, Liverman 2011: 659). Heuristics are often described as "simple rules of thumb" (Nicholls 1999: 1387) or common sense which eases the burden of taking cognitive challenges for myriads of decisions every day. In the context of perceived risk and adaptive capacity this means that there is no rational or detailed assessment undertaken each time a need for a risk-related decision arises. Rather, heuristics apply which facilitate decision-making. Hogarth and Kunreuther (1995), for instance, show empirically that agents most commonly do not collect information on probabilities of the occurrence of events before making a decision.

Misjudgements can also arise from cognitive biases such as **unrealistic optimism**. People commonly think that the probability of being affected by a hazard is smaller than average (Nicholls 1999: 1390; Grothmann, Patt 2005). Another prevalent bias is the **"availability effect",** meaning that the memorability of an event or state determines the perception of it (Slovic et al. 2000: 194). People who were affected by a certain hazard more recently will therefore also expect that this hazard is more likely to happen again in the future. The so called "norm of time" also implies that the future is so vague and feels so distant that an intention to act is less likely to be formed (Norgaard K.M. 2009: 35). Moreover, **risks with higher severity** in terms of consequences will find, despite lower probability, more attention and will provoke more fear and feeling of threat than events which are more likely to occur but come with a lower severity in terms of impacts (Rohrmann, Renn 2000; Zinn, Taylor-Gooby 2006). This is also linked to the fact that events which have a larger impact attract higher media and public attention (Nicholls 1999). The IPCC (2012: 45) recently pointed to the role of emotional reactions to events by saying that only if the information on potential extreme events brings forth strong emotional feelings will people acknowledge and not ignore it.

In addition, the **frequency of events** plays a significant role in this context. Benthin, Slovic and Severson (1993) found that the more often people experience a threatening event, the more knowledge they possess and the less fear they have. Barnett and Breakwell (2001), in contrast, argue that a higher frequency of previous risk experiences goes hand in hand with larger concern, particularly for involuntarily risks taken. This opinion opposes an assumption of habitualisation or desensitisation (Richardson et al. 1987). According to the assumption of habitualisation, agents are, for example, less likely to apply new strategies if they frequently practice behaviour under steady risk exposure (Kuruppu, Liverman 2011: 660). The assumption of desensitisation is, according to Barnett and Breakwell (2001: 176), confirmed if the impacts of previous events were low and outcomes were either neutral or positive. Nevertheless, if severity in terms of impact was high, a higher frequency of events will also lead to a higher risk perception and therefore will be more likely to lead to protective or adaptive behaviour.

The framing of future and current natural hazards is also linked to **personal values, worldviews and religious beliefs** (Adger et al. 2009; Tonn et al. 2006). Despite their importance also in the field of risk perception, these have rarely been addressed so far. Actions facing challenges in everyday life are, for instance, often prioritised over long-term adaptation measures although they might be cheaper and more beneficial to them (Wisner et al. 2004; IPCC 2012: 45). In this regard it has been argued that the implementation intention (Sheeran et al. 2005) and "[...] any limits to adaptation depend on the ultimate goals of adaptation, which are themselves dependent upon diverse values" (Adger et al. 2009: 338). Motivation to take action does not only arise from the fact that a person is aware of a certain risk but also from the fact that this risk threatens important material or immaterial values. This can be health, culture and tradition, environment or financial assets. These values are critically influenced by the prevalent livelihoods, for instance by land use; accordingly, a rice farmer will value flood risk in a different way from a house owner (Krömker, Mosler 2002). Values are also critical in terms of perceived competence. As Bandura argues, "much human behaviour is regulated by forethought embodying cognised goals, and personal goal setting is influenced by self-appraisal of capabilities. The stronger their perceived self-efficacy, the higher the goals people set for themselves and the firmer their commitment" (Bandura 1989: 1175). Knowing the values and goals can accordingly add a subjective view on both tangible and intangible aspects of the environment (O'Brien, Wolf 2010; IPCC 2012: 458) and facilitate a better understanding of the adaptation appraisal described by Grothmann and his colleagues (2005). Values determine, for instance, which adaptation strategy and which of its outcomes is preferred over others. In terms of the perceived efficacy of a measure, several scholars further argue that future benefits are discounted meaning that the impacts which a strategy has today are of a higher value to the people than potential future ones (Adger et al. 2009).

Considering that individuals act in a social field of interaction, risk and adaptation perception has to be seen in **relation to other agents' behaviour**. The perception of response costs depends, for example, not only on the appraisal of actual costs but is also influenced by the expectations of others and potential social sanction mechanisms (Krömker, Mosler 2002). Sharing of benefits and risks or the opportunity to blame another individual or institution can reduce risk perception and therefore decrease the likelihood of taking protective or adaptive measures (Zinn, Taylor-Gooby 2006). Grothmann and Patt (2005) argue in this context that private adaptation to climate change or environmental hazards can be redundant if another agent takes adaptive measures. Private flood preparedness might not, for instance, be judged to be necessary if a public entity builds a dike. Burby et al. (1991) speak in this context of a "Samaritan's dilemma". This acts on the assumption that relief support after a disaster can undermine self-reliance (IPCC 2012: 464). This was supported by several empirical studies such as the one by McElwee (2010: 99) dealing with climate change adaptation in the Mekong Delta. It showed that reliance on public measures "crowded out" local collective action.

In conclusion, the previously introduced approaches can contribute to a more holistic understanding of risk-related practices – an understanding which does not only look at so-called "objective" determinants but which also considers how these determinants are perceived and how they feed into decision-making and into subjective evaluations. Socio-cognitive models of adaptation decision-making have been shown to be most pertinent to arrive at an integrated framework because its terminology is widely compatible with the terminology used in vulnerability research. It is therefore a valid basis for this research which aims at an integrated view on vulnerability and decision-making processes in the context of coping and adaptation evaluation.

2.3 Evaluation research and concepts

Most of the previously introduced discourses about risk, vulnerability and decision-making are concerned with the determinants of risk-related strategies. Accordingly, they mainly focus on the capabilities of agents. This work, however, also revolves around the assessment of the character and quality of practices. Research on what is success and what is failure as well as an understanding of why that is the case, are therefore important issues to be addressed. Evaluation research and practice can provide important contributions to this. In the following section, evaluation approaches in the context of risk-related practices and relevant criteria will therefore be presented and discussed.

2.3.1 Evaluation of risk-related practices in science and practice

Both science and practice have shown interest in measuring the quality of strategies. Evaluations have traditionally played an important role in the field of development and in disaster risk reduction (see e.g. Brooks et al. 2011; McKenzie Hedger et al. 2008 respectively IEG 2008; Gamper et al. 2006). In more recent years, evaluations have aroused increasing attention in the climate change community (see e.g. Anderson 2011; Debels et al. 2009).

Practitioners, particularly from NGOs[16] and national agencies, looked at the quality of strategies for the purpose of project monitoring and evaluation (M&E) and developed a broad range of methodologies. Monitoring “tracks key indicators of progress over the course of a program as a basis on which to evaluate outcomes of the intervention” (Khandker et al. 2010: 7). Evaluations systematically and objectively assess the realised planning, implementation, outcomes and impacts (ibid.: 7f). The international NGO CARE follows, for instance, a participatory approach to M&E for community-based adaptation which mainly focuses on reflection and learning. The Norwegian Agency for Development Cooperation (NORAD) bases many of its evaluations, in contrast, on a more structured approach looking at each component of the development project. Large international organisations such as the Organisation for Economic Co-operation and Development (OECD) (Agrawal 2010), the United Nations Environment Programme (UNEP) (Feenstra et al. 1998) or the World Bank, to name just a few, also develop their own methodologies adapted to institutional goals and principles. Considering that the application of evaluation concepts is in this respect the most central goal, step-for-step manuals, handbooks and guidelines are a common form of communication.

Also in science, evaluations have found a great deal of interest. Evaluation emerged as a highly relevant, interdisciplinary and challenging field of research, particularly in climate change adaptation. Adger and his colleagues (2006) ask, in this context, a fundamental question, i.e. what fairness in adaptation could actually be; and Katrina Brown (2011) is concerned with whether sustainable adaptation is possible at all. Others aim to reconcile different schools of thought and their goals conceptually in evaluation research. McKenzie Hedger et al. (2008), for example, look at the evaluation of adaptation to climate change from a development perspective; and Meinke et al. (2009) try to use evaluation science for advancing agriculture and natural resource management. Generally, evaluation research is a field where many complexities and challenges still need to be resolved such as the questions of how to address uncertainties in the light of future changes or how to decide what makes a strategy a good or a bad one.

[16] Non-governmental organisation (NGO).

Both practitioners and scientists undertook evaluations for various sectors and actors. Dolan and his colleagues (2001) developed, for instance, a comprehensive evaluation of agricultural adaptation. In contrast to the large majority of evaluations, they not only looked at the policy level (see e.g. Brooks, Adger 2005; Füssel 2007; Eriksen, O'Brien 2007) or the project level (see e.g. Adaptation Fund 2010; CARE 2012; GIZ 2011) but also considered the quality of measures taken by individual private actors. Only comparatively few other studies have looked at the prospects of successful household strategies, and even fewer considered their interaction with formal measures. Among those few were, for instance, Fazey et al. (2011) who assessed maladaptive trajectories of the local population in the Solomon Islands; and Robert Mendelsohn (2000) who looked not only at the quality of private CCA but also its interaction with public sector engagement.

Evaluations were also applied to all kinds of strategies. Taking the differentiation of coping and adaptation, which has been prominently used in this study, shows that both short-term oriented risk management strategies as well as long-term oriented adaptation actions have been evaluated in various contexts. It is most commonly adaptation, however, which has been the centre of interest. Mendoza and Martins (Mendoza, Martins 2006: 15) looked, for example, at the sustainability of adaptation in natural resource management; and Gamper et al. (2006) developed a conceptual approach to assess mainly long-term oriented natural hazard management strategies. Not very surprisingly, the evaluation of climate change adaptation has, in recent years, also played a central role. It is, as Smit et al. (2000: 230) argue, one of the four major cornerstones in an anatomy of adaptation to climate change (see section 2.1.3) and was therefore also considered by many scholars (see e.g. Huitema et al. 2011; IEG 2012; Parry et al. 2009; World Bank 2010). Coping mechanisms were, in contrast, only rarely assessed in terms of their quality. One of the few approaches to evaluate coping was undertaken by Maxwell and his colleagues (2003). They developed a so called coping level index which assessed the coping strategies with regard to their impact on household food security. Another approach was suggested by Adams et al. (1998) and Korf (2002) who both consider the outcomes of coping with regard to baseline vulnerability in their conceptualisations of vulnerability (see section 2.1.3).

Sketching the most important fields of and trends in evaluation along the lines of current research foci (i.e. rural development, climate change, natural hazards, formal-informal, coping-adaptation) provides a first overview of gaps which can potentially be filled by this research project. To get a more in-depth understanding of how these gaps can be filled and where other methodological gaps exist, the following section will introduce the most relevant types of evaluation approaches and methodologies.

2.3.2 Types of evaluation approaches and methodologies

Evaluations not only vary in the context to which they are applied but also in the underlying approach or type of evaluation. Different scholars suggest different classifications of evaluations (see Table 2.3 for a list of different evaluation classifications and approaches). The IPCC SREX report (2012: 447) differentiates evaluations, for instance, according to two essential philosophical paradigms, i.e. human rights-based and utilitarian approaches. Utilitarians, often found among scholars in welfare economics (see e.g. Pigou 1920; Pareto 1935; Hicks 1939; Kaldor 1939), argue that a strategy is good providing it maximises social welfare. However, this also means that a strategy would be considered good if the number of food insecure people increased as long as the number of food secure people who benefited from the strategy is higher. Human rights-based evaluations, in contrast, plead that a good strategy also has to relate to moral obligation, i.e. that it is not just anyone who benefits but that it is the most vulnerable who are strengthened in order to fulfil the human rights of a larger number of people (see e.g. Rawls 1976; Sphere Project 2004; Paavola, Adger 2006; Grasso 2010). This relates to another way of classifying evaluation approaches, i.e. effectiveness- versus efficiency-based evaluations. Effectiveness evaluations consider the degree to which certain goals or criteria (such as human rights) are fulfilled whereas efficiency evaluations judge the quality of a strategy based on its cost-benefit ratio (also reflected in the social welfare functions). UKCIP[17] (Pringle 2011), for instance, distinguishes evaluations based on whether they measure performance against given objectives (effectiveness), against good-adaptation principles (effectiveness), or against a baseline (efficiency).

Table 2.3: Selected evaluation classifications in different lines of thought

Evaluation classification	Identified evaluation types	Description of evaluation types	Scholars
Philosophical value frameworks	Human rights-based approaches	Focus on the most vulnerable	IPCC (2012: 459)
	Utilitarian approaches	Focus on maximising social welfare	
Measuring performance of adaptation	Measuring performance against objectives	Compare outputs and outcomes to program/project purpose and objectives	UKCIP 2011 (Pringle 2011)
	Measuring performance against good adaptation	Assess the characteristics of adaptation against guiding principles	
	Measuring Performance against a Baseline	Looking at a situation prior to adaptation and assess achieved progress based on given criteria	
Theory of justice	Procedural justice	Quality of institutions and behaviours that frame decision-making	Rawls (1976)
	Distributional justice	Quality of the outcomes of decisions	
M&E of CCA methodologies	Input-Output-Outcome evaluation	Measures inputs used against the outputs and outcomes of adaptation	Silva Villanueva (2011)
	Process-based evaluation	Defines the key stages in a process that would lead to the best choice of end point, without specifying that point at the outset	
	Evaluation of behavioural change	Focuses on documenting behavioural changes in practices as outcomes	
	Economic evaluation	Economic costs measured against the economic benefits of adaptation	

The most common and most important distinction is between measuring the outcomes and assessing the processes of risk-related practices. In terms of climate change adaptation an evaluation would, in this vein, ask either how well one is adapted (outcome) or how well one adapts (process) (GIZ 2011). Rawls (1976) refers in his theory of justice to distributional and procedural justice. Distributional justice represents the quality of the outcomes of a decision whereas procedural justice looks at the value of institutions and behaviours that frame decision-making. Process- and outcome-oriented evaluations also differ substantially in terms of their evaluation criteria and/or principles of good practice (see Table 2.4 for a list of selected process- and outcome-oriented criteria and scholarly works who applied these criteria in their evaluation). Process oriented criteria include, besides general quality measures (e.g. effectiveness, equity, costs), criteria describing the institutional quality (e.g. reliability, institutional compatibility, centralisation) or procedural prerequisites for successful practices (e.g. stakeholder involvement, inclusion of local knowledge, implementation time). Outcome-oriented criteria comprise general quality measures (efficiency, effectiveness, equity), different dimensions of results (e.g. economic, environmental, social) or result characteristics (e.g. proportion of beneficiaries, durable, implementability).

[17] United Kingdom Climate Impacts Programme (UKCIP).

Table 2.4: Evaluation criteria/ principles of good practice applied in evaluation research

Evaluation criteria/ principles of good practice		**Selected literature where the respective indicator is applied in the evaluation**[18]
Process indicators	Effectiveness	Brooks et al. (2011); Silva Villanueva (2011); Debels et al. (2009); McKenzie Hedger et al. (2008); Ashton et al. (2006); Dolan et al. (2001)
	Equity	Silva Villanueva (2011); Pelling (2011); Nelson (2009); McKenzie Hedger et al. (2008)
	Openness	Ashton et al. (2006)
	Reliability	GIZ (2011); Debels et al. (2009); Ashton et al. (2006)
	Acceptability/legitimacy	Brooks et al. (2011); Silva Villanueva (2011); Yohe, Tol (2002)
	Stakeholder involvement	UNDP et al. (2011); GIZ (2011); Evers, Lange (2011); Smith et al. (2009); Ashton et al. (2006)
	Flexibility	Evers, Lange (2011); Pahl-Wostl et al. (2010); Debels et al. (2009); Dolan et al. (2001)
	Costs	Debels et al. (2009)
	Institutional compatibility/ balance/competence	Brooks et al. (2011); GIZ (2011); Evers, Lange (2011); Pahl-Wostl et al. (2010); Smith et al. (2009); Pahl-Wostl (2009); Ashton et al. (2006); Dolan et al. (2001)
	Institutional cooperation	Evers, Lange (2011)
	Implementation time	Debels et al. (2009)
	Implementability	Brooks et al. (2011); Yohe, Tol (2002);Dolan et al. (2001)
	Well-informed	Brooks et al. (2011);Smith et al. (2009)
	Include local knowledge	Debels et al. (2009)
	Target most vulnerable	Brooks et al. (2011); Pelling (2011);Debels et al. (2009)
	Diverse instruments	Evers, Lange (2011)
	Sensitivity to uncertainty	Bruijn (2004)
	Responsive	UNDP et al. (2011)
	Proactive	UNDP et al. (2011)
	Consideration of barriers	Smith et al. (2009)
	Centralisation/ polycentric system	Pahl-Wostl et al. (2010); Pahl-Wostl (2009)
	Power relation	Evers, Lange (2011)
	Vertical integration	Evers, Lange (2011);Pahl-Wostl (2009)
Outcome indicators	Result/outcome general	GIZ (2011)
	Efficiency	Brooks et al. (2011); Silva Villanueva (2011); McKenzie Hedger et al. (2008); Dolan et al. (2001)
	Effectiveness	Brooks et al. (2011); Silva Villanueva (2011); McKenzie Hedger et al. (2008); Yohe, Tol (2002)
	Equity	Brooks et al. (2011); Pelling (2011); Silva Villanueva (2011); Nelson (2009); McKenzie Hedger et al. (2008)
	Legitimacy	Brooks et al. (2011); Silva Villanueva (2011)
	Sustainability general	Brooks et al. (2011); Silva Villanueva (2011)
	Economic sustainability	Bruijn (2004)
	Environmental sustain.	Debels et al. (2009); Bruijn (2004)
	Social sustainability	Bruijn (2004)
	Independent Benefits	Dolan et al. (2001)
	Durable	UNDP et al. (2011); Debels et al. (2009)
	Flexible	Debels et al. (2009); McKenzie Hedger et al. (2008)
	Proportion of beneficiaries	Brooks et al. (2011);Debels et al. (2009)
	Level of autonomy	Debels et al. (2009)

[18] Review of 16 selected articles/reports on evaluations in the fields of poverty and rural development, natural hazards and climate change.

Silva Villanueva (2011) links the discussion around effectiveness versus efficiency with the discussion around process versus outcomes in her classification of M&E approaches in the field of climate change adaptation. She differentiates four types of methodologies: Input-output-outcome evaluations, process-based evaluations, evaluations of behavioural change and economic evaluations. The first three evaluation types are effectiveness-based, meaning that given elements of adaptive capacity or risk are measured against a set of indicators or goals. Economic evaluations, on the contrary, are efficiency-based and assess the benefits of adaptation in terms of economic losses. Linking different evaluation approaches and criteria in an encompassing classification, this framework can also help in locating the current conceptual evaluation framework within evaluation research and practice.

Input-output-outcome evaluation (IOOE), as Silva Villanueva (2011: 20f) calls it, is an outcome-based evaluation which has often been used by practitioners in M&E, not only in the field of climate change adaptation (e.g. NORAD 1999; GEF Evaluation Office 2007; UNDP Evaluation Office 2002; Adaptation Fund 2010). So-called "theory of change" approaches are widely used for IOOE project analyses and evaluations. The term *theory* is used because these approaches build on a theory that explains processes by looking at how inputs activities and outputs are linked causally, how they result in outcomes and how they impact a system (3ie 2012: 9; GEF Evaluation Office 2007: 8; see figure 4). A "pathway of change" or "change framework" (GEF Evaluation Office 2007: 8) graphically represents such theories. Logic-framework approaches (LFA) and result chains are commonly used for operationalisation. A "theory of change" gives the 'big picture' of a larger strategic endeavour (e.g. climate change adaptation) while LFAs and result chains often depict individual programs (e.g. climate-awareness raising initiatives) within this broader framework (Bours et al. 2014). LFAs are based on a theory about the projected or expected outcomes of certain activities which are brought about by a causal chain from inputs to outcomes (3ie 2012: 5). Result chains give a sequence of testable "if-then" assumptions. They are, in contrast to the logic model, clearly related to the question of how specific activities can contribute to achieve a given goal or set of goals and not only how they are executed (GEF Evaluation Office 2007: 9). A major drawback of this approach is the fact that in most cases only tangible outcomes are considered, they are linear in their thinking, and they do not sufficiently account for uncertainties (Silva Villanueva 2011).

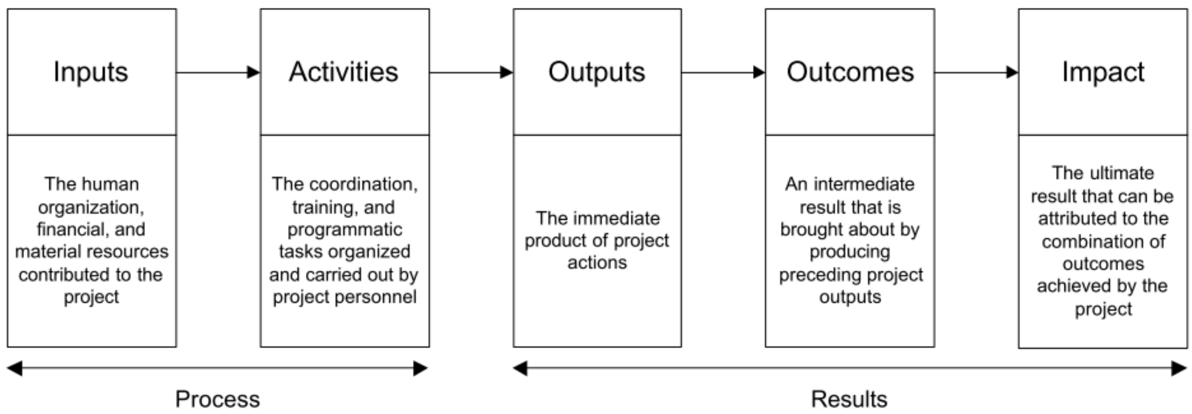


Figure 4: Components of a change framework (Source: GEF Evaluation Office 2007: 5)

Process-based evaluations assess, like IOOEs, the effectiveness of an endeavour. In contrast to an outcome-based approach, however, "a process-based approach seeks to define the key stages in a process that would lead to the best choice of end point, without specifying that point at the outset" (Harley et al. 2008: 16). It aims to identify how an increase in the capability to manage outcomes can be achieved and also accordingly makes reference to the capacity of institutions, governments and civil society required for "good" adaptation (Jacob, Mehiriz 2012: 25). It is therefore mainly applied in the context of project-level and policy evaluations and not in the context of private household-level action. Procedural evaluations, as they can also be termed, have for instance been undertaken by Füssel (2008). He looks at the process of public health adaptation and identifies 14 criteria for effective planning. Eriksen et al. (2011) also take procedural aspects into account and identify five criteria for sustainable adaptation to climate change. Further research has considered the quality of governance as the most appropriate evaluation criteria (see e.g. Pahl-Wostl et al. 2010; Smith et al. 2009). Pahl-Wostl et al. (Pahl-Wostl et al. 2010: 578), for example, judge adaptive capacity according to governance indicators such as centralisation, vertical integration and the balance between top-down and bottom-up approaches.

Evaluation of **behavioural change** is also effectiveness-based but focuses, in contrast to the other types of evaluations, on outcomes in the form of behavioural changes. These are represented by practices of the targeted people, groups or organisations. Assessing the influence, i.e. the contribution of actions to the overall goals, plays a central role in this context. Outcome mapping, as suggested by Beaulieu et al. (Beaulieu et al. 2009), is one way to assess behavioural changes. Thereby, 'graduated progress markers' which highlight the level of progression towards an optimal outcome are identified (Beaulieu et al. 2009: 329). In the case of building adaptive capacity to respond to hurricanes such markers were, for example, represented by "expected to see", "like to see", and "love to see" situations with regard to the community's behaviour. Other scholars also look at the adaptation progress. Gagnon-Lebrun and Agrarwala (2006), for instance, identify a three-tier framework for assessing the attention to adaptation in national communication, where the level of attention to impacts, impact assessment and the state of progress are taken into consideration. Overall, these approaches, however, often only consider what has changed and not why things changed. It is also important to assess the drivers of change and decision-making processes. Therefore several scholars have complemented this approach or integrated it into other evaluations such as in logical framework models (Silva Villanueva 2011: 29).

Economic evaluations are, in contrast to the previously described approaches, efficiency-based, i.e. the basic principle is: "for an action to be justified, the cost of the action should be less than the benefits derived from them" (Silva Villanueva 2011: 29). Such economic and financial considerations play a considerable, if not the largest, role in evaluation practice. Known as cost-benefit analyses (CBA), these evaluations focus on the efficient allocation of a society's resources. In most cases, all factors implying costs and advantages are translated into monetary terms in order to find the most advantageous adaptation options for the specific context (Gamper et al. 2006: 294). These have been applied for both formal and informal practices in the disaster risk, climate change and development context (see e.g. World Bank 2010b; Tol, Fankhauser 1998; Easterling et al. 1993; Textbox 2.1 provides an example of one CBA approach used for DRM in more detail). One of the best known assessments is the Stern Review (Stern 2007). Nicholas Stern acts on the assumption that the benefits of climate adaptation can be measured in the form of avoided climate-related damage costs by adaptation. The benefits are then compared with the costs of adaptive measures in order to judge whether it is better to act or not act. Other studies compared the costs with the effectiveness of adaptation. A specific objective of adaptation is described at the beginning of these approaches. A portfolio of strategies will then be assessed in regard to how this goal can be reached in the least costly way (see e.g. Niang-Diop, Bosch 2005; Smit, Pilifosova 2003: 888). In climate change research, one of the most debated aspects of both effectiveness and efficiency-based CBAs is the definition of discount rates for calculating future costs and benefits. This value determines how far the benefits and costs for future generations are accounted for in the calculations. However, it can be dangerous to assign numbers to unmeasurable aspects like this. Numbers are often taken for granted although loaded with uncertainties and unrepresentative for intangible aspects.

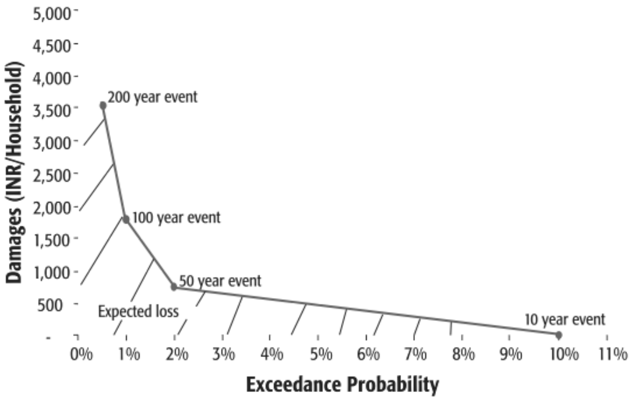
Textbox 2.1: Cost-Benefit Analysis of Disaster Risk Management Framework as proposed by Mechler (2008)

Mechler (2008; 2005) developed a framework for analysing the costs and benefits for disaster risk management which has been used as part of several GTZ/GIZ (German Technical/International Cooperation) projects. The assessment includes **four steps**:

1) risk analysis (potential impacts without project)
2) identification of projects and costs
3) analysis of risk reduction (potential impacts with project)
4) calculation of net benefits (reduction of potential impacts – costs of the project)

The approach accounts for direct (due to the disaster) and indirect (due to disaster impact) quantifiable disaster impacts/benefits and includes monetary (market value exists) and non-monetary (non-marketed) values. It considers social, economic and environmental aspects.

The **analysis of risk** (probability of potential impacts) is based on a loss–frequency curve which depicts the probability that an event does not exceed a certain level of damages (see figure below). The area under the curve represents the sum of all damages weighted by its probabilities and thereby represents the expected annual value of damages.



The **identification of projects and costs** requires the following information: "(i) the exact type of the option under consideration, (ii) its planned lifetime, (iii) the costs, (iv) planned funding sources, (v) possibly additional benefits and impacts" (Mechler 2008: 20). The costs of the project include besides investment and maintenance costs, the opportunity costs (benefits foregone from not applying the second best project option).

The **analysis of risk reduction** estimates the potential benefits of DRM activities on risks. They are assessed in relation to the loss-frequency function (see figure above). This acts on the assumption that DRM shifts the curve downward so that the area between the two curves represents the avoided damages or benefits. Risks can be completely avoided, reduced or transferred. Moreover, disbenefits are to be considered. The negative consequences of a project need to be recorded on the benefit side of the calculation.

Finally, the **net benefits** are calculated. Considering that costs and benefits occur over time and are assumed to have a different value today from in future, they have to be discounted. The discount rate represents the preference for the present over the future (the larger the rate, the smaller the value of future benefits). In the suggested CBA approach, three decision criteria are of importance:

1) Net present value: NPV is the difference between the sums of discounted costs and benefits over a given period of time at a fixed discount rate → desirable projects have a positive NPV
2) Benefit/cost ratio: B/C ratio is the sum of discounted benefits divided by the sum of discounted costs at a fixed discount rate → desirable projects have a ratio larger than 1
3) Internal rate of return: IRR does not assume a fixed discount rate but calculates the interest rate for the investment internally. It is compared with the defined average interest rate on public capital investments → desirable projects have an IRR larger than the defined interest rate.

In contrast to many other CBAs, this approach suggests an analysis which can be conducted with a low resource and data availability, considers uncertainties, allows a forward-looking assessment, and includes non-monetary values.

There are also scholars who evaluate adaptation according to a **combination of these evaluation** types (see e.g. UNFCCC 2010; Debels et al. 2009; Plummer, Armitage 2007; Feenstra et al. 1998). The UNFCCC[19] (2010) suggests, for instance, a comprehensive framework for the evaluation and monitoring of adaptation projects, policies and programs. It looks at both effectiveness and efficiency by considering the whole adaptation policy process embedded in broader socio-economic and ecological systems (see Figure 2.10 and Textbox 2.2 for a more detailed depiction of the framework). Accordingly, it bases its evaluation and monitoring, as also intended in this research, on a comprehensive analysis of the system and the characteristics of strategies. This shows that it can contribute copiously to a conceptualisation of evaluation and an integration of this conceptualisation in the overall conceptual approach of this study.

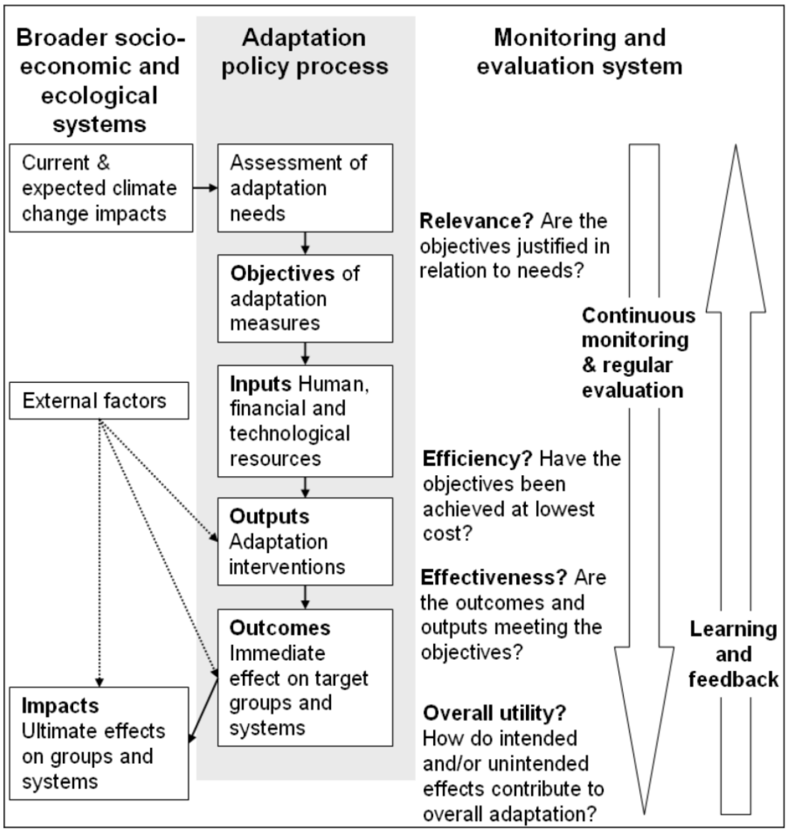


Figure 2.10: Framework for evaluating adaptation projects, policies and programs as proposed by UNFCCC (Source: UNFCCC 2010: 5)

[19] United Nations Framework Convention on Climate Change (UNFCCC).

Textbox 2.2: Synthesis of current CCA evaluation activities by relevant projects and parties to the UNFCCC

The UNFCCC (2010) proposed a framework for evaluating CCA on the thirty-second session on the Nairobi work program on impacts, vulnerability and adaptation to climate change. It was part of a synthesis report based on information received from relevant organizations and parties to the UNFCCC about their efforts undertaken with regard to M&Es of adaptation projects, policies and program. The report underscores the need to:

1) *monitor* the progress in project implementation in relation to given objectives and required inputs (most commonly conducted by project/policy/program staff)

2) evaluate the effectiveness in relation to the objectives (most commonly undertaken by independent experts).

These processes should include the analyses of whether goals are reached and of whether this achievement can be attributed to the measure. Besides *effectiveness*, UNFCCC (2010) identified *relevance*, *efficiency* and *overall utility* of a project or program as decisive quality criteria. Tracking the success of an adaptation measure along the lines of these criteria requires a good understanding of the "broader socio-economic and ecological system" and the "adaptation policy process". The relevance of a project can, for instance, be assessed when comparing the identified adaptation needs with the project/program/policy goal (see Figure 2.10 for more details about the other criteria in relation to the broader context and adaptation process).

UNFCCC (2010) further emphasises the necessity of a *continuous monitoring* and *regular evaluations* to guarantee that good practices and maladaptive practices are identified timely and reliably. This provides a good basis for sharing experiences with other stakeholders and is therefore a prerequisite for constant *learning* and the M&E improvement process.

There has also been a large range of studies which are based on an application of a multitude of different evaluation criteria, i.e. **multi-criteria analyses** (MCA). The International Multi Criteria Decision Making (MCDM) Society defines MCA "as the study of methods and procedures by which concerns about multiple conflicting criteria can be formally incorporated in a decision-making process" (International MCDM Society 2004 in Gamper et al. 2006: 294). These approaches have been applied in various contexts. Mendoza and Martin (2006), for example, applied it in a natural resource management context, Gamper et al. (2006) appropriated it for an analysis of hazard risk management, and Mizina et al. (1999) employed it for an evaluation of agricultural adaptation to climate change in Kazakhstan. Debels et al. (2009) also applied MCA in the context of adaptation to climate change and built an Index of Usefulness of Practices for Adaptation (IUPA). In contrast to most other studies, they argue that MCAs do not sufficiently consider the values and preferences of the stakeholders involved. This index therefore not only integrates several evaluation criteria but allows the users to assign scores and weights to them. Aiming at a more comprehensive, multi-dimensional and stakeholder-specific evaluation, this study can also gain from methodologies and concepts arising from MCA approaches – particularly from the ones which consider multiple stakeholder goals.

In the field of **climate change adaptation, evaluations** have to face several **specific challenges**. First, the timeframe associated with the impacts of the activities is different from evaluations in other contexts (Bours et al. 2013; GIZ 2012; McKenzie Hedger et al. 2008). Climate change is a process which goes far beyond the timeframe of most policy planning and project management cycles. In a scenario where the consequences - either positive or negative - of a measure are only felt decades after its initiation, a measurement of the achievements is very challenging. This is interwoven with a second aspect which distinguishes CCA evaluations, i.e. the high level and multiple sources of uncertainty (GIZ 2012; UNFCCC 2010). These are attached not only to climate change scenarios but also to the socio-economic impacts of climate change (Bours et al. 2013). An often neglected source of uncertainty, in this regard is the change in the preference structures and goals of local stakeholders and decision-makers. Furthermore, adaptation today may turn out to be maladaptation in future due to unintended consequences, i.e. another source of uncertainty (Bours et al. 2013; UNFCCC 2010). The high level of uncertainty underscores the need to include both short- and long-term impacts and acknowledge the critical role of flexibility and robustness of adaptation measures in CCA evaluations. Third, CCA evaluation entails potential shifts in the baselines against which progress is commonly measured. Risks and vulnerability patterns are highly dynamic and have to be treated accordingly. This means that comparing the before-project scenario with the after-project scenario may not be enough to understand the success of an adaptation process (Bours et al. 2013; GIZ 2012). Fourth, it is necessary to account for “non-events” (Bours et al. 2013: 9). Adaptation may target events which do not occur during a project cycle. For that reason, success cannot always be tested, e.g. the functioning of a public disaster risk management system can only be scrutinised in practice if a disaster hits the region. Moreover, it has to be considered that success does not always manifest itself in form of improvements, i.e. maintaining water security against the background of an increasing drought is a major achievement even if no improvement can be recorded (ibid.). Fifth, achievements cannot always be attributed to a single project (Bours et al. 2013; UNFCCC 2010). The complex nature and multi-sector orientation of adaptation measures will rarely allow a final judgement which attributes, for instance, the improved/maintained water security to one specific program or policy. CCA evaluation should therefore rather be about measuring the contribution to overall adaptation goals and about applying adapted evaluation tools and criteria to improve the adaptation process (Bours et al. 2013; GIZ 2011; UNFCCC 2010; McKenzie Hedger et al. 2008).

In summary, the previous section on evaluation approaches has highlighted the fact that assessing coping and adaptation should be about not only the systemic and subjective drivers of strategies but also likelihood of their success (Downing et al. 2004: 16). The previously introduced approaches can contribute in many ways to finding a way to a more comprehensive evaluation which accounts for multiple stakeholders, criteria, perspectives and dimensions. Input-output-outcome frameworks can add a tool for a structured assessment of adaptation measures and provide the basis for understanding how they change the vulnerability of households; effectiveness-based evaluations can provide a pertinent basis to assess the quality of a strategy based on both objective and subjective goals; economic cost-benefit analysis can set a foundation for comparing a baseline vulnerability with scenarios of a future with and without adaptation. All these evaluation tools can be complemented by in-depth information drawn from analyses based on the previously introduced vulnerability concepts and decision-making models. In combination, the consideration of the literature around the three schools of thought outlined in the last three sections provide a pertinent basis for informing and understanding the theoretical and conceptual framing developed for this research.

2.4 Theoretical and conceptual framing in the present research context

As stated in the beginning of this section, "facts do not speak for themselves" (Sowell 2007: 6); it is theories that give them meaning and make them understood. In the previous sections, existing debates, theories and concepts relevant to this research context were presented in the light of their contributions and challenges. This provides a profound basis from which to position and explain the innovative approach developed for this research. On the one hand, it has emerged from an acknowledgement of the given deficiencies in the current debate and from drawing on the strengths of existing frameworks. On the other hand, the theories and concepts had been adapted and advanced in the vein of grounded theory (see Glaser, Strauss 1967). This means that theory development had, as indicated in the beginning of this chapter, continuously emerged from conclusions drawn in the process of data collection and analysis. The framework and the underlying theoretical definitions will be presented in the following section (an overview of the definitions of the central scientific terms in this research can be found in Table 2.5).

Table 2.5: Theoretical definitions of the most relevant scientific terms in this study

Scientific term / label	Theoretical definition	Literature
Risk	Risk is a function of the hazard and a system's vulnerability which determines the possibility that practices, processes or events detrimentally affect objects of value to social systems.	Blaikie et al. (2003); Wisner et al. (2004); and Klinke, Renn (2002)
Hazard	The probability that a potentially damaging phenomenon occurs.	UN-ISDR (2004); Turner et al. (2003)
Vulnerability	Endogenous and dynamic character of a system which determines the exposure, capacities to respond and scope of impacts related to a hazard.	UNU-EHS 2004 in Thywissen (2006); Turner et al. (2003)
Exposure	Part of the spatial dimension of vulnerability which represents the extent to which people, livelihoods, environmental services and resources, infrastructure or economic, social and cultural assets are located within the geographical range of a hazard.	Birkmann (2013: 25); IPCC (2012)
Susceptibility	A system's characteristics that determine the likelihood and the degree to which a system is modified or experiences harm and damage due to the influence of a hazard event.	Gallopin (2006: 295); Birkmann (2013); IPCC (2012: 73))
Capacity of response	The combination of all the strengths, attributes and resources available to a social system which can be used to adjust to and cope with an expected or experienced hazardous event, attenuate potential damage and seize given opportunities.	Gallopin (2006: 295); IPCC (2012: 556)
Threat	Function of hazard, exposure and susceptibility (excluding capacity of response).	Own definition, based on previous definitions
Social risk-related response	Intentional, reactive or anticipatory social action undertaken by an individual, group or entity in response to an expected or experienced hazardous event (comprises both coping and adaptation).	Gallopin (2006: 295)
Coping	The use of available livelihood assets and opportunities as a social response to an experienced hazardous event with the goal of fulfilling the basic needs and functioning of the system in the short-term.	IPCC (2012: 558); Korf (2002: 3); Birkmann (2011b); Turner et al. (2003)

Adaptation	Deliberate medium- and long-term adjustments to experienced or expected hazards by changing the existing system; the social response mechanisms are based on livelihood assets and opportunities and aim to protect and improve the livelihood basis and the objects of value.	IPCC (2012: 558); Korf (2002: 3); Birkmann (2011b)
Threat appraisal	An agent's "internal" definition of what is dangerous developed from a subjective assessment of the probability of being exposed to hazards (perceived hazard exposure) and of the perceived damage potential to things which are of value to the agents (perceived susceptibility).	Dessai et al. (2004); Grothmann, Reusswig (2004: 104); Grothmann, Patt (2005: 4)
Competence appraisal	An individual's evaluation of the own capability to respond to experienced hazardous events and anticipated threats in a beneficial way. It encompasses the appraisal of potential strategy options, self-efficacy and response efficacy.	Krömker, Mosler (2002); Grothmann, Reusswig (2004); Grothmann, Patt (2005: 203); Rogers (1975)
Evaluation	Strategic, retrospective assessment of merit, worth and value of objects, processes and results of actions on the basis of which adaptation barriers and strategic points of intervention can be identified	Huitema et al. (2011: 182); Vedung (2008: 2)
Theory of change	Theory that links inputs, activities and outputs causally and looks strategically at how they result in outcomes and how they impact on the social-ecological system and individual agents.	3ie (2012: 5,9); GEF Evaluation Office (2007: 8)
Limit	Absolute and insurmountable obstacle which relates to a set of immutable ecological, physical and technological thresholds beyond which existing systems, states, valued objects and activities cannot be maintained or secured.	Moser, Ekstrom (2010: 22026); Dow et al. (2013: 306); Adger et al. (2009: 335)
Barrier	Subjective and socially constructed obstacle that can be overcome so that existing systems, states, valued objects and activities can be maintained or secured.	Moser, Ekstrom (2010: 22026); Dow et al. (2013: 306); Adger et al. (2009: 335)

2.4.1 Anatomy of social risk-related response mechanisms

Analysing and evaluating social responses to risks, such as water-related ones in the Mekong Delta, poses foremostly the question of what these practices are "all about". Following a conceptualisation of Smit et al. (1999: 204) (see section 2.1.3), this research tries to find answers to this question by taking a closer look at the anatomy of risk-related practices (see Figure 2.11). In contrast to Smit and his colleagues, however, it is not only adaptation to climate change which will be examined but risk-related practices in general. In consideration of the relevant literature, it was assumed to be able to be integrated into in the anatomy suggested by Smit. Anatomy is assumed to stand for the dissection of a social response mechanism in its key components. This dissection shall serve as a foundation to analyse the structure, position and interrelation of its various segments. The components are reflected in the six diagnostic questions identified to be the most relevant to this research and to an analysis of social response mechanisms in general. Four of these questions have also been addressed by Smit et al. (1999: 204): "Responding to what?", "Who/what responds?", "What does the response look like?", and "How good is the response?" (see sections 2.4.2, 2.4.4 and 2.4.5 for more details). Considering that this research also aims to analyse decision-making processes, the question "Why to respond?" is added to the anatomy (see section 2.4.3 for more details). Moreover, the research questions and the literature review indicate that one should not stop at a mere analysis of the quality of responses, which is why a sixth question, i.e. "Why does a good response occur?" is integrated (see section 2.4.6 for more details). In the subsequent sections, these anatomical components will be presented against the background of their relevance to the present research context and their contribution to the scientific debate.

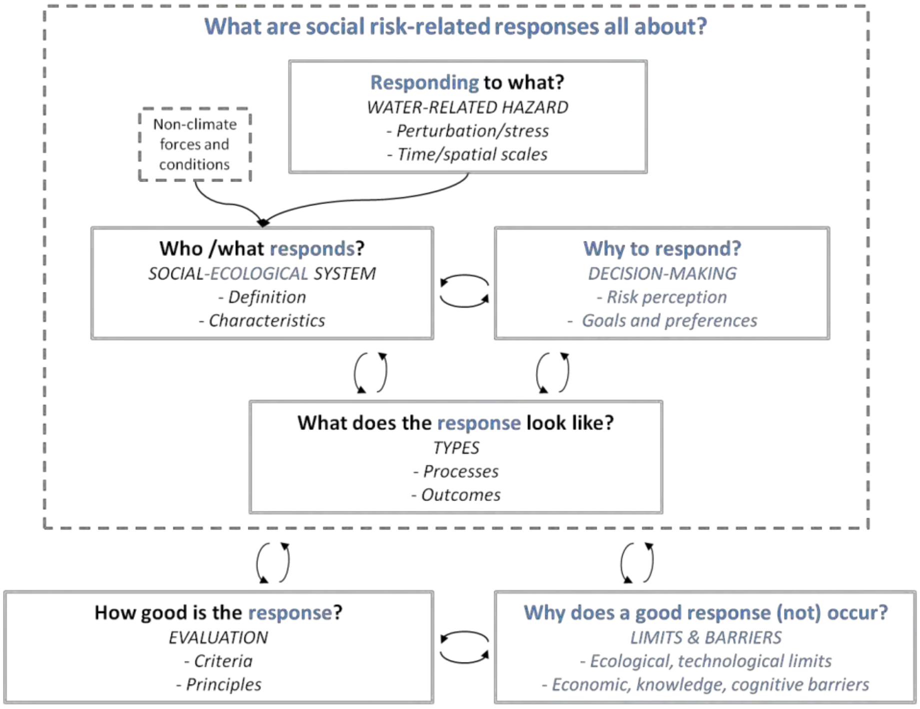


Figure 2.11: Anatomy of risk-related response mechanisms; blue font represents changes to the original framework (Source: author, based on Smit et al. 1999: 204)

2.4.2 Agents in a social-ecological vulnerability context

The concept of risk can help answer the question of "who responds to what?". Risk is defined as a function of the hazard and a system's vulnerability which determines the possibility that practices, processes or events detrimentally affect objects of value to social systems (definition based on Blaikie et al. 2003; Wisner et al. 2004; Klinke, Renn 2002: 1071; see Table 2.5 for definitions and Table 2.6 for a depiction of the interrelation of the different components of risk).

Table 2.6: Interrelation between the components of risk

Risk				
Hazard	Vulnerability			
	Exposure	Susceptibility	Capacity of response	
Threat			Capacity to cope	Capacity to adapt

Source: author, based on Blaikie et al. (2003); Turner et al. (2003); UNU-EHS (2004); Birkmann (2011b; 2013); IPCC (2012)

The diagnostic question about **"responding to what?"** asks for the stimulus which evokes a response. In risk research, the hazard often represents the source of such a stimulus. Based on a review of the literature, the hazard is hereby delineated as the probability that a potentially damaging phenomenon occurs (UN-ISDR 2004: 4). This phenomenon is, according to Turner et al. (2003), assumed to be of a physical or social nature and can also be produced by the interaction of the two. It has been widely shown that hazards vary in their spatial and temporal scope. They are therefore depicted as being locally, regionally and globally experienceable and are defined as potentially occurring as a long-term change, variability or extreme event (Smit et al. 2000: 230). Adaptation and coping are assumed to take place either as a direct response towards one or multiple hazards (e.g. drought) or as an indirect response towards the impacts of them (e.g. income loss due to drought-related crop failure) (Turner et al. 2003: 8074).

Following McLaughlin and Dietz (2008), the notion of vulnerability brings resilience, i.e. coping and adaptive capacity, into play – i.e. a focal point in this research. Therefore it is necessary to assess vulnerability as part of the risk. Referring to conditions that are intrinsic to the system which adapts or copes indicates the importance of defining "**who or what responds"** first. Thereby the so-called unit of analysis has to be identified to demarcate system boundaries (Smit et al. 1999; Smit et al. 2000). Responses to hazards are, for instance, always a matter of scale. They can take place at the individual, national or global level. The nature of the system is also of central importance. In this research, an explicit differentiation between formal and informal processes is of high relevance as already outlined earlier (see sections 1.3 and 2.1.3). Formal strategies are thereby defined to refer to government actions, whereas informal strategies are defined to relate to practices of private actors (Birkmann et al. 2010). The focus will lie on informal household strategies at a local level on the one hand and on formal governmental policies on multiple scales on the other. It is therefore crucial to arrive at a more integral and multi-scale understanding of social response mechanisms, in particular when it comes to outcomes and processes of social practices and an evaluation of these. These aspects are still, however, among the greatest challenges in the conceptualisation of human risk responses and have rarely been addressed in the literature (Birkmann 2011a). The interplay between formal and informal strategies will therefore be analysed explicitly to draw some conclusions for further research.

An analysis following the theoretical ideas of coupled social-ecological systems (see e.g. Berkes et al. 2003; Folke et al. 2005) has shown to constitute appropriate means to shed light on both the 'to what' and the 'who responds'. Social and ecological systems are described to reveal close and dynamic coupling processes acting on various scales which can be of high relevance for this analysis. In rural areas of the Mekong Delta, the livelihoods are not only closely linked to both social- and ecological factors outside and inside the place but are subject to the dynamic interplay between the two. These coupling processes are assumed to be complex and create outcomes and behaviour which cannot be understood or even seen when the systems are analysed in isolation (Meinke et al. 2009: 72). Saline intrusion is, for instance, present at any time in coastal areas but it only becomes a hazard if social factors like inadequate dike systems interact with the natural characteristics. Especially Turner et al.'s (2003) framework not only addresses social-ecological interactions but also their effect on people's vulnerability towards risk (see 2.1.3). A multi-scalar approach allows for focusing on the local while at the same time considering human and environmental influences, variability and changes outside the place. This is why the current framework also integrates multiple scales (see grey shaded layers in Figure 2.12). Based on the literature review outlined in chapter 2.1, vulnerability is defined as an endogenous and dynamic character of a system determining the magnitude and scope of impacts caused by a hazard event. The resulting loss and damage is assumed to act upon the system itself and upon objects of value to the system (see blue impact boxes in Figure 2.12; definition based on UNU-EHS 2004 in Thywissen 2006: 34; Klinke, Renn 2002: 1071; Turner et al. 2003). Vulnerability comprises, as with Gallopin's (2006) conceptualisation, three major components, i.e. exposure, susceptibility and capacity of response (orange boxes in the vulnerability component in Figure 2.12). These are presumed to be determined by human and environmental conditions inside the place, as is also outlined by Turner et al. (2003). These conditions are assumed to include on the human side, in accordance with the sustainable livelihood framework (Ashley, Carney 1999; DFID 1999), physical, financial, human and social capital endowments in their function as entitlements. Environmental conditions are defined to encompass natural capital, i.e. the biophysical endowment providing, for instance, access to ecosystem services. Together, they represent the wealth and diversity of capital endowment. Adopted from other scholars in vulnerability research, the wealth of assets assumingly comprises the capacity of response in its function of capital transformation. The diversity in the endowment of assets is seen to be an important driver of susceptibility (see e.g. Fraser et al. 2005). The adverse impact of a hazard event on one livelihood component (e.g. income from agriculture) is assumed to be more likely to result in a crisis or even calamity if there is no other component that could compensate for the losses.

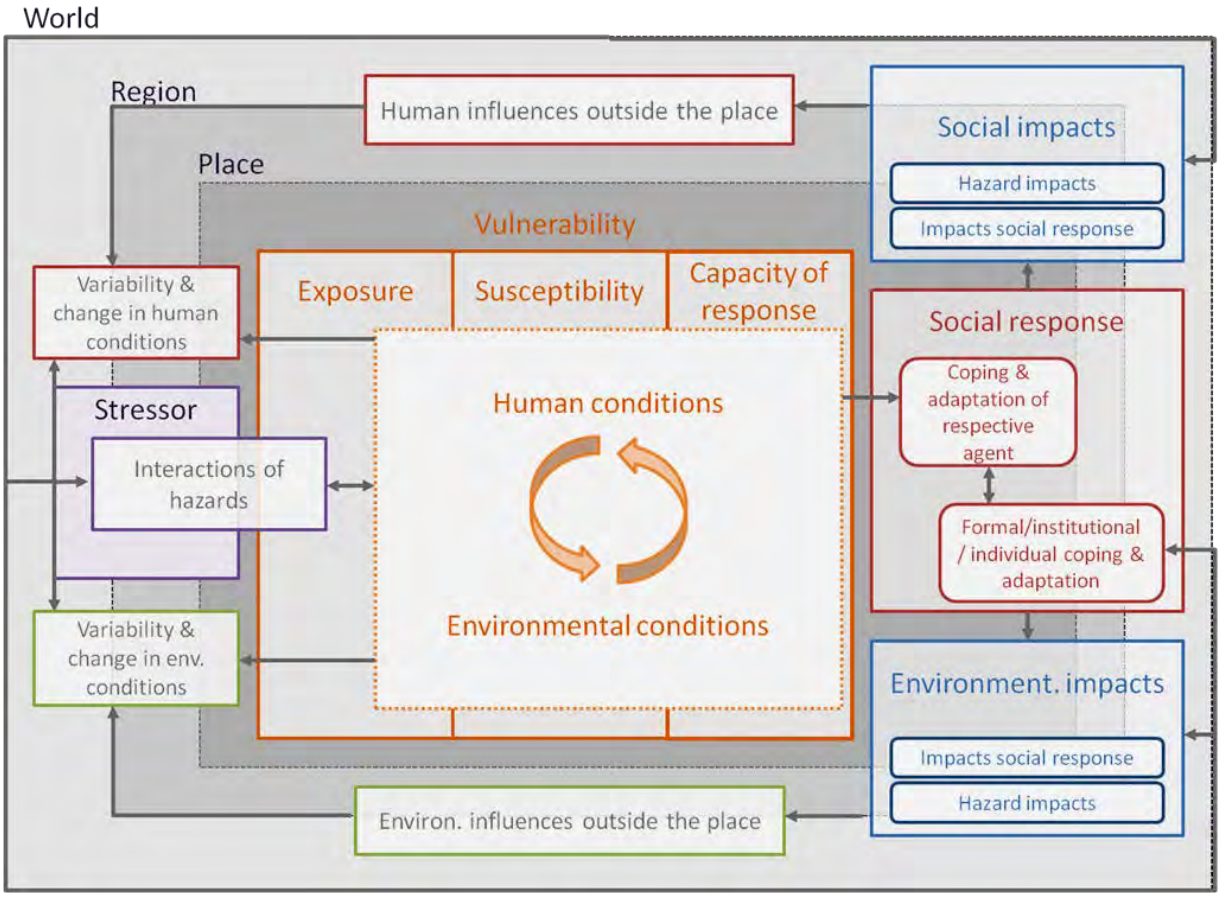


Figure 2.12: Conceptualisation of vulnerability of coupled social-ecological systems (Source: author, based on Turner et al. 2003; Gallopin 2006: 300)

Risk management strategies are addressed by Turner and his colleagues (2003) as part of the resilience component. However, the term resilience is tied to its own significantly different line of thought in social-ecological systems theory. In resilience literature, arising from ecology, resilience is commonly defined as the ability to retain structure and function, the capability of self-organisation and the capacity to learn (Nelson et al. 2007: 398). Gallopin (2006: 300) argues that this understanding does not include processes of coping with hazard impacts and taking advantage of given opportunities. The term capacity of response is, in contrast, understood to add these processes to the meaning of resilience. Although coping is, at least at a local level, explicitly mentioned in Turner's resilience component, capacity of response is seen as a more appropriate and less misleading term in the research context and will accordingly be used in the following analysis. Moreover, this research makes a clearer distinction between response *capacities* which are determined by human-environmental conditions (part of the vulnerability component in Figure 2.12) and *actual responses* (red boxes outside of the vulnerability component). Risk-related responses are defined to be one category in the catalogue of strategy classifications. They comprise not only reactive strategies in the aftermath of an adverse event but also encompass proactive strategies in anticipation of an adverse event (i.e. a response to an expected phenomenon). A strategy[20] is delineated as an intentional social practice which can be both short-term and long-term oriented. It is either a single action or a set of deliberately connected actions. In contrast to Bourdieu's theory of practice (see e.g. Bourdieu 1987: 116; Dörfler et al. 2003: 17), strategy does thereby not refer to an internalised practice which is neither intentional nor target-oriented. Risk-related strategies are presumed to comprise on the one hand responses of the respective agent or the system affected at the local level and on the other hand responses of other actors on various spatial scales. In this way, the actions of households can be seen in their interplay with formal actions taking place on the governmental side.

In addition to that, a clear distinction between **coping and adaptation** is perceived to be of particular importance in the present research context and is therefore integrated in the conceptualisation of vulnerability. Adaptation represents the deliberate medium- and long-term adjustments to experienced or expected hazards by changing the existing system; the strategies are based on livelihood assets and opportunities and aim to protect and improve the livelihood basis and objects of value (see definition in Table 2.5 based on IPCC 2012: 558; Korf 2002: 3; Birkmann 2011a). Coping is defined as the use of available livelihood assets and opportunities as a response to hazards with the goal of fulfilling the basic needs and functioning in the short-term (see definition in Table 2.5 based on IPCC 2012: 558; Korf 2002: 3; Birkmann 2011a; Turner et al. 2003). Furthermore, impacts are conceptualised as distinct framework components (see blue impact boxes in Figure 2.12). Impacts are assumed to act upon the social and the environmental system and include hazard impacts as well as impacts of coping and adaptation.

In general, this conceptualisation of the social-ecological system and the related vulnerability provides a basis for deriving specific vulnerability indicators and their decisive role for social response mechanisms. The more systemic perspective is valuable as it allows for a better integration of feedback effects, transformations and thresholds, being mostly social-ecological in nature (Miller et al. 2010). This in turn is important in understanding potential consequences arising from past and present action and makes it possible to predict the environment in which future decisions will be taken. The outcomes of social response mechanisms can consequently be evaluated along the lines of changing vulnerability indicators. This provides the basis for judging the degree to which current measures aim at a more adapted social-ecological system under changing circumstances (Gallopin et al. 1997: 5).

2.4.3 Decision-making for coping and adaptation

This study aims at a more in-depth analysis and evaluation of adaptation and coping which considers not only 'who adapts in which way to what', as Smit et al. (1999) suggest, but also '**why** adaptation is taking place'. Comprehending decision-making processes is key to understanding this 'why'; hazard characteristics and social vulnerabilities alone do not explain the occurrence of adaptation. As already outlined in section 2.2, there are social and cognitive factors which explain how a stimulus is perceived by different agents, why it leads to which adaptation and coping measures, and how underlying goals influence how "good" these options are perceived to be (Grothmann, Reusswig 2006: 107; Rogers 1975; Krömker, Mosler 2002). This indicates the significance of introducing a model that considers these factors in decision-making processes when it comes to the evaluation of coping and adaptation strategies.

This research builds on Grothmann and Patt's (2005: 208) socio-cognitive model of individual coping and adaptation to explain the intention and action of individual actors by looking at a number of socio-cognitive variables (see section 2.2). In the adapted and amended model presented here, threat and competence appraisal are judged to be the two variables with the most power to explain an

[20] Mechanism and practice are used synonymously for strategy.

agent's intention to act (see Table 2.7 for an illustration of the analytical components which form risk perception).

Table 2.7: Interrelation between the components of risk perception

Risk perception				
Threat appraisal		Competence appraisal		
Perceived hazard exposure	Perceived susceptibility	Appreciated options	Perceived self-efficacy	Perceived coping/adaptation efficacy

Source: Grothmann, Reusswig (2004); Grothmann, Patt (2005); Krömker, Mosler (2002); Dessai et al. (2004)

Based on a review of the most important literature on socio-cognitive decision-making models (see section 2.2), **threat appraisal** is defined to expresses an agent's "internal" individual definition of what is dangerous (2004). It is presumed to express an agent's assessment of the probability of being exposed to threats and of the perceived damage potential to things that are of value to the agents (Grothmann, Reusswig 2006: 104; Grothmann, Patt 2005: 4). The term risk appraisal, as Grothmann and Patt (2005: 4) term it, is not in line with the definition of risk as outlined in the previous section 2.4.2 on social-ecological vulnerability. This is why the term threat appraisal is applied to the conceptual model of this research instead. In accordance with the vulnerability concept presented previously, threat appraisal is described as perceived hazard exposure and perceived susceptibility. Therefore it is also important to acknowledge the perception of the hazard itself more explicitly than Grothmann and his colleagues do (Grothmann, Reusswig 2006; Grothmann, Patt 2005). An understanding of the hazard is assumed to give a better idea of how the hazard is expected to occur and does not only look at the probability but also at the severity of potential hazards. Despite the assumption that the threat appraisal provides the motivational energy for taking an action, it has shown not to determine whether a measure is actually taken (Grothmann, Reusswig 2006: 107; Rogers 1975). Agents can perceive that they are seriously threatened or, as described in section 2.2, consciously face an intolerable risk without taking an action. Actors might not believe in or know about their capabilities and options to respond in a beneficial way and would therefore not opt for adaptation (see e.g. Cervone 1989; Bandura 1982; Krömker, Mosler 2002).

This study therefore includes an individual **competence appraisal** - an often neglected aspect in the debate around risk perception. Adopted from socio-cognitive models of decision-making, an agent starts judging his/her competence only after a certain threshold of threat is perceived. Competence appraisal is, based on the literature review presented in section 2.2.2, defined as subjective evaluation of the agent's own capability to respond to experienced hazardous events and anticipated threats in a beneficial way (Krömker, Mosler 2002; Grothmann, Reusswig 2006; Grothmann, Patt 2005; Rogers 1975). In contrast to the term "adaptation/coping appraisal" used by Grothmann and his colleagues (Grothmann, Patt 2005: 203; Grothmann, Reusswig 2006), it is labelled as competence and is assumed to comprise the perceived capacity to both cope and adapt. The appraisal process includes three major components: the appreciated coping and adaptation options, the perceived self-efficacy, and the perceived response efficacy. Perceived adaptation and coping options have, so far, not been included in socio-cognitive models of adaptation/coping decision-making. Nevertheless, only if an agent is aware of a certain strategy can he/she start evaluating these options and his/her own efficacy in bringing it into practice (Slovic et al. 2000: 6-7). This is why "appreciated adaptation/coping options" are included in the competence appraisal here. The "response efficacy", which has also been included by Grothmann and his colleagues (Grothmann, Patt 2005: 203), is defined to describe the subjective valuation of whether a strategy can protect oneself and the objects one values in an effective and cost-efficient way from being harmed by a hazard. The framework thereby also includes quality criteria such as sustainability and acceptability, i.e. criteria which are defined as important in the evaluation section of this study (see section 2.3.2), are encompassed to gain a more holistic understanding of what values are ascribed to a certain action (Brooks et al. 2011; McKenzie et al. 2008; Yohe, Tol 2002). The "perceived self-efficacy" depicts, as described by Grothmann and his colleagues (Grothmann, Patt 2005; Grothmann, Reusswig 2006), the personal judgement of one's abilities to perform an action (adopted from conceptualisations presented in section 2.2.2).

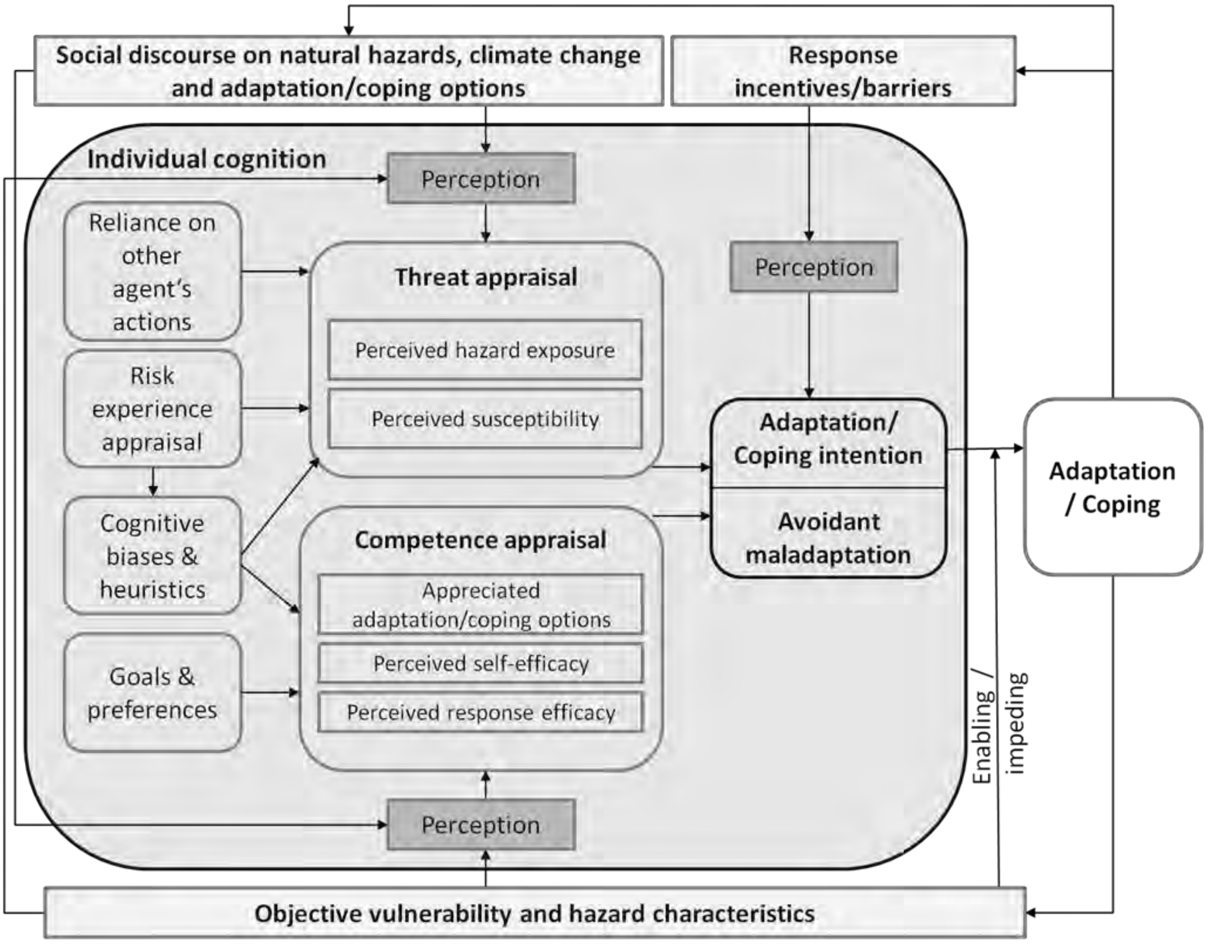


Figure 2.13: Socio-cognitive model of individual coping and adaptation (Source: author, based on Grothmann, Reusswig 2006: 105; Grothmann, Patt 2005: 204; Krömker, Mosler 2002)

Based on previous studies in the field of socio-cognitive decision-making (see section 2.2), both threat and competence appraisal are assumed to form the foundation of whether and how an individual reacts to certain risks. Adaptation and coping intention is defined to be derived from a perception of high risk and high adaptive capacity, whereas maladaptation is defined to mainly arise if threat perception is high but competence is perceived to be low. Maladaptation comprises both the avoidance of responding and responses which do not protect but often worsen the impacts of hazards. In this context, a focus is put on avoidant reactions which include for instance the denial of a threat, wishful thinking and fatalism (Grothmann, Patt 2005; Grothmann, Reusswig 2006; depicted at the right side of the individual cognition component in Figure 2.13).

Similar to other socio-cognitive models of adaptation/coping decision-making, an individual's perception is presumed to be influenced by the socio-physical environment. This is why it is, in contrast to the PMT of Rogers, explicitly addressed in this conceptual framework of individual decision-making. One important social aspect is the actual or **objective vulnerability and hazard characteristics** of the respective agent (see box below the individual cognition component of 2.13).

The subjective self-efficacy appraisal is, for example, mainly based on the actual capacity of response (also described by Grothmann, Patt 2005). In contrast to Grothmann and Patt (2005), it is assumed that not only objective adaptive capacity but also objective hazard exposure and susceptibility influence the threat and competence appraisal. It is therefore termed and integrated as objective vulnerability and hazard characteristics. Considering that the majority of people have been shown to be relatively well aware of their endowment with financial resources, of their access to natural capital, or of their physical possessions, the individual appraisal of these asset possessions is comparatively reliable. It is expected to be harder to judge the endowment with regard to intangible assets such as know-how or social capital (Grothmann, Patt 2005; 2002).

The awareness of threats and competences are also assumed to be substantially affected by the **social discourses in the context of risks and adaptation/coping** (Nicholls 1999; see box above the individual cognition component of Figure 2.13). Relying on Kasperson and his colleagues' (2005) concept of the social amplification of risk, this study acts on the assumption that social discourses either amplify or attenuate the individuals' interpretation of objective risks (see section 2.2.2). Having shown in the literature that human agents create their reality based on their own experiences, it is also important to integrate people's **own risk experiences** (Kuruppu, Liverman 2011: 659; Vries 2007: 39). A threat experience appraisal assesses, as Grothmann and Reusswig (2006: 107) argue, past experiences with hazardous events such as a flood or drought. This appraisal can motivate or discourage individuals from taking actions and can also function as a subjective indicator for expected future hazards (Weber 2006). It is therefore explicitly included in the model of individuals' decision-making. A range of scholars have noted that these experiences are interrelated with cognitive biases and heuristics (see e.g. Norgaard K.M. 2009: 34; Nicholls 1999; Slovic et al. 2000). Based on this literature, cognitive biases are defined as irrational misjudgements of threats and capabilities (Slovic et al. 2000); heuristics are, based on Nicholls (1999: 1387), defined as established rules of thumb to facilitate taking a multitude of decisions in day-to-day-life (cognitive biases and risk experiences are depicted within the individual cognition component on the very left side of Figure 2.13).

In contrast to other socio-cognitive models, this framework includes and depicts **goals and values** explicitly to see more clearly what agents want to do and not only what they are able to do (see box on the very left of the individual cognition component in Figure 2.13). In the context of the evaluation of strategies, these aspects are of particular interest. The review of the evaluation literature has shown that goals are at the centre of each effectiveness evaluation (Dolan et al. 2001; Eriksen et al. 2011; see section 2.3). Explicitly addressing goals and values thereby highlights subjective evaluation criteria and indicates that only when considering values can one understand why goals arise and how socio-cognitive barriers of adaptation and coping can be overcome. Based on the models of Grothmann and his colleagues (Grothmann, Patt 2005; Grothmann, Reusswig 2006), externally given **barriers and incentives** are also included in this conceptual framework of individual decision-making (see box external to the individual cognition component on the upper right side of Figure 2.13). They can directly influence whether an agent opts for maladaptation or forms the intention to adapt. Barriers or incentives can, for example, arise from political measures such as regulations, taxes or subsidies. Finally, it has been shown that if an actor intends to take measures, it does not necessarily mean that this measure is also implemented. Sometimes an actor bases his intention to act on an overestimation of his/her adaptive capacity. The implementation can then fail to materialise if an actual lack of resources exists (Grothmann, Patt 2005; Kuruppu, Liverman 2011). The current research framework therefore differentiates between adaptation/coping intention inside the individual cognition and actual adaptation/coping outside individual cognition.

Overall, the presented conceptualisation of individual decision-making and its integration in the previously described systemic vulnerability framework can facilitate a more holistic understanding of the co-dependent relationship between vulnerability and social response mechanisms and can provide a profound basis for evaluation not only from an evaluator's perspective but also from a subjective, stakeholder-specific level.

2.4.4 Risk responses against the background of theories of change

Following the anatomy of adaptation and coping suggested in section 2.1.3, it is important to answer, aside of the '*who responds to what*' and the '*why*', the question of "**what does the social response look like**". Thereby, a closer look at the processes and forms of social practices is taken and it is related to the evaluation concepts introduced in section 2.3.

When aiming to understand what adaptation and coping is, it is important to look at the actual processes that take place, consider their outcomes, and finally assess the impacts of the practices on the social-ecological system. In the present research context, so-called "**theory of change**" approaches, which are widely used in project analyses and evaluations, will explain processes by looking at how inputs, activities and outputs are linked causally, how they result in outcomes, and how they impact on a system (3ie 2012: 9; GEF Evaluation Office 2007: 8). Thereby, a "pathway of change" or "change framework" (3ie 2012: 5; GEF Evaluation Office 2007: 8) can facilitate a description of a sequence of testable "if-then" assumptions (see Figure 2.14 for a depiction of a theory of change for an adaptation in form of training classes).

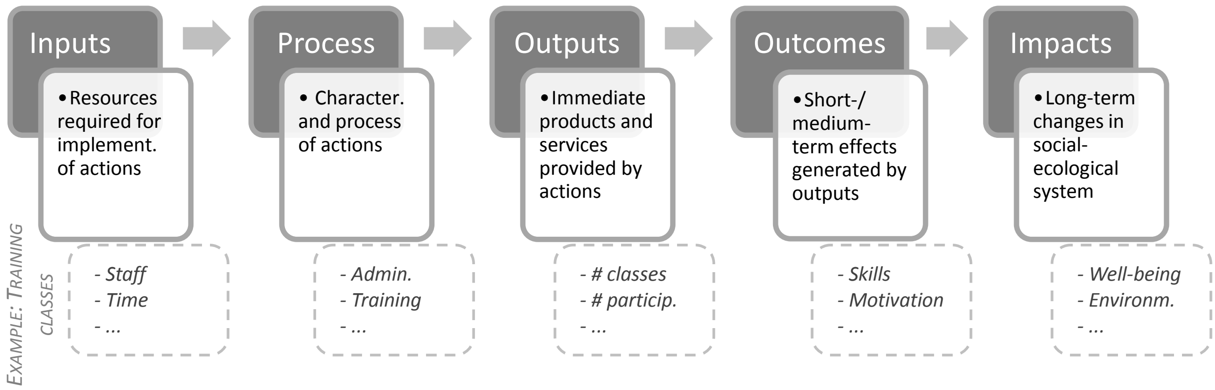


Figure 2.14: Theory of change for coping and adaptation strategies depicted at the example of training classes (Source: author, based on GEF Evaluation Office 2007: 9; UNFCCC 2010: 5; UNDP Evaluation Office 2002: 6; Jacob, Mehiriz 2012)

A first point of analysis is defined as the description and quantification of **inputs** which are required to undertake a certain activity. Inputs are, similar to other scholars' definitions (see e.g. Bowen, Riley 2003: 309; Segnestam 2002: 5), expressed in terms of time, financial, natural and physical assets or human and social forms of capital. A training class within an educational program would, for example, require expenditures for a space to teach, human resources (especially a teacher), and educational materials such as books. The use, exchange and transformation of these resources are the foundation of each production **process**, meaning projects or activities depicted in the progress and characteristics of actions (Jacob, Mehiriz 2012). This component also relates to institutional aspects or governance processes pointing out another highly relevant aspect for a more comprehensive evaluation as is intended in the present research context (Jacob, Mehiriz 2012). Programmatic activities in the forefront of a training class such as administrative support, staff training and logistics are, for instance, process or activity characteristics which matter. The immediate products and services provided by or resulting from the activities are described by the term **outputs** (Segnestam 2002: 5; UNFCCC 2010: 4). This could, for instance, be the number of classes conducted. The **outcomes**, in contrast, are assumed to be more short- and medium-term effects on target groups or systems which are generated by an adaptation's outputs (UNFCCC 2010: 5; UNDP Evaluation Office 2002: 6). It has been shown that these outcomes are in the short-term often related to learning and in the medium-term to changes in policies or individual behaviour (GEF Evaluation Office 2007: 9). In the case of educational programs this could be the conveyance of skills and motivation and a consequent change of production practices. An **impact** is described, based on the definition of the GEF Evaluation Office (2007: 5), as the "ultimate result that can be attributed to the combination of outcomes [...]". Impacts are defined to reflect more pervasive and longer-term results of strategies. The term impact is, in this research, assumed to include also the notion of change, i.e. it reflects institutional changes and comprises turning points to a different development path (Birkmann 2011a: 817). In the example of training classes, impacts could therefore be different income structures of rural populations or improved water quality due to changes in agricultural practices, or a complete change in the livelihood basis due to rural-urban migration. While output and outcome indicators are assumed to relate back to individual/local goals, impacts tend to be linked to progress towards goals at a larger level such as the changes in the social, economic or environmental system conditions (Bowen, Riley 2003: 309; GEF Evaluation Office 2007: 9).

In conclusion, a conceptualisation of the characteristics of social practices along the lines of theories of change provides answers to the question "what does the social response look like" into more workable categories. This does not only help to better understand adaptation and coping as such but also facilitate their evaluation. Theories of change will therefore be integrated in the overall framework of analysis of this research.

2.4.5 An context-specific and actor-oriented framework for evaluating coping and adaptation

Knowing about the overall context of risk (i.e. being *context-specific*), about how decisions are taken in this context (i.e. being *actor-oriented*), and about what resultant strategies look like (i.e. being positioned in *evaluation* research) provides a good basis to pose the question "what is actually good coping and adaptation?". In order to come to a satisfying answer to this question, an innovative context-specific and actor-oriented evaluation framework has been developed for this research.

Evaluation is viewed as strategic, retrospective assessment of the merit, worth and value of objects, processes and results of actions on the basis of which adaptation barriers and strategic points of intervention can be identified (Huitema et al. 2011: 182; Vedung 2008: 2). In contrast to most of the scholarly works in the field of evaluation, this research aims to consider more than just one or a limited number of strategies. This study wants to provide a comprehensive overview of all relevant strategies; only in that way can decisions for or against an option be sufficiently understood. As previously outlined in the context of adaptation appraisal (see decision-making section 2.4.3), people first have to know what their options are before they can evaluate which one of them would be the best one to choose. Therefore, an adaptable evaluation framework was developed through which different types of social practices can be appropriately and comparatively evaluated. According to the current research foci (see section 1.3), its goal is to look at: coping as well as adaptation processes; risk-specific and more general risk-related strategies; public actions at the various administrative levels as well as household strategies at the local level; and potential strategy option and actually implemented actions.

This evaluation framework builds on the anatomy of adaptation and coping presented above (see process of adaptation/coping depicted on the left side of Figure 2.15) and thereby combines the benefits of the most common evaluation concepts identified by Silva Villanueva (2011) presented in section 2.3.2 (see columns in the centre of Figure 2.15; the dark grey boxes in each of the columns depict which aspect of the evaluation process is included in the respective evaluation approach). Firstly, analysing the overall risk context facilitates evaluations that require the identification of system characteristics as baseline and as outcome (baseline is depicted as "stimulus & system" box, outcome is depicted as "outcomes & impacts" box on top respectively on the bottom of the anatomy of adaptation column in Figure 2.15). These components are of particular importance to efficiency-based economic evaluations (see section 2.3.2 for a detailed description of economic evaluations).

In addition, effectiveness-based evaluations can be undertaken with the information provided by an analysis based on the current framework. In the analysis of decision-making processes, goals and values are identified. They provide the basis of each effectiveness assessment and are therefore of central importance in the evaluation context. One example for effectiveness-based evaluations is process-based evaluation. Thereby, goals in the form of process-oriented criteria can, for instance, be taken as foundation for assessing the quality of some (particularly governmental) measures (see second of the evaluation approach columns in Figure 2.15 and section 2.3.2 for a definition of process-based evaluations). Result chains and logic frameworks (input-output-outcome) as well as behavioural change assessments also evaluate strategies based on predetermined goals against a set of implementation and outcome characteristics (depicted as input-output-outcome respectively behavioural change oriented approaches in Figure 2.15 and defined in section 2.3.2). Subjective judgements of the response efficacy and self-efficacy, as described in the decision-making component of this framework, have only rarely been taken as a basis to evaluate strategies and are accordingly also not included in the most common evaluation frameworks depicted in Figure 2.15. Nevertheless, it is these components which convey an understanding of the differential distribution of subjectively perceived costs/benefits and facilitate an identification of potential stakeholder and value conflicts. Aspects of subjective evaluation are therefore explicitly addressed in the current evaluation frame as part of the decision-making component.

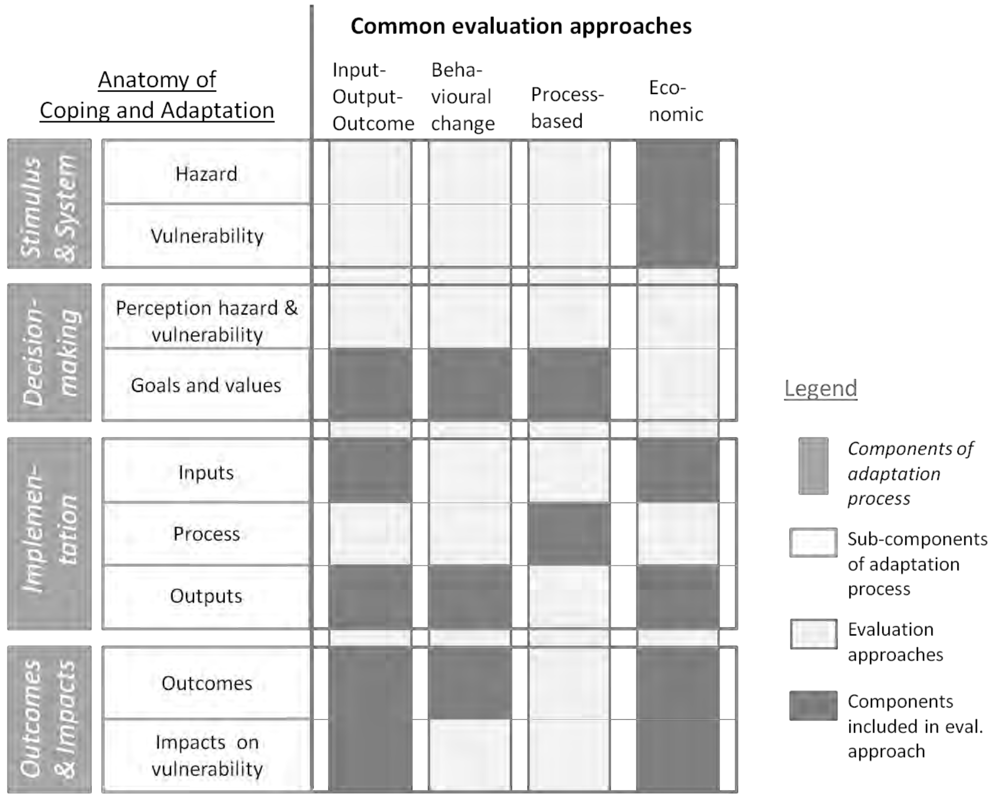


Figure 2.15: Anatomy of coping and adaptation and its role for common evaluation approaches (Source: author, anatomy mainly based on Turner et al. 2003, Grothmann 2005, GEF 2007, UNFCCC 2010, Jacob and Mehiriz 2012; classification of evaluation approaches based on Silva Villanueva 2011)

This evaluation framework not only considers a multitude of approaches for evaluating different strategies but also looks at a large range of evaluation criteria. Strategies can therefore be evaluated, in the sense of multi-criteria analyses (see section 2.3.2), against a set of different indicators. The present research means to take on a multi-stakeholder perspective by analysing and comparing the views of different groups on a set of strategies. Therefore, especially the most relevant evaluation criteria to the stakeholders on site shall be taken into consideration and shall be acknowledged in their differential value. This is intended to serve as a foundation not only for expert-based but particularly for stakeholder- and household-based evaluations. Accordingly, not only are public, scientific or project goals meant to be acknowledged but also the preferences of different actor groups on site. These actor groups will include the respective target group and other groups.

Each of the identified evaluation concepts and criteria are the basis for a more comprehensive evaluation and shall be considered when evaluating the range of relevant options. However, it is not intended to arrive at an evaluation which applies all approaches/criteria to all strategies. It is an *adaptable* framework where the respective assessment component will only be applied when appropriate and possible.

2.4.6 Analysis of barriers and limits to good coping and adaptation

Having gained an understanding of the drivers of coping and adaptation and having depicted an approach to assess the quality of such strategies, not only a holistic view of "good" coping and adaptation is provided, but also a basis for systematically identifying the barriers to "good" strategies. There already exists, as outlined in section 2.1.3, a growing scientific literature on the limits and barriers of adaptation. An analysis of barriers to "good" adaptation and coping has, in contrast, not explicitly been addressed so far. The following section will therefore depict a systematic approach to the question "What are the limits of and barriers to *good* coping and adaptation?" along the lines of the framework components outlined in the previous sections.

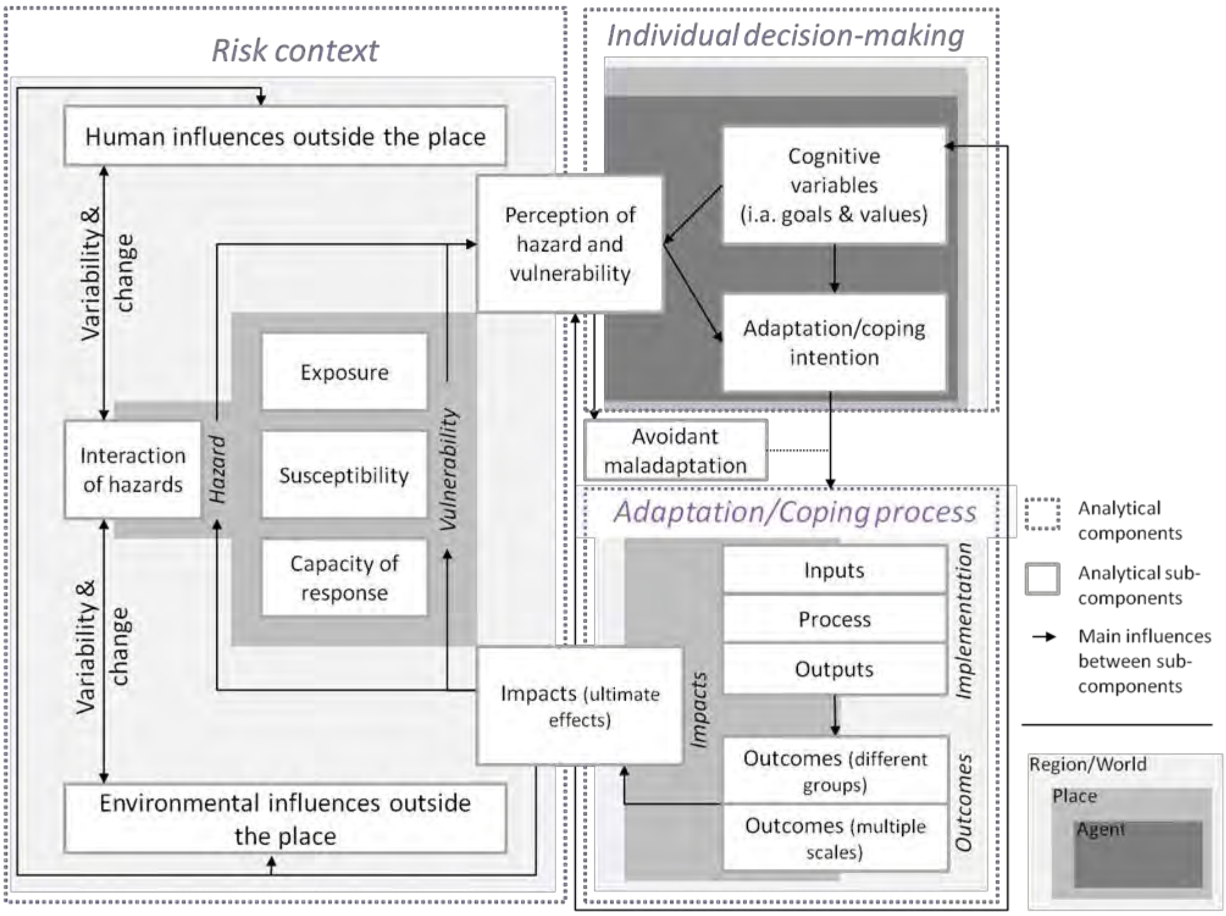


Figure 2.16: Depiction of an integrated framework for understanding and evaluating risk-related response mechanisms (Source: author, mainly based on Turner et al. 2003, Grothmann and Patt 2005, Jacob and Mehiriz 2012, UNFCCC 2010)

Based on the reviewed literature in the field of vulnerability (see section 2.1.3), limits are defined as absolute and insurmountable obstacles which relate to a set of immutable ecological, physical and technological thresholds beyond which existing systems, states, valued objects and activities cannot be maintained or secured. Barriers are defined as subjective and socially constructed obstacles which can, in contrast, be overcome (Moser, Ekstrom 2010: 22026; Dow et al. 2013: 306; Adger et al. 2009: 335). In order to systematically analyse risk-related response mechanisms and identify their barriers and limits, the previously presented research approaches are linked and brought together in an integrated analytical framework (see Figure 2.16). It consists of three major components: (1) the social-ecological risk context, (2) individual decision-making processes, and (3) the manifestation of coping and adaptation strategies.

Taking on a social-ecological perspective allows for the integration of different dimensions, addresses diverse actors at various scales, and provides a good baseline to judge the complexity of outcomes and impacts of strategies. It is, as outlined in section 2.4.2, mainly based on the framework of Turner et al. (2003) and is conceptualised as a risk context in the current analytical framework (the risk context and its major analytical components are depicted at the right side of Figure 2.16). The lens of vulnerability is particularly pertinent to this research because it makes it possible to depict barriers and limits arising from multiple dimensions. It facilitates the detection and analysis of limits arising from the ecological system such as ecosystem thresholds beyond which the current livelihood system cannot be maintained. Hydrological limits, such as the availability of freshwater sources, might, for instance, rule out some - in other areas effective - coping options. Taking a look at the human side of the system too enables a grasping of barriers, especially economic, knowledge-related and institutional barriers. The individual endowment with financial resources, for instance, can hamper the capacity to take capital intensive adaptation measures; the lack of knowledge or skills of a farmer can deteriorate the quality of implementation substantially; and human conditions outside the place, such as an insufficient legal enforcement, might restrict private investments in more sustainable technologies (see Table 2.8 for an exemplary identification of barriers and limits along the lines of the three research components).

Looking at the subjective perception of risk in the consideration of individual goals, experiences and cognitive biases adds a more actor-centred view on the assessment of risk-related response mechanisms. The understanding of decision-making processes is mainly based on Grothmann and Patt's (2005) socio-cognitive model (it is depicted as individual decision-making with its major analytical components in the upper right corner of Figure 2.16). The conceptual component "objective vulnerability and hazard characteristics" in the socio-cognitive model of decision-making (see section 2.4.3) links the decision-making concept with the previously presented systemic concept of risk. This indicates the compatibility of two concepts acting on different scales and enables the possibility of making use of the advantages a decision-making model has for indentifying barriers and limits to "good" practices. In particular the understanding of priorities, the recognition of misperceptions, and the acknowledgement of stakeholder-specific perceptions adds often neglected aspects to the appreciation of strategies and their barriers. It is therefore possible to identify not only knowledge-related barriers but also cognitive barriers. Knowing about the preferences of different stakeholders might, for example, show that some adaptation options are not applied because they do not match the goals of an agent; and the appreciation of the role that other actors play can illustrate how the illusion of protection inhibits taking action by oneself (see Table 2.8 for an exemplary identification of barriers and limits along the lines of the three research components).

An analysis of the actual adaptation/coping process can finally facilitate a closer look at individual strategies. Being the product of an adaptation/coping intention, it is linked to the conceptual "decision-making" component of the overall framework. The adaptation/coping process is conceptualised in accordance with "theories of change", i.e. as the functional interaction of inputs, processes, outputs, outcomes and impacts (see the conceptual component "adaptation/coping process" depicted in the lower right corner of Figure 2.16; see section 2.4.5 for a definition of each of these components). The impacts act on the risk context and thereby connect the "adaptation/coping process" component with the systemic concept of risk introduced previously. Like the systematic approach for identifying and organising barriers to adaptation by Moser and Ekstrom (2010), this research relies on a diagnostic identification of the barriers along the lines of idealised steps in the process of adaptation/coping. This enables, for example, a more in-depth analysis of the financial efficacy of a measure - a major barrier for many new and innovative adaptation options. Moreover, it allows an identification of governance failures such as corruption which often restrain taking beneficial actions. The analysis of the adaptation/coping process can also show where technological limits of adaptation options are reached and where a lack of access to or awareness of new technologies is a barrier to "good" practices (see Table 2.8 for an exemplary identification of barriers and limits along the lines of the three research components).

Table 2.8: Exemplary identification of barriers to "good" coping/adaptation based on the conceptual framework

Conceptual approach	Analytical component	Major types of barriers/ limits addressed	Examples for limits/barriers
Social-ecological risk context	Env. influences outside the place	Ecological and physical limits/barriers	Ecosystem thresholds
	Place-based env. conditions		Geographical limits
	Hazard		Geological & hydrological limits
	Human influences outside the place	Knowledge barriers Economic barriers Institutional barriers	Lack of awareness-raising
	Place-based human conditions		Lack of financial resources
	Coping/adaptation of other agents		Lack of institutional support
Individual decision-making	Perception of risk	Cognitive barriers Knowledge barriers	Accessibility of weather data
	Cognitive biases & heuristics		Misperception of own skills
	Goals & preferences		Adaptation option not accepted
	Risk experiences		Lack of experiences
	Reliance on others		Illusion of protection
Manifestation of coping & adaptation	Inputs	Economic barriers Technological limits/ barriers Institutional barriers	Financial efficacy of a measure
	Processes		Inexistence of suitable technology
	Outputs		Governance failures
	Outcomes		Strategy increases vulnerability
	Impacts		Existence of monitoring system

Source: author, arrangement based on the major conceptual components presented above

In conclusion, the literature review in the fields of risk, vulnerability, socio-cognitive decision-making and evaluation has provided a pertinent basis for developing an innovative framework which can contribute to both scientific and practice-oriented debates. It builds a conceptual guideline to arrive at a more holistic understanding of vulnerability and its co-dependent relationship with coping and adaptation strategies. This understanding has provided a foundation for analysing what "good" practices are and why these "good" practices are restrained. In consequence, this approach permits a systematic and integrated way to identify, understand, and overcome barriers to "good" adaptation and coping. In order to understand "good" practices and its barriers in the specific thematic and regional context, the subsequent chapter will present the characteristics of and trends for rural livelihoods, water-related hazards and vulnerabilities in the Mekong Delta, based on a literature review.

3 The Mekong Delta: A geographical and thematic contextualisation

Having outlined the theoretical framing of this research, the specific geographical and thematic context will be outlined as a next step along the way toward reaching the goals of this research. This regional contextualisation is important for several reasons: firstly, it shows what has been researched so far and reveals the gaps which are to be filled in the future. The review of the literature thereby points out relevant research foci for this PhD work. Secondly, it provides an understanding of the Vietnamese Mekong Delta. This is of importance because not only do facts not "speak for themselves" if divorced from theory (Sowell 2007: 6) but they are also "mere isolated curiosities" if observed independently from the overall context. Knowing about the research context can provide explanations for observed structures and processes on site; the data can be put in relation to developments in the region; and the implications of the findings can be discussed against the background of their wider relevance. It is these aspects which make an understanding of the Mekong Delta so central in the current research context.

This chapter begins with the Mekong River. Its waters "are the lifeblood of Southeast Asia" (Osborne 2000: I) weaving over a course of more than 4,900 km through China, Burma, Laos, Thailand, Cambodia and Vietnam (Stewart, Coclanis 2011; MRC 2010). Before entering the South China Sea, the mighty river splits into nine tributaries fanning out over the most of south-western Vietnam and giving the Mekong Delta the name *"Đồng bằng Sông Cửu Long", i.e.*"Nine Dragon River Delta". The nine river branches are the lifelines of the Vietnamese Mekong Delta. They have created its distinct topography and hydrology, have been the keystones of its unique and diverse ecosystems, and have shaped the livelihoods of more than 20 % (17 million people) of Vietnam's population (Garschagen et al. 2012: 87; Le Anh Tuan et al. 2007: 19). Nevertheless, the nine powerful *"dragons"* are not only vital sources of life but are also closely linked to water-related risks in the region. Both sides have been shown to be subject to a multitude of social and ecological changes in the past and are also expected to pursue a transformative path in the future (Käkönen 2008: 205). All these aspects make it a pertinent region for studying the nature and quality of social responses to changing water-related risks – the thematic foci of this research.

Regionally, this thesis has focused on Tra Cu district in Tra Vinh province. It is a coastal region in the central south of the Mekong Delta. The Tien River, the Hau River and the South China Sea enclose Tra Vinh province. Tra Cu district borders the Hau River and is located in the south-western part of the province, around 20 km from the sea. The research area represents both the closely intertwined relationship with water and the dynamic nature of social and environmental developments in the Vietnamese Mekong Delta.

The following section will provide an overview of the Vietnamese Mekong Delta, Tra Vinh province and Tra Cu district and of the features most relevant to the research project. Firstly, rural livelihoods are characterised against the background of transformation (section 3.1); in a subsequent section the most important water-related hazards are outlined with regard to past and expected future changes (section 3.2). In the following pages, a closer look at the vulnerability of rural households to these hazards will be taken (section 3.3.1 and 3.3.2). This provides the basis for characterising coping and adaptation mechanisms in this risk-prone environment (section 3.3.3 and 3.3.4). The last part of this chapter will then review existing evaluations and analyses of risk-related practices (section 3.3.5).

3.1 Rural livelihoods in the Mekong Delta under transformation

Being concerned with rural areas in the Mekong Delta, it is central to gain, first of all, an overall picture of rural livelihoods in this part of the world. Vulnerabilities and risk-related response mechanisms in the researched hamlets can only be understood when being aware of the general geo-physical and ecological setting, the history of social and environmental transformation, the agricultural system and the development-related challenges. A mere analysis of the empirical data appraised in a single PhD project would not be able to uncover the nature of rural livelihoods in sufficient detail – not for the research area and particularly not for the entire Mekong Delta. It needs secondary literature which focuses on history, politics and natural processes. The following section therefore presents the characteristics of rural areas in the Mekong Delta and explains them against the background of societal and political changes.

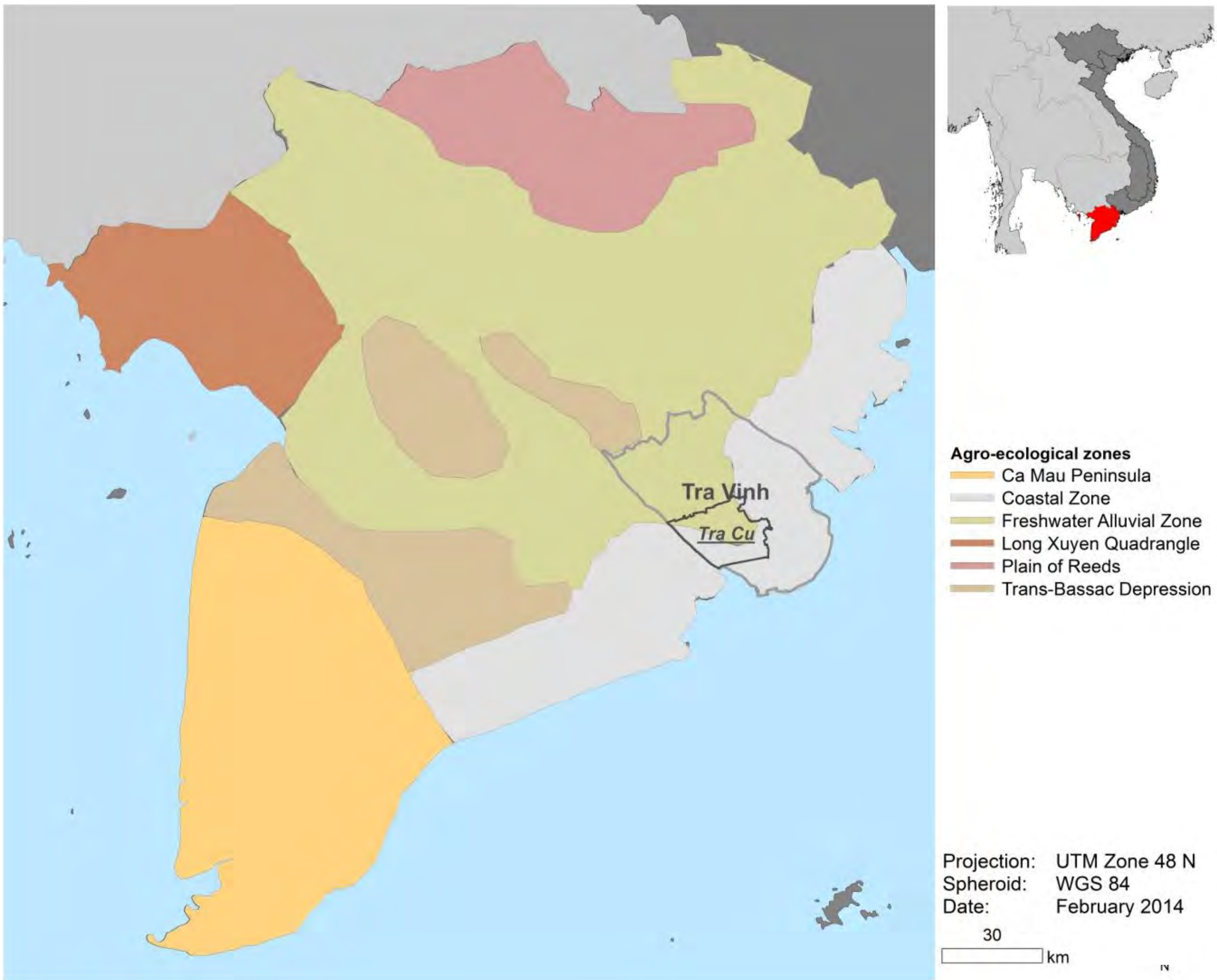
The people in the research area live, like the large majority of the population (76 %) in the Vietnamese Mekong Delta, in rural areas (GSO 2011: 71, 73) and are engaged in the primary sector (like 52 % of the total population as well; GSO 2012a: 24). The Mekong Delta is known as the "rice bowl" of Vietnam, a name which not only represents its role for rice production but also indicates its relevance for food production in general, for commodity trade and for food security for the whole of Vietnam (Renaud, Künzer 2012: 3). Being an agrarian and resource-dependent society, the life of the people is deeply interwoven with the natural environment. Land and water have been the main sources of people's livelihoods for centuries and society has brought about change and transformation to the natural environment (Käkönen 2008). In the following pages, the physical-geographic context is outlined, agricultural developments are described, societal structures and disparities are depicted, and environmental degradation is addressed.

3.1.1 Geo-physical and ecological characteristics of rural areas in the Mekong Delta

Water-related risks in the research area have their origin in the geo-physical and ecological features of the Mekong Delta; and only when knowing the nature of the Mekong Delta, can the characteristics, relevance and the implications of coping and adaptation in the research area be understood and transferred to other regions in the Mekong Delta. This section will therefore examine the regional context from a geo-physical and ecological perspective.

The Mekong Delta is among the largest deltas in the world. It forms a vast triangular plain with only a few areas at an elevation higher than 5 metres above sea level (MRC 2005: 53). Encompassing an area of more than 55,000 km^2, whereby nearly 40,000 km^2 (approximately the land area of Switzerland) are located in Vietnam (MONRE, Sub Institute of Hydrometeorology and Environment of South Vietnam 2010), it is around four times the size of the Red River or the Chao Phraya River Delta (Miller 2003: 80). In Phnom Penh, the Mekong splits into two main distributaries, the Hau River (Mekong) and the Tien River (Bassac), which run southeast and south towards the South China Sea (see Map 3.1). Throughout the last 300 years, the hydrological system of the delta has been substantially changed by its inhabitants (Le Anh Tuan et al. 2007: 19). So far, an extensive water network with 7,000 km of main canals, 4,000 km of secondary canals, and a vast number of smaller irrigation canals have been constructed (MARD 2003). On top of that, more than 20,000 km of dikes have been built.

Climatically, this region is located in the humid tropics and falls under the Southeast Asian monsoon. The Mekong Delta therefore experience high mean temperatures (25-30°C) all year round and high seasonal rainfall (1,200-2,300 mm). Nearly 90 % of the entire rainfall is recorded during the wet season which lasts from May to November (Deltares, DeltaAlliance 2011; Hashimoto 2001: 7). The wet and the dry season also coincide with the seasons of high and low water discharge of the Mekong River. It is highest from June to November and lowest from December to May.



<u>Explanation:</u> The delineation of the agro-ecological land resource mapping units builds on geo-physical (particularly geological formations and soils), hydrological (particularly hydraulic infrastructure, water regime and tidal influences), and ecological characteristics of the regions (particularly crop suitability and land cover).

Map 3.1: Agro-ecological zones in the Vietnamese Mekong Delta (Source: author, classification based on Vo Tong Xuan, Matsui 1998, administrative borders based on MOST 2010)

The Mekong Delta can be divided into six agro-ecological zones based on geo-physical, hydrological and ecological characteristics (Vo Tong Xuan, Matsui 1998; see Map 3.1). Among these six zones there are four major basins in the region: the Plain of Reeds, the Long Xuyen Quadrangle, the Trans-Bassac Basin and the Ca Mau Peninsula (Biggs et al. 2009: 206). All these areas are affected by acid sulphate soils (ASS), most severely in the low-lying backswamps further away from the main distributaries. In addition, the regular saline intrusion leads to seasonally or permanently saline soils in the South and South-East and to saline acid sulphate soils in the North-West. Besides the four basins, the Coastal Zone is another agro-ecologically definable region which stretches along the South China Sea. It is influenced by a semi-diurnal tidal regime and underlies saline water conditions throughout several or sometimes all months of the year. There too, saline soils prevail close to the coast and saline acid sulphate soils can be found more inland. This is the agro-ecological zone where most of Tra Cu district, i.e. the research area, is located (see map 3.1). The northern regions of Tra Cu district are part of the Freshwater Alluvial Zone. The alluvial terrace spans between the central areas around the Tien and the Hau Rivers. With its older alluvial land and the high freshwater availability, it is the most fertile region in the Delta. This is why it has the longest history of agricultural cultivation and includes the largest cities (My Tho, Can Tho, Vinh Long and Long Xuyen) in the delta.

The previous paragraphs have revealed the diverse nature of the geo-physical, hydrological and ecological setting of the Mekong Delta, a region which is often considered as one uniform area of interest. The acknowledgement of its unique physical geography provides an important basis for understanding water-related risks, rural livelihoods and many of the social response mechanisms taken by the local population. Enhancing the picture of rural livelihoods in the Mekong Delta also requires a more in-depth analysis of the transformations which took place in the recent history, though. These will be depicted in the following section.

3.1.2 The Mekong Delta's recent history of rural transformation

The geo-physical and ecological characteristics alone do not produce water-related risks and they are not the only drivers and determinants of coping and adaptation processes in the research area. Both the social and the ecological system have undergone substantial changes in the recent history and have thereby produced distinct risk patterns and have shaped response mechanisms. The following section will therefore outline the Mekong Delta's recent history of transformation.

Since reunification, the Vietnamese Mekong Delta experienced a multitude of changes in both society and the environment. Many of these changes were induced by Vietnam's central government in the course of political transformation. This political transformation process has intrigued a multitude of authors (see e.g. Garschagen et al. 2012: 97; Athukorala 2009; Ravallion, van de Walle 2008; Marsh et al. 2006; Le Coq, Trebuil 2005; Painter 2005; McCargo 2004; Hy V. Luong 2003; Beresford, Phong 2000; Chan et al. 1999; Grossheim 1999). These scholars have widely acknowledged the vital implications of this transformation process for the environment, for society and for economic development. In the Mekong Delta, rural (often equated with agricultural) development played a vital role in this context. Based on a review of the literature, the following phases were identified: (1) the phase of socialist transformation which started in the Mekong Delta after reunification in 1975 and lasted until the open market reforms beginning in 1986, (2) the period of liberalisation which followed in the late 80s up until the late 90s, and (3) the time of diversification and aquaculture expansion from the early 90s until today. These phases will be described in more detail in the following sections.

Agricultural developments in the light of socialist transformation (1975 – late 1980s)

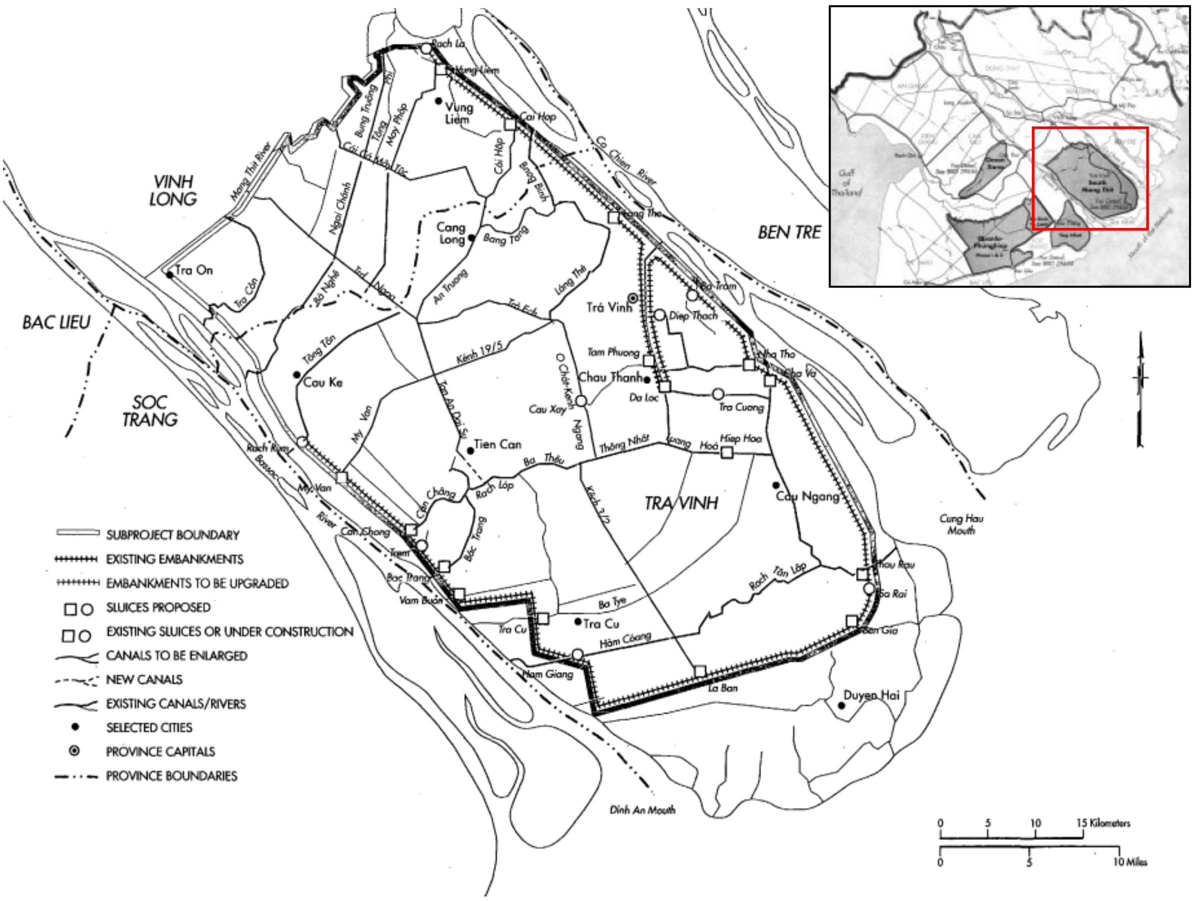
The socialist transformation, which had already begun in the north of Vietnam in 1954, started in southern Vietnam only after reunification in 1975. The communist government initiated from that time on a multitude of political changes in the Mekong Delta, most of which followed a centrally planned socialist mindset (Tran Thi Thu Trang 2004).

Seeking agriculture-driven development in the Mekong Delta, the central government initiated several measures for the expansion of the agricultural production area. Firstly, a central state water regulation system was set in place. Salinity and flood control as well as an improvement in the existing irrigation system were thereby at the centre of the government's interest. It was envisaged to make use of areas which were originally unsuitable for agriculture. In this vein, salinity-affected coastal areas were also targeted (Garschagen et al. 2012: 98; Vormoor 2010; Miller 2006; Hashimoto 2001). Secondly, the government wanted to continue the process of rice intensification. The improvements in the local and regional irrigation infrastructure and a continuous introduction of high-yielding varieties, which was already ongoing since 1966, should have facilitated the achievement of rice intensification (Vormoor 2010; Hashimoto 2001). Despite efforts to expand and intensify agricultural production, food sovereignty and security were less able to be met in the Mekong Delta. Reasons for this failure were strongly linked to the pursuit of collectivisation (see e.g. Ravallion, van de Walle 2008; Marsh et al. 2006: 16; Le Coq, Trebuil 2005 for more details).

Rice intensification in times of renovation (late 80s up until the late 90s)

In 1986, the central government introduced the so called Doi Moi policies, i.e. the “renovation” of the political system towards a "socialist-oriented market economy" (Taylor 2007). This market liberalisation was, as Kerkvliet (2005: 1) recognised, less of a change in the socialist mindset or an acknowledgment of the deficiencies of the system than an approval of what had already begun at a very local level. By that time, farmers had already started slowly moving away from collective management, especially in the Mekong Delta.

In the course of Doi Moi, land use rights were officially contracted to individual households for a period of 20 years, farm equipment was privatised, and private trading of produced commodities was authorised. This led to a more flexible, efficient and autonomous management. Furthermore, Vietnam positioned itself within the international market by entering trading agreements and reducing subsidies. This not only opened the gate for exports but led to better prices and a more reliable provision of inputs such as chemical fertilisers (Taylor 2007: 7; Le Coq, Trebuil 2005: 519). Overall, this increased land productivity substantially and raised incomes and living standards in the countryside (Ravallion, van de Walle 2008; Marsh et al. 2006). Throughout the Mekong Delta and in most of Vietnam, the political renovation transformed the agricultural system from subsistence-based to cash-crop farming. According to Brandt and Benjamin (Brandt, Benjamin 2002: 26), it was especially the Mekong Delta that benefited from this transition.



Map 3.2: South Mang Thit subproject (Source: World Bank 1999: 80) as one out of several large-scale water-control projects of the World Bank lead Mekong Delta Water Resources Project - depicted in the small box in the upper right corner (Source: Hashimoto 2001: 24 based on World Bank 1999: 70)

Further canal improvements and construction supported the expansion and intensification of production (Vormoor 2010: 7; Käkönen 2008). Nevertheless, the focus of hydraulic development was no longer on canals but had shifted towards dikes and gates in the 1990s (Evers, Benedikter 2009: 425). Continuing a paradigm of rice monocultures, these works mainly aimed to raise the productivity and outputs of rice farming and sought to control water-related hazards (Garschagen et al. 2012: 99; Vormoor 2010: 7). In coastal areas, large salinity protection infrastructure was brought forward in the 1990s under the central government's control after years of planning (since the Mekong Delta Development plan in the 1960s; Käkönen 2008). These massive projects were meant to protect freshwater areas from increasing salinisation and turn brackish water areas into freshwater areas (Miller 2003: 85). Many of these projects were supported by the World Bank. According to Evers and Benedikter (2009: 426), "much of the delta's territory had been transformed into a hydraulic landscape under human control" by the end of the 1990s. One of the largest systems of dikes and sluice gates has been the South Mang Thit dike in Tra Vinh and Vinh Long province (Hashimoto 2001: 24; SIWRP 2010: 20). Its construction was supported by the World Bank (like several other large-scale water control projects) and protects 171,441 ha of agricultural land (World Bank 1999: 41; see map 3.2 for a depiction of the South Mang Thit subproject and other World Bank supported water control projects in the upper right corner).

Diversification and aquaculture expansion (since early 2000s)

Throughout the 1990s many farmers found that rice brought comparatively little return on investments, particularly in areas of limited agro-ecological suitability. The changes in regional and international demand patterns played an important role in this context. They influenced the marketing condition in favour of commodities such as fruits, vegetables, sugar, meat or fish (Garschagen et al. 2012: 98). Moreover, peasants recognised the importance of having different sources of income. Considering that there had been limited employment opportunities outside agriculture at that time, diversification of the cultivation patterns was perceived to be viable (Tran Thi Thu Trang 2004: 116). Such efforts also spread the risks of pest outbreaks or hydro-meteorological events (Garschagen et al. 2012: 98). In 2000, the Vietnamese government acknowledged this strive for diversification by implementing a policy for agricultural diversification and sustainability (Garschagen et al. 2012: 98). This policy allowed farmers to choose the structure, scale and product types depending on the local context and the market demand (Ngo Thi Phuong Lan 2011a: 273). This choice was not totally free, however. It was still bound to the land use planning of the government, i.e. fruits could only be produced in areas assigned to fruit production in the 5 or 10 year plans; what a farmer could choose was merely the kind of fruit to be produced (Garschagen et al. 2012: 99). In consequence, the diversification efforts have led to a shift in cropping patterns in the different regions of the Mekong Delta. In the coastal areas, aquaculture was increasingly on the rise. In several regions, previously created fresh-water areas were even re-transformed into brackish water zones. In the Mangrove areas, the livelihoods were increasingly based on mangrove logging combined with shrimp farming; whereas farmers who previously produced salt or cultivated one rice crop per year have shifted to shrimp mono-farming or rice–shrimp rotation farming (Käkönen 2008: 209).

The productive infrastructure[21] was largely completed by 2000 and there have been no significant works carried out since then (SIWRP 2011; Käkönen 2006: 27; Vormoor 2010). Nevertheless, as Biggs argues, there were substantial investments and efforts needed to keep the "delta machine" running and protect the existing infrastructure (Biggs et al. 2009: 212f). In contrast to the relatively low investments in the productive infrastructure, the central government decided to make major investments in protective infrastructure[22]. One of the most prestigious projects has been the construction of a sea dike along the whole of the VMD coast to counteract the consequences of rising sea levels and storm surges (SIWRP 2011).

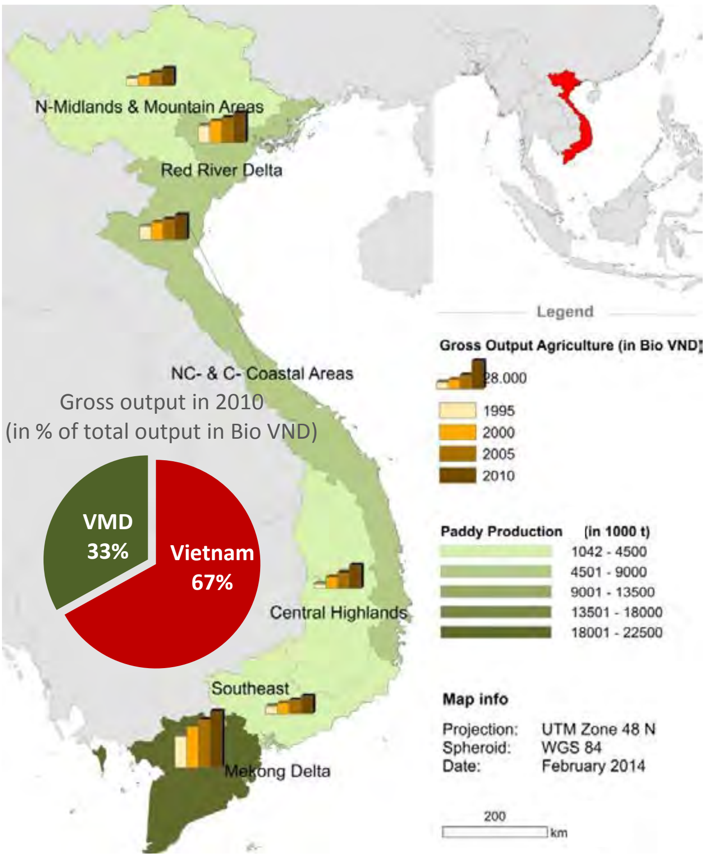
In addition to agricultural diversification, the overall economic structure has also become more

[21] Productive infrastructure comprises measures such as canals, aqueducts, reservoirs, dikes and sluice gates for the purpose of irrigation (Wittfogel 1957 in Evers, S. Benedikter 2009: 6) .
[22] Protective infrastructure comprises measures of flood control such as drainage canals and dikes (Wittfogel 1957 in Evers, S. Benedikter 2009: 6).

diverse. Most notably the share of the secondary sector rose constantly in the recent past. Between 2000 and 2008, its share grew by nearly 20% on average every year (SIWRP 2011: 11). This is in line with the vision of the Vietnamese government to "making ours basically a modern-oriented industrialised country by 2020" (GoV 2001: 1). Despite the impressive growth rate of the industrial sector accompanied by a diversification of the economic structure of the Delta, diversity within the industry sector is still rather low. The processing industries account for more than 90% of total industrial production (SIWRP 2011: 11), meaning that the tertiary sector is principally agriculture-led. Regionally, three industrial hubs have increasingly stood out in the Mekong Delta, i.e. Can Tho city as well as Long An and Ca Mau provinces. Tra Vinh province ranks among the provinces with the lowest industrial growth rates (SIWRP 2011: 11). Regions with little industrial development so far will, however, receive more attention in the future. In the rural provinces a number of industrial zones are, for instance, planned to be constructed by 2020. Most of these will be located in the Coastal Zone. This is part of the most recent governmental *leitmotif* for the development of the Mekong Delta, i.e. of becoming a "coastal and riverine agricultural region with multipolar (major cities) development hubs (Can Tho as the core municipality) and interconnecting municipal and infrastructural corridors" (Marchand et al. 2011: 45).

3.1.3 Current state of agriculture in the Mekong Delta

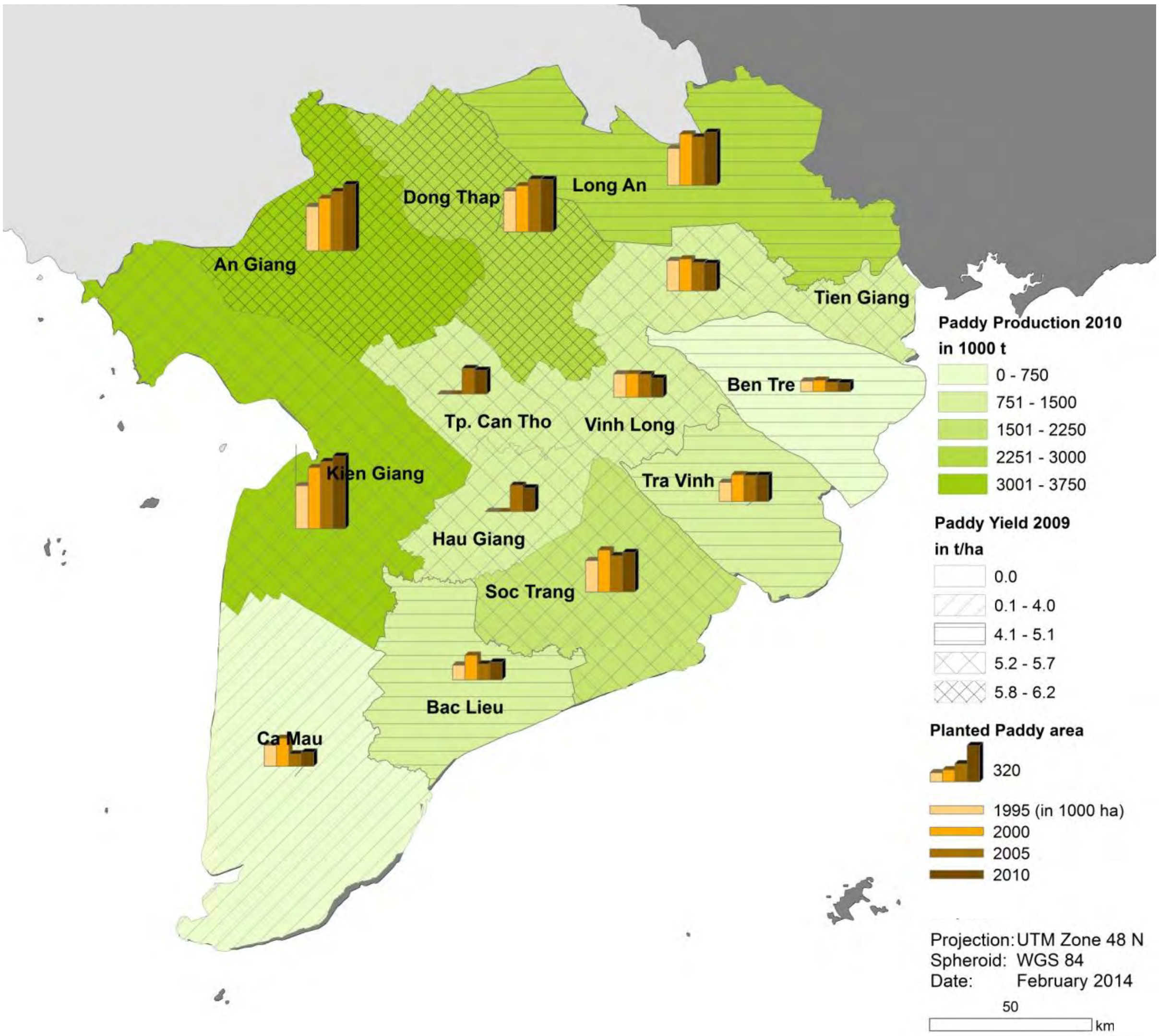
The previously depicted physiographic characteristics and the distinctive history of rural transformation have made the Mekong Delta to Vietnam's "rice bowl". More than one third of the gross agricultural output in 2010 (nearly 60 trillion VND – around 2.4 billion Euro[23]) was produced in this region (see graph in the lower right corner of Map 3.3).



Map 3.3: Agricultural output from 1995-2010 and paddy production in 2011 in Vietnam (Source: author, statistical data based on GSO 2012, administrative boundaries based on MOST 2010)

[23] At an average exchange rate of 2010 (25.400 VND per Euro).

Moreover, it achieved the highest return rate per ha in the whole country (100 million VND/ha) and average cereal production at 1,260 kg/capita was more than double the Vietnamese average. The Mekong Delta is of particular importance for Vietnam's rice production. More than half of the cultivated rice production area is located in the Delta (4 Mio ha in 2011), bringing an output of 23 Mio tonnes in 2011. This adds up to 90 % of Vietnam's rice exports. In terms of other agricultural commodities, the Mekong Delta also plays a central role. Around 20 % of its sugarcane (3.6 Mio tonnes in 2011) and more than 70 % of the farmed aquatic products are produced here (2 Mio tonnes in 2011) (GSO 2013a, 2012b).

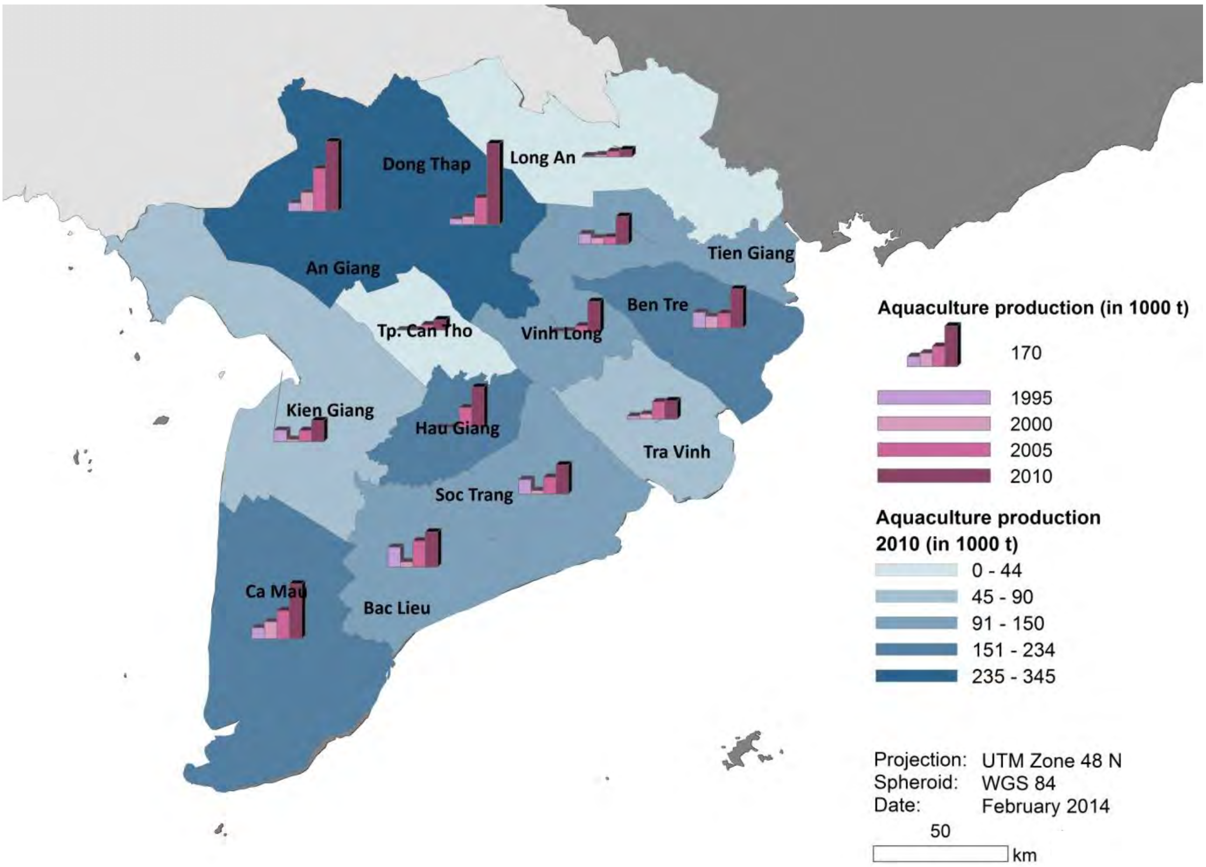


Map 3.4: Rice production in the Mekong Delta (Source: author, statistical data based on GSO 2012, administrative boundaries based on MOST 2010)[24]

The production structures often differed substantially between the Mekong Delta regions (the following numbers are based on GSO 2012). **Rice production** is, for instance, much higher in total outputs and productivity in the Northern Mekong Delta provinces and along the Northern Golf coast than in the Coastal Zone along the South China Sea. The Ca Mau Peninsula is the furthest behind mainly due to its more adverse agro-ecological setting (see section 3.1.1). Tra Vinh is in the lower

[24] The planted production area of Can Tho city and Hau Giang province were only considered for the years 2005 and 2010. Hau Giang province was part of Can Tho province before it became an independent administrative unit in 2004, when Can Tho received the status of a city. For this reason, there is no data available for these two provinces for the years prior to 2004.

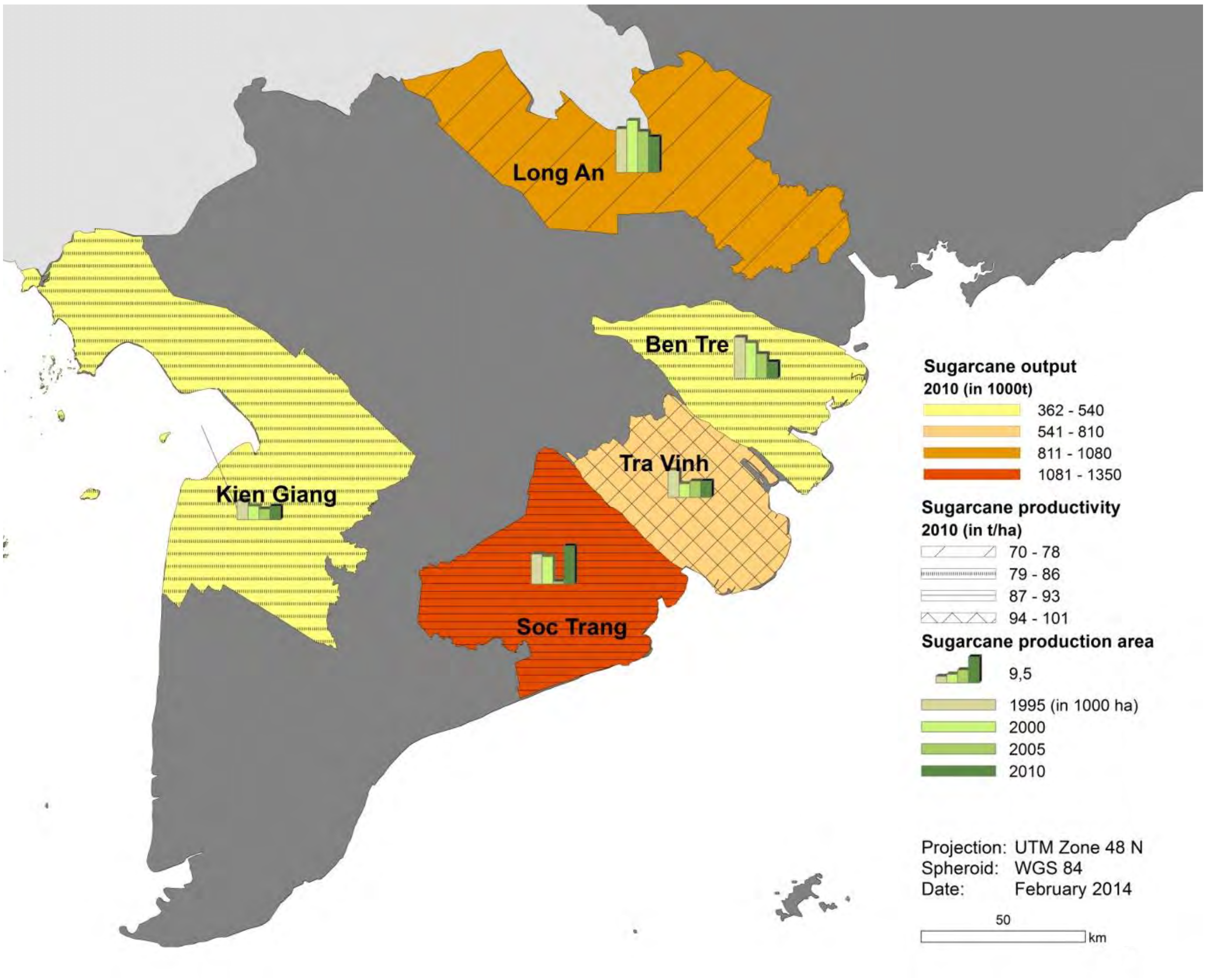
middle field with regard to the amount of paddy production (around 1 Mio t in 2010) and the size of production area (233,000 ha in 2010; see Map 3.4). The productivity is lower than the Mekong Delta average (5 t/ha compared with 5.5 t/ha; see Map 3.4). The production area in Tra Vinh province rose by 40% in the years after the large South Mang Thit dike was constructed but has stagnated since 2000. In the Northern Mekong Delta provinces, in contrast, the planted paddy production area has risen continuously for the last 20 years (see Map 3.4).



Map 3.5: Aquaculture production in the Mekong Delta (Source: author, statistical data based on GSO 2012, administrative boundaries based on MOST 2010) [25]

The diversification policies in the early 2000s were taken up in different ways, which is why the **aquacultural production** structure also differs substantially between the various Mekong Delta regions (the following numbers are based on GSO 2012). The Northern provinces, particularly An Giang and Dong Thap, have experienced the largest growth rate in the last 20 years. They are today the leading producers of aquaculture in the Delta. Among the coastal areas, Ca Mau province has made the most of the political changes and grasped its agro-ecological potential for producing aquaculture. The provinces in the Coastal Zone still seem to lack behind these provinces despite good natural prerequisites for aquaculture production. Tra Vinh province multiplied its aquacultural production by six between 1995 and 2005, but since then it has not increased much. Compared with the Dong Thap (345,000 t), An Giang (296,000 t), and Ca Mau provinces (234,000 t), the extent of output in Tra Vinh province is still limited (79,000 t in 2010; see Map 3.5).

[25] The aquaculture production of Can Tho city and Hau Giang province were only considered for the years 2005 and 2010 (see previous footnote for an explanation).



Map 3.6: Sugarcane production in the Mekong Delta (Source: author, statistical data based on GSO 2012, administrative boundaries based on MOST 2010)

Sugarcane production seems to have lost significance in the course of the hydraulic and political changes in the recent past (the following numbers are based on GSO 2012). In five Mekong Delta provinces, sugar cane has a relevant share of primary production. Most of these provinces are located in the Coastal Zone. In 2010, Soc Trang was the leading producer in terms of output (1.3 Mio t) and production area (14,000 ha). This is also the only province where sugarcane production still seems to be on the rise. Tra Vinh province, in contrast, registered a substantial decline in sugarcane production, most notably between 1995 and 2000 when rice production increased in reaction to the hydraulic developments (9,500 ha in 1995 compared with 5,300 ha in 2000). In recent years, the production size has been comparatively small (0.6 Mio t on 6,000 ha) but reveals the highest productivity of all the sugarcane-producing provinces (101 t/ha in 2010 compared with an average of 85 t/ha in 2010; see Map 3.6).

3.1.4 Development-related challenges and opportunities

Policy reforms, the increased market-orientation, technological changes and hydraulic infrastructure developments brought about not only economic gains and opportunities. They also induced manifold challenges for the Vietnamese Mekong Delta as a whole and for the research area in specific. In the following section the most relevant challenges and opportunities for the current research context will therefore be outlined.

The **market liberalisation and decollectivisation** initiated impressive economic growth accompanied by an improvement in the average living standard in the Mekong Delta (see section 3.1.2). Not all parts of society benefited equally from the economic reforms of Doi Moi, however. Some well-off "patronal" and "entrepreneurial" farmers, as Le Coq and Trebuil (2005) call them, have increasingly been opposed to poor and landless farmers. Despite the observed spill-over effects from successful large landowners to smaller farmers and landless households, the social differentiation has been continuously growing in the last decades (Le Coq, Trebuil 2005; Käkönen 2008: 210). Several empirical studies, such as the rural case study of Can Tho city by Le Coq and Trebuil (2005), showed that access to land is the major driver for this inequality. This was particularly true of the Mekong Delta. Here, land allocation led, according to Shank et al. (2004: 58f), to the highest proportion of farming households losing their land in the whole of Vietnam. Higher levels of market-based risk in combination with a high rise in land prices made land increasingly less retainable and accessible to the poorer households (Le Coq, Trebuil 2005). Lacking market information and access as well as pressures from international market prices constituted further reasons for precluding some parts of society from the economic benefits of liberalisation (Garschagen et al. 2012). Overall, market reforms have therefore led to a more uncertain, insecure and unstable livelihood basis. Coclanis and Stewart (2011) argue that especially rice production has therefore become "precarious work" where the risks burdened the workers rather than the government or private businesses. Furthermore, Vietnamese centralism is still pronounced and keeps tight control over production activities. The strict hierarchical planning and decision-making (which reflects the principles of the highly hierarchical nature of relationships in Vietnamese society) led to high inflexibility under highly dynamic market conditions. Beside the economic challenges which have arisen from this inflexibility, it has supported corruption and has hampered locally adapted policy measures (Garschagen et al. 2012; Waibel et al. 2012; Evers, Benedikter 2009).

The **hydraulic developments** have also brought about substantial changes (see section 3.1.2). The construction of an enormous system of protective and productive infrastructure has successfully reduced flood damages and allowed cropping in three seasons per year. Nevertheless, those economic benefits for some groups have been accompanied by losses for others. The poor and landless in particular, who have always relied on aquatic resources in the flooded rice fields, have lost an important source of livelihood (Birkmann et al. 2012; Vo Van Tuan 2013; Hashimoto 2001). Moreover, the protective infrastructure has increased the risk of flood damages in other regions, for instance in Cambodia (Käkönen 2008: 211; Le Thi Viet Hoa et al. 2007). Building dikes also raises the risk of disastrous damages in protected areas in the event of infrastructural failures (Le Thi Viet Hoa et al. 2007). In addition to these challenges, the environment has had to bear high costs for advancements in flood protection. The absence of flooding has, for instance, reduced soil fertility. Environmental degradation in combination with the intensification policies, accordingly, raised the need for artificial substitutes in form of agrochemicals substantially. This has turned out to be a burden both to the environment and to the financial situation of the farmers (Hashimoto 2001; Nguyen Duy Can et al. 2007: 91f). The massive salinity protection system has also led to serious shifts in the environmental conditions, challenging, for example, the whole brackish water ecosystem (Käkönen 2008: 210). At the international level, hydro-power developments in the Mekong riparian countries Cambodia, Laos and China arouse great attention. On the one hand, these developments have brought about economic gains to the upstream countries and have been an answer to the rising demand for energy in the region (including Vietnam); on the other hand, manifold challenges arose from the altered ecosystems, from a changed river flow and sedimentation, and from a loss of environmental services for rural areas in the Mekong Delta (Künzer et al. 2012).

The **agricultural development** process has also brought about a large range of opportunities and challenges. On the positive side, it has led to a public shift towards more sustainable development. The public policies have changed from a primary support of rice monocultures towards more rural diversification and a stronger acknowledgement of environmentally friendly production options (Käkönen 2008: 210f). The campaign ''Three Reductions and Three Gains'' in rice production promoted, for instance, a reduction of seeds, nitrogen fertiliser and pesticides to improve the health of farmers, to raise incomes, and to promote environmental protection (Huelgas et al. 2008). Despite these efforts, the agricultural development process has also brought about many challenges. It has been shown to reinforce the disparities arising from market liberalisation. Again, it has been mainly the poorest farmers who have not had a chance to benefit from the modernisation and intensification. They have not been able to afford the required investments in moto-mechanised machinery or agro-chemicals and they have not had enough land to realise the potential economies of scale (Käkönen 2008: 210). Moreover, decreased demand for off-farm labour due to mechanisation, in combination with a general lack of non-farm[26] employment, inhibited landless and land-poor farmers from generating off-farm[27] income (Le Coq, Trebuil 2005; Käkönen 2008: 210). The environmental consequences of agricultural intensification have also been substantial. Water quality has deteriorated in many regions due to the increased use of agrochemicals; and drainage and leaching to improve acid sulphate soils has led to widespread water acidification (Käkönen 2008: 210; Dang Kieu Nhan et al. 2007). Both developments have lead to a decrease in the stock of wild fish and have resulted in more water-related conflicts. Water demand has also risen substantially, especially due to increased irrigation for rice production in the dry season. An intensification of rice production in the upstream provinces has consequently led to a larger freshwater scarcity and increasing saline intrusion in the downstream coastal provinces (Dang Kieu Nhan et al. 2007).

As with most of the described changes, the **aquaculture boom** in the Mekong Delta has had not only positive consequences for the society and the environment. It has led to impressive economic gains for many farmers, on the one hand, but has also come at high costs, mainly for "others". These challenges have increasingly caught the attention of scientists (see for instance Pham Thi Anh et al. 2010; Dang Kieu Nhan et al. 2007; Taylor 2007: 9; Tran Thanh Be et al. 1999). According to Biggs et al. (2009), the resulting conflict potential is one of the largest problems which the primary sector has to face, including in the future. The decision for/against brackish water conditions carries substantial conflict potential. Farmers who want to produce shrimp and need brackish water conditions are opposed by households who want to cultivate crops and require freshwater (Dang Kieu Nhan et al. 2007). Further conflicts have arisen between upstream and downstream areas. Downstream areas have been the ones to bear the costs of flushing pond or cage effluents resulting from aquaculture production upstream (ibid.). Moreover, aquaculture production has not only brought about risks for "others" but has also come with many risks for the producers of aquaculture themselves. The high potential returns have been accompanied by high economic risks. Aquaculture production requires substantial capital investments which, in most cases, have to be covered by loans. Being dependent on highly fluctuating world market prices and being susceptible to diseases and climate-related hazards has therefore not only increased the risk of losing one's own capital but also of falling into increasing indebtedness. Furthermore, aquaculture production requires detailed production know-how and is highly sensitive to water pollution and diseases. Minimal know-how and experiences among aquaculture producers have often led to large production losses and an often larger level of indebtedness (Taylor 2007: 9).

Several of the current opportunities and challenges are related to the **general institutional and structural setting**. Many of the problems are linked to educational aspects. The Mekong Delta still has, despite its relatively good education infrastructure, low enrolment rates and there are still many illiterate people, especially among old people, poor people, women and Khmer (Garschagen et al. 2012; GSO 2013b). Despite a high prevalence of training classes, access to specific information is still relatively difficult and there is a mere focus on technology-oriented development. The capability of accessing new and advanced technologies are, however, still relatively low (Nguyen Duy Can et al. 2007: 91f). Moreover, there are still very few employment opportunities outside of agriculture so that most households are directly dependent on the natural resource base for gaining a living (Nguyen

[26] Employment outside of the agricultural sector.
[27] Employment outside of the own farm.

Duy Can et al. 2007: 91f). Knowledge and skills are also bound to agricultural activities and there are few people qualified for other non-farming activities (Hashimoto 2001). This takes on even larger importance when considering the fact that the demand for unskilled labour is likely to decrease whereas the demand for skilled labour will most probably increase in the light of current economic developments (Reddy 2011).

Another factor inhibiting sustainable development has often been related to the substantial structural inequalities, particularly between **ethnic minorities** and Kinh people (ethnic majority group in Vietnam). This is a problem most notably in the coastal provinces Soc Trang, Tra Vinh, Bac Lieu and Kien Giang, which have a high proportion of Khmer – the so called Khmer Krom[28]. Several empirical studies have shown that they tend to have lower education levels, less land and productive assets, lower income, fewer chances to obtain a stable employment, and weaker bonds to local officials and public decision-making (GSO 2013b; Truong Ngoc Thuy 2012; Nguyen Quang Tuyen 2011; AusAid 2004). These inequalities were acknowledged by the Vietnamese government but prevail despite several governmental programs to support ethnic minorities (Truong Ngoc Thuy 2012). A further structural disparity was observed between **rural and urban** areas. A poverty rate of 14.4 % in rural areas of Vietnam contrasts with a poverty rate of 3.9 % in urban areas (GSO 2013a). In combination with increased rural underemployment, rising competition over productive land and a rapid growth of employment opportunities in large southern cities led to **surging out-migration** from rural to urban areas, as assessed by several authors and statistical surveys (Huynh Truong Huy 2009a; 2009b; Anh Dang et al. 1997). In 2010, all Mekong Delta provinces revealed a negative net-migration rate (average of -8.4 ‰ per year). The highest outmigration was observed in Ca Mau (-27.4 ‰ per year); Tra Vinh had a comparatively low out-migration rate of only -4.1 ‰. Ho Chi Minh City had, in contrast, a net-migration rate of +18.3 ‰ and Binh Duong of +74.6 ‰ per year. These numbers fluctuate significantly from year to year (GSO 2013b). Environmentally induced migration also seems to play an increasing role in this regard. It was observed as a consequence of flooding (Dun 2011) and climate change-related hazards (Warner et al. 2010). Considering that it is mainly young people who move to the cities, the age structure in rural areas has changed significantly in the last years. It becomes a region where the old and the youngest stay behind; the people in their productive age move away.

Overall, the previous section has shown that rural areas in the Vietnamese Mekong Delta have undergone substantial changes in the recent past. It has been a transformation process that has been accompanied by a wide range of opportunities and challenges. An understanding of these aspects provides an essential foundation for grasping vulnerability patterns and risk-related response mechanisms in the research area. To complement this foundation, it is essential to take, as the next step, a closer look at the water-related hazards to which people are vulnerable and to which they respond.

3.2 Water-related hazards and climate change in the Mekong Delta

Water is not only at the centre of this research project but is at the centre of people's livelihoods in the entire Vietnamese Mekong Delta. It is means of transport, source of nutrition and income, and essential in daily domestic consumption. Nevertheless, water also has its reverse side. Here, riverine and tidal flooding, storm surges, water scarcity, water pollution and saline intrusion are among the most important water-related hazards for the population (Nguyen Huu Ninh 2007; Renaud, Künzer 2012; ADB 2009). These effects can deprive essential sources of income by destroying the harvest or means of production; can destroy houses and critical infrastructure like roads, embankments and canals; cause casualties due to epidemic diseases, drowning or serious accidents, with children

[28] The Khmer Krom is a group of indigenously Khmer people who live in the southern part of the Mekong Delta (Kampuchea Krom – lower Cambodia). This is a region which was part of Khmer Empire in the past (Pouvatchy 1986).

especially at risk (Nguyen Thi Hue 2007: 6). In the Coastal Zone, the area on which this research focuses, tidal flooding and saline intrusion have been shown to be the most decisive hazards for rural livelihoods. In order to grasp water-related risk and related practices in the research area, the following section examines these hazards more in depth. Considering that both these hazards are strongly influenced by riverine flooding in the North this water-related hazard will additionally be analysed in the next part.

3.2.1 Flooding and saline intrusion in the Mekong Delta

Riverine flooding belongs to the yearly cycle of life and is part of the Mekong Delta's very nature. Heavy rainfall between July and October coincide with the arrival of the total volume of floodwater from the upstream and inundate much of the Delta every wet season (Nguyen Thanh Binh 2010). In periods of high flooding a total area of up to 19,000 km^2 is affected (nearly 50% of the total area of the VMD), especially in the Plain of Reeds and Long Xuyen Quadrangle. These slow-onset floods might not have high discharge capacities; nevertheless they are responsible for deep inundation over a long period, cause river bank erosions, and determine tidal flood intensity in the coastal region. Since the beginning of the 20th century, water levels have exceeded a state of serious emergency (stage III of the official flood warning levels) eleven times. The flood in 2000 was one of the most severe floods in this period (Kazama et al. 2002). Since then, flood levels were relatively low, especially in the last couple of years. In the autumn of 2011 water levels were again alarmingly high. At the end of September 2011, for the first time since 2000, the Tien River exceeded the 4.5m mark causing a serious emergency situation. In addition to that, water levels remained high for a long period of time (MRC 2011, see Figure 3.1).

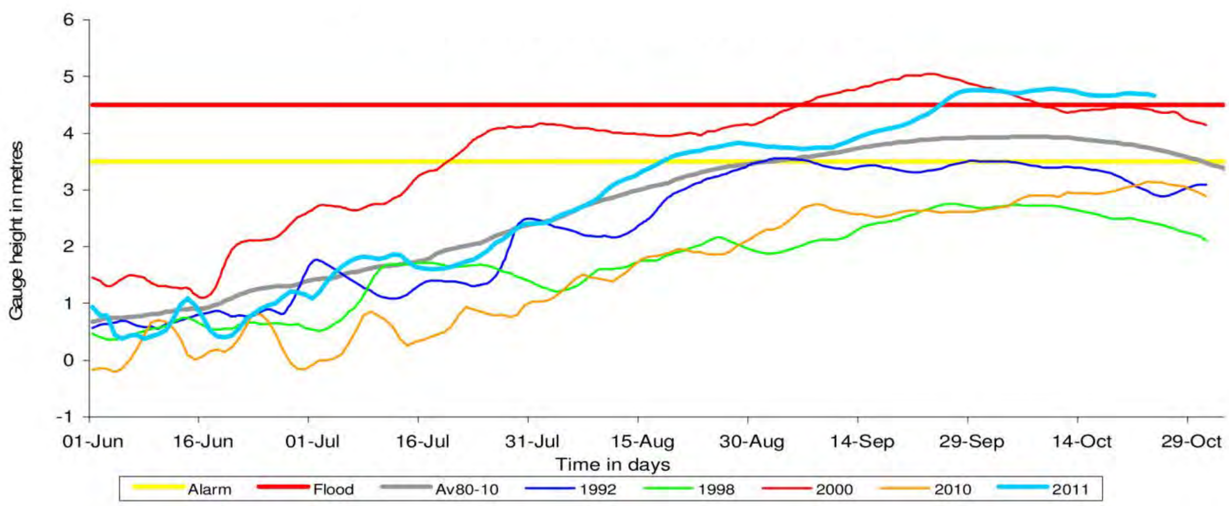


Figure 3.1: Gauge height at Tan Chau gauging station in selected flooding seasons between 1992 and 2011 (Source: MRC 2011)

The Coastal Zone and the Ca Mau Peninsula are affected by **tidal flooding**. An area of around 10,000 km^2 in the Mekong Delta experiences regular flooding caused by the tidal influences (Wassmann et al. 2004: 90; USAID 2013). In contrast to the Northern delta floods, flooding in the coastal areas is influenced not only by local rainfall patterns and the Mekong water regime, but also by tidal influences from the South China Sea and Gulf of Thailand (see section 3.1.1). Water levels are therefore at their highest when, firstly, high precipitation occurs locally; secondly, the Mekong river water levels are at a high level (September – November); thirdly, in times of spring tide; and fourthly, when spring tide is reinforced by the Gio Chuong, a South-Western wind from the South China Sea (December-January) (Hashimoto 2001: 8; Le Anh Tuan et al. 2007: 40). Peak tides occur therefore generally between October and March. In this period, the tides sometimes fluctuate by more than 4 metres. The spring tide arrives rapidly within only a few hours once (at the Gulf of Thailand coast) or twice (at the South China Sea coast where Tra Cu district is located) a day in a biweekly rhythm (USAID 2013). In 2011 the water levels were higher than in most other years due to high rainfall and the exceptional floods upstream along the Mekong River.

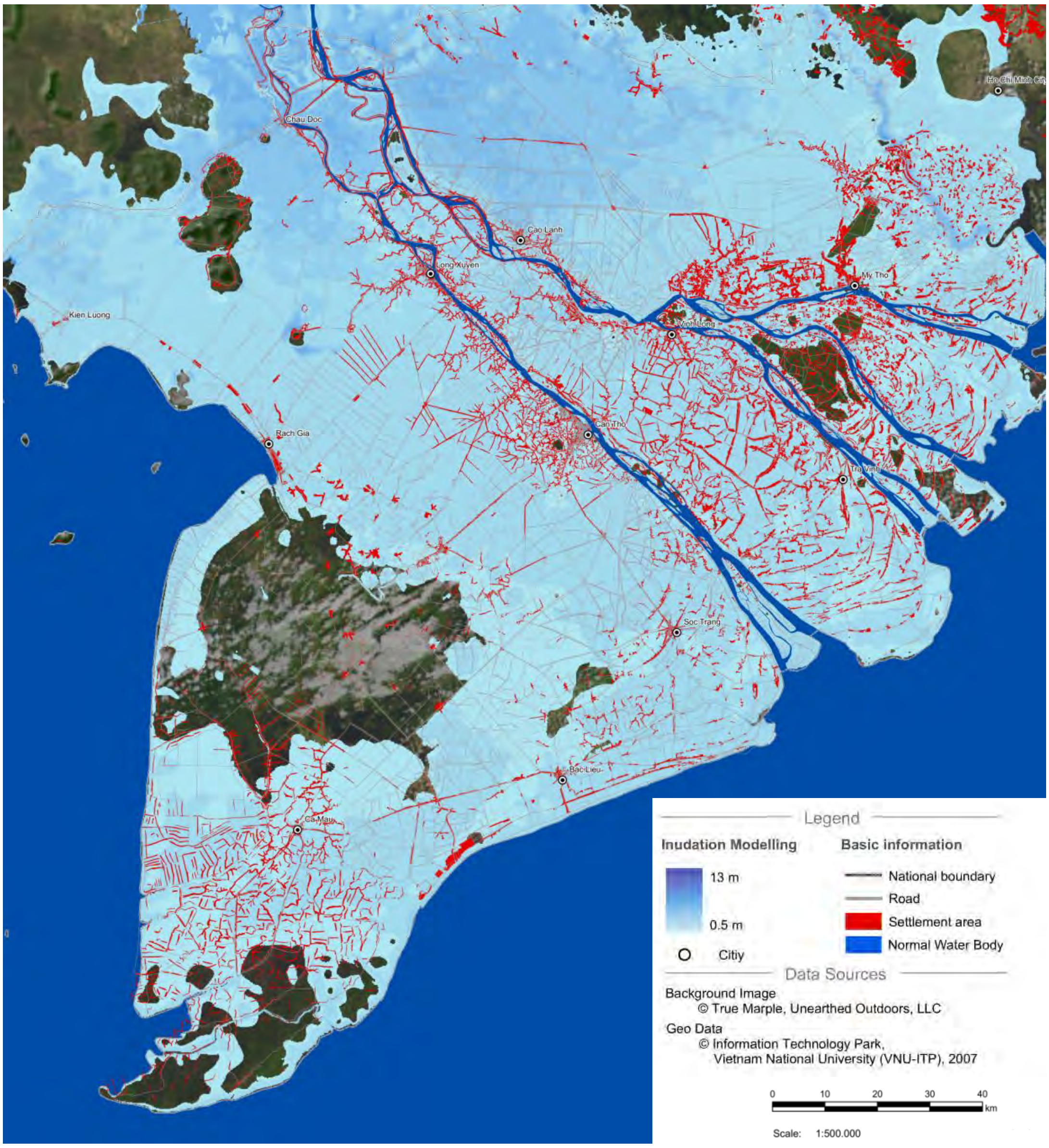
The tidal regimes also determine **saline intrusion**. The strength and amplitude of tides in combination with local rainfall and freshwater discharge, the slope of the river bed, the depth of the estuary, the wind direction and velocity, as well as the presence of control structures such as sluice gates, define the intensity and timing of saline intrusion. In times of low river water discharge from upstream, saline sea water flows as far as 80 km inland reaching Central Mekong Delta regions such as Can Tho (most intensely from February to May). The dense network of canals also allows an intrusion of seawater into areas further away from the main channels and Mekong distributaries (Hashimoto 2001: 8; Le Anh Tuan et al. 2007: 40). Long-term changes in the level of saline intrusion were merely minor in recent decades; only the duration increased since 1980 (Tin and Ghassemi 1999, in Hashimoto 2001: 27). Saline water intrusion also determines the soils in the coastal areas (Lang et al. 2004). As outlined in section 3.1.1, saline or saline acid sulphate soils of varying intensity dominate in this region.

3.2.2 Water-related hazards in the light of climate change

The Vietnamese Mekong Delta is a global hot spot for climate change. This is why it is so important to take a future outlook on the major water-related hazards. The climate change scenarios of the Ministry for Environment and Natural Resources (MONRE 2012) predict an increase in rainfall for Southern Vietnam until 2100 in the rainy season, particularly between September and November (around 9 % in Tra Vinh compared to around 15 % in the Northern delta provinces in the B2 medium emission scenario[29]) and a decrease in the dry season especially between December and February (11 % in Tra Vinh province compared to 15 % on the Ca Mau peninsula in the B2 scenario). The yearly temperature is predicted to increase by around 2 °C. The largest temperature increase is expected to occur between June and September. In this regard, Ca Mau peninsula is predicted to experience the most substantial change of up to 3.1 °C (Tra Vinh: +2.7 °C). The smallest temperature increase will supposedly be in the Northern provinces. The most serious threat for the Mekong Delta arises from sea level rise. The Ministry of Natural Resources and Environment (MONRE 2012) assumes an increase of 59 to 82 cm until 2100 (B2 scenario); in the high emission scenario an even larger rise of 70-105 cm is predicted. The Gulf of Thailand coast is predicted to experience the largest rise in the whole of Vietnam.

Sea level rise in particular will have a substantial influence on the Delta. A sea level rise of 75 centimetres is expected to pose a threat of inundation to 15.8 % of the land surface in the Vietnamese Mekong Delta according to the Vietnam Institute of Meteorology, Hydrology and Environment (IMHEN 2008). The updated sea level rise scenarios of the Ministry of Natural Resources and Environment (MONRE 2012) even project that such a sea level rise would inundate 21.5% of the Delta. A rise of one metre is expected to inundate nearly the entire Ca Mau peninsula, large parts of the Coastal Zone, and much of the land surface in the North-Eastern delta (in total 39% or the whole VMD) according to the scenarios of MONRE (2012). Carew-Reid (2008) assumes, in contrast, that not the Ca Mau Peninsula but the Coastal Zone is by far the most affected by sea level rise. Ben Tre and Tra Vinh provinces are expected to experience the largest share of inundated province area in the whole of Vietnam (50.1% respectively 45.7%).

[29] The scenarios always refer to the average of the period 1980-1999.



Explanation: The map shows the maximum extension of seasonal flooding under a 45cm sea level rise scenario. The large flood in 2000 was the baseline for the 1D hydraulic model.

Map 3.7: Seasonal flooding under the assumption of a 45cm sea level rise (GFZ 2010)

Sea level rise and changes in temperature and precipitation will affect **flood and salinity hazard patterns** in the Delta. Calculations by USAID (2013: 100) for the year 2050 show that large parts of the Delta (around 19%) which have historically never or only rarely been flooded will be confronted with flooding depths of 0.5 to 1.0 meters during an average flood year. A flood model by the GFZ (2010) predicts that a flood to the extent of the 2000 flood would inundate nearly the entire Delta in the event of a 45cm sea level rise (see Map 3.7). Tra Vinh would, in this case, be fully inundated. In addition, the flood duration is projected to increase. It is, for instance, assumed that the area affected by flooding with a depth of more than 0.5 m for longer than 121 days will increase from 75,000 ha to nearly one million ha (USAID 2013: 100). Moreover, saline intrusion will increase. Sea level rise in combination with less rainfall and higher temperatures in the dry season will most likely increase the area affected by salinity. In the course of a continuously landward-progressing 4 g/l salinity isohaline (critical threshold for production, see sections 3.2.3 for more details), there will likely be more and more areas, especially in the central plains which will have to experience raising salinity levels. Carew-Reid (2008) predicts in this context an increase in the agricultural area affected by salinity concentrations of more than 4 g/l by nearly 45% until 2030 to a total of 640,200 ha. In addition, the duration of salinity concentrations of more than 4 g/l will become longer, particularly in the coastal provinces Soc Trang and Ben Tre. According to these figures, Tra Cu district in Tra Vinh province (i.e. the research area) will also have to deal with an increase in the duration of up to 2 % (USAID 2013: 101). According to a study by To Quang Toan et al. (2010), upstream hydropower development will not have an additional impact on salinity intrusion in the VMD in normal years but it will have a notable impact in drought years, especially along the Hau River.

Besides pointing out the substantial relevance of addressing the dimensions and impacts of climate change, these data (in particular the discrepancies between different sources) indicate that there are substantial **uncertainties involved** in the projections. The existing scenarios have been critiqued for being based on simplistic models which merely overlay the predicted sea level rise with existing topographic maps. The MONRE scenarios, for instance, did not include the effects of waves, tides, storms, floods or other hydrological mechanisms in their inundation maps (MONRE 2012: 22). Moreover, the MONRE predictions act on the assumption of static human and physical conditions as they are merely based on statistics about the present status quo (Garschagen 2013: 80). The same holds true for the predictions of Carew-Reid, USAID and IMHEN (Carew-Reid 2008; IMHEN 2008). These drawbacks significantly challenge reliable and solid adaptation decision-making, particularly against the background of a strong public belief in those scenarios and an ensuing policy alignment (Garschagen 2013). It is therefore important to acknowledge the uncertainties, integrate climate and socio-economic scenarios, and ensure flexible adaptation decision-making.

3.2.3 Past and expected future impacts of water-related hazards on rural livelihoods

Flooding and saline intrusion have manifold and significant impacts on the Mekong Delta. These impacts shape the society and economy in both positive and negative ways. On the positive side, there are so called **"beautiful" flood** years where flooding occurs but flood levels do neither exceed alarming levels nor remain lower than required for gaining a livelihood (Nguyen Huu Ninh 2007). In these years floods supply fresh water and natural fertiliser for agricultural activities, help flushing out accumulated toxins in the soil, and increase fish resources. Moreover, they improve access to fresh water for domestic use and improve navigation and transport (Nguyen Huu Ninh 2007: 6; Hashimoto 2001; Le Anh Tuan et al. 2007: 41). These are all benefits that are significantly reduced when flood levels are lower than normal. In recent years much of the positive effect of floods did not materialise for exactly this reason.

Similarly, **salinity** has **benefits** to the social-ecological system of the Mekong Delta. It is the basis for highly valuable ecosystems. The Vietnamese Mekong Delta possesses, for instance, the largest wetland forest in the whole Mekong region which is rich in biodiversity and provides a multitude of ecosystem services (Le Anh Tuan et al. 2007: 41). Mangroves, for example, provide services such as the protection against storm damages and erosion (USAID 2013: 188). Furthermore, saline water conditions are an important prerequisite for making a living. In particular, the rise of aquaculture in the coastal areas highlights the significance of brackish water environments for sustaining local livelihoods and generating substantive revenues (see section 3.1.2). A study by To Phuc Tuong et al. (2003) showed, amongst other things, that it was the poorest who suffered most from salinity control as the fishery resources, their primary livelihood basis, declined substantially. Saline intrusion also has a positive effect on soil quality. It reduces acidity in potential acid sulphate soils, a major limiting factor for agricultural productivity in some coastal regions (see section 3.1.1). A case study in Ca Mau Province by Thang Nam Do et al. (2005) found, for example, that fisheries, aquaculture, timber, fuel wood, Nypa palms[30] and medicinal plants have an average value of more than VND 7.5 million

[30] Nypa palms are plants which grow in a mangrove biome and provide multiple services to the people in the Mekong Delta. The leaves are used to build the roofs or walls of thatched houses and the pulp is basis for making juice, sugar or alcohol (Thang Nam Do, Bennett 2005).

(around 380 Euro[31]) per ha per year. Aquaculture amounts for 48 per cent of total direct use values. The implementation of a high number of sluice gates and prolonged closure times at many gates has seriously threatened the provision of salinity-related environmental services.

Nevertheless, flooding and salinity are better known for their more threatening side. This is particularly visible when looking at the effects on agricultural production - the most important source of livelihood for people in the Mekong Delta. In years of high water levels, **flooding** causes substantive production losses. Although agricultural production areas have increasingly been protected from floods by dikes (see section 3.1.2), high water levels still pose a serious threat to crop production. The feeling of protection, combined with the public promotion of rice, has led to an increasing number of people cultivating rice and other crops in the flooding season. This has led to substantial losses in case of dikes breakages. Moreover, the intensification policy and agricultural advancements have induced a rise of high yielding but also more flood-sensitive rice varieties. During the floods of 2011, 24,000 ha of rice were damaged, of which 11,000 ha were totally destroyed. This caused an estimated economic loss of 250 billion VND (ca. 8.7 million Euro[32]) in the Mekong Delta (CFSC 2011). Most affected were the Northern provinces. In the coastal areas severe losses were mostly experienced due to tidal flooding (yet reinforced by riverine flooding). They did not only bring about crop damages due the state of being submerged but also due to the saline nature of the water in the fields. In 2013, high tides damaged, for instance, 60 dikes and submerged thousands of hectares of fruits and other crops in Tra Vinh province (VNN 2013).

Moreover, **saline intrusion** has serious implications for agricultural production. Most crops, especially rice, can tolerate saline irrigation water and soil conditions to only a small degree. Four grams per litre is often described as the critical threshold for crop production (Le Anh Tuan et al. 2007: 41; Tran Duc Thanh, Pham Van Luong 2000). Beyond this point, rice production is no longer possible (except for some more saline-resistant varieties); more saline-tolerant crops such as sugarcane and corn are substantially inhibited in their growth (NSW - DPI 2006; Omani 2005). A further point to consider is the duration and timing of saline intrusion. The earlier saline water intrudes within the production phase and the longer the saline water stays in the field, the more detrimental the impact on plant growth (Dang Kieu Nhan et al. 2012). Despite major developments in saline protection infrastructure agricultural production in particular still carries a high risk of salinisation. According to the Ministry of Agriculture and Rural Development (MARD 2011, in Dang Kieu Nhan et al. 2012) 100,000 ha out of 650,000 ha of rice production in the lower delta region are still at high risk of dry season saline intrusion.

In addition to agriculture, tidal flooding and saline intrusion have serious **implications for other aspects of life**. They cause, for instance, infrastructure-related costs. Floods submerge infrastructure and saline water leads to the increased corrosion of metal materials. This does not only cause maintenance and reparation costs but also hampers transportation, trade and communication because roads are often impassable for long periods (Hashimoto 2001). Moreover, saline intrusion severely limits the use of canal water for domestic and industrial purposes (Le Anh Tuan et al. 2007: 42). Epidemic diseases like dengue fever, diarrhea or malaria occur more frequently during severe floods and affect human health more adversely than in other seasons of the year (Nguyen Huu Ninh 2007: 6).

There has been a range of studies dealing with the expected **impacts of climate change** on Vietnam and the Mekong Delta (USAID 2013; IFAD 2011; Gebretsadik et al. 2012; World Bank 2010; MONRE 2009a). All studies agree on the fact that the predicted changes in climate will have a detrimental effect on rural livelihoods. The agricultural sector is most substantially affected by climate change, according to the MONRE (MONRE 2009a). The ministry assumes a reduction in the value added by

[31] At an average exchange rate of the year 2005.
[32] At an average exchange rate of 2011.

nearly six percent until 2050 in the whole of Vietnam, whereby the Mekong Delta will be most severely affected. The other sectors are estimated to improve their value added. The changes in flooding and salinisation are important drivers of these impacts. Changes in flood inundation depth, duration and frequency are major factors that reduce both the production area and the crop yields in the Mekong Delta. According to a study by the World Bank (2010a: 19), inundation in the flooding season in the event of a sea level rise of 30 cm by 2050 would lead to the loss of 193,000 ha of the whole rice production area in the VMD (without adaptation). Moreover, large rainfall intensity and unexpected flooding would temporarily (from a few days to several weeks) reduce the saline concentration of seawater which is expected to lead to the dying of dual crust molluscs (bivalvia) such as clams and oysters. These are important sources of livelihood in the coastal areas of the VMD, especially for the poor. In addition to this, sea level rise is expected to decimate mangrove forests in coastal areas. This will most likely affect the provision of ecosystem services in an adverse way (e.g. the commercial and domestic use of wood and fish resources, or the improvement of soil quality for agricultural production). Besides the impacts on agriculture and ecosystem services, the changes in flooding will also increase the impact on infrastructure, water availability for domestic and industrial usages, and human health (MONRE 2009a; World Bank 2010a). Furthermore, a rise in saline water conditions would decrease the areas of freshwater aquaculture in the coastal areas of the Mekong Delta. In addition to this, progressing saline soils and saline irrigation water is expected to reduce the land available for crop cultivation and diminish agricultural productivity in vast areas of the delta. The World Bank (2010a: 19) estimates that, without adaptation, around 70% of the agricultural production area in the Mekong Delta would be impacted by salinity of more than 4 g/l in the dry season. This would lead to a loss of 294,000 ha of rice production (World Bank 2010a: xiv).

3.3 Vulnerabilities to water-related hazards and related response mechanisms

The previous section has shown that flooding and saline intrusion are of central importance, especially for coastal areas in the Mekong Delta. In combination with an understanding of the nature and changes of rural livelihoods (see section 3.1), it provides a pertinent starting point for approaching vulnerability patterns as well as risk-related response mechanisms – i.e. the focal points of this research project. The following section will, firstly, present the central findings of the reviewed region-specific literature on vulnerability. Subsequently, the related transforming political structures will be outlined. Then, before taking a look at the risk-related response mechanisms, the region-specific studies in the context of individual risk perception will be introduced. Finally, both the assessments and evaluations of government and household response mechanisms will be outlined. This provides a pertinent entry point for developing a more specific research concept, acts as a basis of comparison and validation for the empirical findings of this research project; puts them into relation with other regions; and allows drawing conclusions relevant to the whole Mekong Delta region and beyond.

3.3.1 Vulnerability of rural households to water-related hazards and climatic changes

In line with the rising acknowledgement of vulnerability in the theoretical and conceptual debate (see section 2.1), scientists and practitioners concerned with the Vietnamese context also increasingly looked at vulnerability towards natural hazards and climate change. It has been shown that Vietnam (most notably the Mekong Delta) is not only exposed to natural hazards such as flooding and saline intrusion (see e.g. Carew-Reid 2008; Miller 2003; ADB 2009), but that social and natural elements are also highly sensitive to these hazards (see e.g. Adger 1998; AusAid 2004). Moreover, the literature revealed that the means to adapt and cope with the impacts of these hazards are only limited (see e.g. Birkmann 2011a; Fortier 2010). The increasing acknowledgement of climate change gave rise to a further influential line of research, i.e. climate change-related vulnerability and adaptation research.

An important body of literature concerned with vulnerability emerged by the end of the 1990s. Neil Adger and Mick Kelly were the most prominent scholars in this context (see e.g. Adger 1996, 1998; Adger et al. 2001; Sneddon, Nguyen Thanh Binh 2001). They focused on individual and collective vulnerability to natural hazards in the light of economic, political and climatic change in Northern Vietnam. Although their regional focus was not on the Mekong Delta, several of their findings are of relevance to the Delta. Their empirical results show that poverty, levels of inequality, and institutional characteristics were the most relevant vulnerability indicators and that they could be both improved and deteriorated by social, political and economic transition (Adger 1996). Adger and his colleagues, moreover, claim that it is mainly resource availability and individual entitlements to access these assets that determine socio-economic and institutional capacities to respond (Kelly, Adger 2000; Adger 1998). They therefore see poverty reduction, risk-spreading through income diversification, respecting common property management rights, and promoting collective security as the basis for decreasing the vulnerability of the people in Vietnam (Kelly, Adger 2000). Other vulnerability-related research took a livelihood perspective (Trap 2006; SEA Start 2009). SEA Start[33], for instance, assessed the climate change-related vulnerability of different sectors in a case study approach. At the pilot example of the Mekong Delta province of An Giang in the Long Xuyen Triangle, they show that rice production will be exposed to less rain in the dry season and to more flooding in the rainy season. They also reveal that there existed a high susceptibility to climate-related hazards, mainly due to the characteristics of the produced crop. Moreover, SEA Start (2009) argues that the coping capacity of the local population included, most importantly, pumping more water, building closed dikes and using additional chemical fertilisers.

Most recently, vulnerability to natural hazards has been addressed by scholars of the WISDOM[34] project (Birkmann 2011a; Birkmann et al. 2012). They analysed vulnerabilities in urban (Garschagen 2013) and rural contexts (Vo Van Tuan 2013; Nguyen Thanh Binh 2010) in the light of riverine flooding in the Plain of Reeds (Vo Van Tuan 2013), tidal flooding in the Central Plains (Garschagen et al. 2011) and salinisation in the Coastal Zone (Nguyen Thanh Binh 2010). Extensive empirical research provided the basis for assessments of vulnerability. The conducted studies reveal the multifaceted, dynamic, local and hazard-specific nature of vulnerability to water-related hazards in the Mekong Delta. In the rural context, Vo Van Tuan (2013) identified seven main drivers of flood vulnerability in Dong Thap province, i.e. (1) access to agricultural land, (2) access to residential land, (3) type of house, (4) endowment with household assets, (5) demographic composition of households, (6) access to remittances and (7) income dependency. Nguyen Thanh Binh (2010), using the example of Tra Cu district in Tra Vinh province[35], shows that the interviewed households were highly exposed and susceptible to saline intrusion, tidal flooding and freshwater scarcity; the adaptive capacity was lowest among poor and Khmer households. He also argues that even if those groups moved out of poverty, natural hazards often made them return to poverty. Moreover, the group of researchers argue that the focus on mere exposure reduction is often misleading because it can result in adverse secondary effects leading to second-order adaptation (see section 2.1.2), e.g. in the case of common policies such as resettlement or dike building. It is pointed out that coping and adaptation processes are not only manifold and context-specific but that they are decisive drivers for vulnerability towards water-related risks (Birkmann 2011a; Vo Van Tuan 2013; Nguyen Thanh Binh 2010). A more in-depth analysis of risk-related response mechanisms was therefore identified as essential future research need, also within the WISDOM project.

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[33] Southeast Asia - System for Analysis, Research and Training (SEA Start) is one of five international StART research networks which support multidisciplinary research.

[34] This research is also conducted as part of the WISDOM project. It is a German-Vietnamese research initiative to build up a **W**ater-related **I**nformation system for a **S**ustainable **D**evelopment **O**f the **M**ekong Delta (WISDOM).

[35] This PhD work has continued the research undertaken by Nguyen Thanh Binh and moved from vulnerability assessments towards a stronger focus on risk-related strategies.

Only recently, the process of compiling a "Viet Nam Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation" (IMHEN, NISTPASS 2013) along the lines of the IPCC SREX report (IPCC 2012) was brought forward by several Vietnamese state and research institutions (i.e. Vietnam Institute of Meteorology, Hydrology and Environment; National Institute for Science and Technology Policy and Strategy Studies, Vietnam National University, Can Tho University, Hanoi Water Resource University, Centre for Natural Resources and Environmental Studies). This endeavour emphasises the increasing interest of research and policy in natural disaster risks in the light of climate change and the orientation towards international processes in the field of climate change.

A further strand of literature originates from the work of several NGOs and international organisations who have taken a vulnerability-centred view on water-related hazards and climate change (USAID 2013; ADPC, FAO 2003). The Asian Disaster Preparedness Centre and the Food and Agriculture Organisation (ADPC, FAO 2003), for example, took a closer look at the role of local institutions in reducing vulnerability to natural disasters. The study was undertaken in the Central provinces of Vietnam but its results in many aspects also apply to the Mekong Delta. The research bases its institutional implications on the Vietnamese transformation process. It shows, for instance, that the community responsibility for the maintenance of dikes continuously decreased in the previous decades. This significantly increased susceptibility to flooding and saline intrusion because of the often critical state of dikes. Changing the crop calendar, in contrast, substantially reduced susceptibility to flooding. The continuous improvement in housing structure has reduced susceptibility, but has at the same time escalated the losses and the costs of reparation. Overall, the report demands a shift away from centralised planning towards more community-based approaches in disaster risk reduction. This includes the implementation of more effective information, early warning and planning systems, an improvement in local storage facilities, small scale community infrastructure such as the stabilisation of riverbanks, and the provision of disaster management training and equipment.

3.3.2 Transforming political structures and processes in the context of flooding, salinity and climate change

The vulnerability patterns and risk-related strategies in the research area are also determined by the Vietnam-specific institutional framework in the context of water-related risks. It sets legal requirements, defines responsibilities, and determines incentives and barriers to adaptation/coping. In the following paragraphs, the most important transforming political structures and processes in the context of flooding and salinity will therefore be outlined.

The legal and regulatory framework has been set by several policies in the context of water-related hazards drafted and implemented in recent decades. The Ministry for Agriculture and Rural Development (MARD) takes the lead when it comes to protecting agriculture and rural livelihoods from these hazards and strengthening the capacities to respond. Its actions are based on policies such as the Ordinance on Dikes (1989), the Water Resources Law (1998), the Ordinance on Exploitation and Protection of Irrigation Infrastructure (2001), and the Law on Dikes (2006) (Nguyen Thi Phuong Loan 2013; AIPA 2012; Chu Tran Dao 2008: 12). Within the MARD, the Department of Irrigation Management, the Department of Science, Technology and Environment, and the Department for Dikes, Flood and Storm Management take most of the responsibilities in terms of flood and salinity management. At the lower level, the MARD is represented by: the Departments for Agriculture and Rural Development (DARD) at the province level and by the Offices of Agriculture and Rural Development (OARD) at the district level. All of them are, at an executive level, subordinate to the National Government and the People's Committees (PC) and People's Council (PPC) at the provincial, district and communal level. Moreover, so-called State Inspectorates are in place. They are responsible for legal violations at the provincial and district levels (Nguyen Thi Phuong Loan 2013).

The mass organisations also have their share in public risk management. They are so-called "socio-political organisations" (Norlund 2007: 10) which operate semi-independently from the state and represent the interests of their target group. In this function, they are also responsible for granting support in times of crisis and help to be better adapted in future. The most notable mass organisations in the context of water-related risks in rural areas are the Women's Union, the Farmers' Association and the Fatherlands Front[36]. The most decisive institutions related to Natural Disaster Risk Management in the context of floods and storms are: the Committee for Search and Rescue (CSR) and the Committee for Flood and Storm Control (CFSC). Both are in charge of taking action in the case of flash floods, flooding, tidal flooding, tropical depressions, tornadoes and landslides (GoV March 1993: 8). The committees are represented at the national, provincial, district and communal level. The CFSC includes representatives of all major ministries/departments, the respective PC and the relevant mass organisations. Their actions are based on the Ordinance on Flood and Storm Control (1993), the Water-related Disaster Control Strategy (1994), and the National Strategy on Natural Disaster Prevention, Control and Mitigation by 2020 (2007). Currently, a possible change in the laws is being discussed in terms of disaster prevention and control.

The national government also acknowledged the importance of climate change. It approved the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol in 2002. The Ministry for Natural Resources and Environment (MONRE) takes the lead in planning, coordinating and implementing climate change-related measures. It published a National Target Program to Respond to Climate Change (NTP-RCC) in 2008 (MONRE July 2008). Being coordinated by the MONRE, it is not surprising that the largest share of the funding was allocated to environmental policies. Mitigation played an only minor role and received as little as two percent of the resources. Only eight percent of the funding went to provincial or district levels (Fortier 2010). From these funds, each province in Vietnam has to establish a Provincial Climate Change Action Plan (PCCAP) which identifies and prioritises climate change adaptation actions (AusAid, Oxfam 2012). Tra Vinh province, for instance, established such a plan in 2012. The guidelines of the target program also have to be taken up by other ministries. The MARD, for instance, compiled an Action Plan Framework for Adaptation to Climate Change in the Agriculture and Rural Development Sector for 2008–2020 in the year 2008 (MARD September 2008). By the end of 2011, the Prime Minister approved the National Plan on Climate Change; and at the beginning of 2012, a National Committee on Climate Change was established (GoV December 2011; Truong Duc Tri 2012).

Despite the efforts taken, the institutional set-up received quite some critique in recent years (see e.g. AusAid, Oxfam 2012; Nguyen Trung Thang 2011; Fortier 2010). It is commonly critiqued that: (1) most of the plans are not comprehensive or legally binding, yet; (2) capacity building is widely insufficient at the regional and local level; (3) the participation of local stakeholders is inadequate; (4) the assessment structures with regard to local conditions are relatively one-dimensional; (5) there is little know-how and actual implementation of mainstreaming policies in terms of CCA; (6) there is little attention given to community-based disaster risk management; and (7) the coordination between the different ministries and institutions is deficient.

3.3.3 Perception of risks

A further focus of this research lies on decision-making processes. To gain an understanding of why certain risk-related response mechanisms are taken, the conceptual discussion of this thesis has already shown that it is important to take a look at the individual perception of risk (see section 2.2). The following section will therefore present the findings of the region-specific literature undertaken in the context of risk perception.

[36] The Fatherlands Front is a coordinating umbrella organisation for another 29 mass organisations but is often regarded as mass organisation itself (Norlund 2007: 10).

There has been a range of studies in the Vietnamese and Mekong Delta context which assessed risk perception, particularly with regard to climate change (Hoa Le Dang et al. 2014; Hoa Le Dang et al. 2013; Lebel et al. 2013; Le Thanh Sang 2010; Völker et al. 2011; Abery et al. 2009). These scholarly works acknowledge that it is not only the hazard, vulnerability patterns, transforming structures or potential impacts which shape the motivation to take actions but that it is rather the way in which these aspects are perceived at an individual level.

A quantitative study by Le Thanh Sang (2010), undertaken in the Vietnamese Mekong Delta, aims to reveal the socio-economic differences in the perception of climate change. Le Thanh Sang argues that there is only minimal awareness and alarm in terms of climate change, most notably among the people younger than 34 and among people living in rural areas. One of the most striking differences was found between Kinh people (ethnic majority in Vietnam) and ethnic minorities. While only about 45% of the Kinh people have never heard about climate change, there are around 72% of the minorities who were not aware of it.

A qualitative study by Hoa Le Dang et al. (2014) goes beyond the mere assessment of the threat perception and includes also perceived adaptation efficacy and perceived adaptation cost in the assessment. The study builds on the previously outline protection motivation theory (Rogers 1975, Grothmann, Patt 2005; see section 2.2). Hoa Le Dang et al. (2014) found that farmers were more likely to apply strategies which were attached to a high perceived self-efficacy and low adaptation cost (in particular paying attention to disaster warning information, saving water and buying insurance) than strategies which were attached to low perceived self-efficacy and high adaptation costs (in particular changing from rice farming to non-farm activities or livestock and vice versa).

Much of these disparities seem to be related to the overall level of education and the sources and quality of risk-specific information. Le Thanh Sang (2010) shows that the higher the general education, the higher the awareness of climate change. Lebel and his colleagues (2006; 2008) point out that the communication of risks was one of the most crucial aspects when seeking successful adaptation and coping in times of crisis. The most important medium to convey climate change-related information was, according to Le Thanh Sang, television (97 % of people got their information from this source). Hoa Le Dang et al. (2014) found, in contrast, that the information provided by the media did not much influence households risk perception. The most influential source of information has been shown to be the informal communication with friends, relatives and neighbours because they were perceived to be more easily accessible and trustworthy (ibid.: 397).

The MARD seems to have acknowledged the importance of awareness-raising and developed a program to raise the awareness on disaster risk reduction. It focused on self-assessments of the individual situation for more informed decision-making. In this regard, movies, radio programs, child-oriented education material and illustrative posters and pamphlets were developed. In addition, NGOs increasingly picked up awareness raising programs. Oxfam, Red Cross and several Vietnamese NGOs included it, for instance, in their training programs (World Bank 2011). The effectiveness of these approaches has rarely been assessed, however.

Overall, these studies do not assess how actors perceive adaptation options and only implicitly address the implications of risk perception for the decision-making process at both governmental and household level. These are aspects which have been identified as crucial in order to strengthen the implementation of sustainable adaptation measures, however (see section 2.3).

3.3.4 Coping and adaptation in an arena fraught with flood and salinity risks

The previous sections have outlined the most relevant findings in the context of water-related risks and vulnerability in the Mekong Delta. This provides pertinent background knowledge for reviewing what has been found with regard to the strategies applied as a response to these risks. The following sections will outline the most relevant findings related to governmental and household-level response mechanism.

Governmental measures in the context of flood and salinity risk

At the government level, a large range of measures was taken in the context of flooding and salinisation risks. These were widely related to the construction of hydraulic protective and productive infrastructure and played a central role in agricultural development policies since the 1970s (see section 3.1.2). In the Mekong Delta, flood and salinity control should, according to the National Strategy on Natural Disaster Prevention, Control and Mitigation (NS-DPCM), focus on the "construction of residential clusters [for flood and storm avoidance] and infrastructure above flood level, improvement of flood discharge for rivers and canals, construction of sea dikes, estuary dikes, embankments, reservoirs, and other structures for salinity prevention and fresh water preservation" (GoV November 2007: 10). Furthermore, the regulation stipulates that the Mekong Delta should enhance cooperation with the other Mekong riparian countries (GoV November 2007: 10). Agricultural adaptation plays a particularly important role in flood and salinity management. The government invested, for instance, a large share of the natural hazard management funds in the research and promotion of drought-resistant or saline-resistant rice varieties (Le Anh Tuan et al. 2007: 47; Lang et al. 2004). A range of awareness-raising programs and training classes were implemented in order to strengthen the capacity of response in rural areas of the Mekong Delta. Furthermore, some of the diversification policies since the 2000s (see section 3.1.2) aimed at being better adapted to flooding and salinisation. The government accordingly included shifts to aquaculture and more saline-resistant crops in agricultural land use planning and promoted them widely in rural areas – these were not primarily supported to be better adapted to water-related risks but to make use of economic opportunities, however. The Committee for Flood and Storm Control (CFSC) at a national level is meant to collect data, monitor floods and storms, and release warnings. At the province level, the CFCS coordinates and arranges respective measures when a warning is issued and after a storm or flood hit the region (Le Anh Tuan et al. 2007: 47; Nguyen Thi Phuong Loan 2013).

Moreover, several measures were implemented with regard to climate change. The NTP-RCC and the National Strategy on Climate Change aim, among other things, to mainstream climate adaptation and mitigation in sectoral development policies. The climate change-related planning documents compiled in the different ministries and departments set the basis for this alignment. Moreover, an increase in funding from international donor organisations was envisaged and quite successfully implemented. After the approval of the NTP-RCC, DANIDA[37] was, for instance, willing to provide as much as 40 million USD to the Vietnamese government for implementing climate change-related measures (Fortier 2010). International NGOs as well as bi- and multi-lateral agencies also implemented a large range of climate change-related projects themselves. A study by the World Bank (2011) estimates that by 2011 at least 1.4 billion USD was budgeted for such activities, of which nearly one billion USD was given to government agencies for implementation. The climate change-related policies also aimed at strengthening people's awareness of climate change impacts. This led to several programs such as the MONRE program to raise awareness of climate change in a similar way to the MARD program on disaster risk reduction (see section 3.3.3). The enhancement of knowledge of mitigation and adaptation measures also played a central role, especially through an improved scientific foundation. Consequentially, the MONRE developed climate change scenarios and assessed adaptation strategies for a study published in 2009 (MONRE 2009b) and an updated version

[37] Danish International Development Agency (DANIDA).

published in 2012 (MONRE 2012).

Households coping and adaptation in the context of flooding and saline intrusion

At the household level, a large range of coping and adaptation strategies was identified. Nguyen Van Kien (2012), for example, finds in a case study of coastal Mekong Delta communes that people mentioned 24 different types of adaptation behaviours alone in the context of salinisation. Upgrading of farm dikes, crop calendar adjustments, and water storage and groundwater exploitation have widely been identified as important response mechanisms in this risk context (Nguyen Van Kien et al. 2012; Nguyen Thanh Binh 2010: 36). Moreover, changes to the farming system, e.g. towards integrated mangrove-aquaculture farming systems or rice-shrimp rotation systems (Le Anh Tuan et al. 2007: 47), were identified to have become more common strategies in the context of salinisation and tidal influences. In response to flooding events, several scholars reveal that households most commonly applied coping strategies such as the modification of housing structures, or sending children to day care centres (Birkmann 2011a; Phong Tran et al. 2008). To be better adapted to future flood events, households have often opted for changes in the agricultural production system or for moving out of the exposed areas. These studies were concerned with riverine flooding in the North which entails different risk patterns than tidal flooding, however. Risk-related strategies in the context of tidal flooding did not find attention in research so far – at least not in rural areas of the Mekong Delta (several studies were concerned with tidal flood related strategies in urban areas of the Mekong Delta, see e.g. Garschagen 2013).

In addition to these strategies, there is a large range of more general risk-related response mechanisms which are not exclusive but are still applied in the context of flooding and salinisation. Many households decide, for instance, to migrate in order to find off-farm employment in the cities and improve their general income situation or break out of the vulnerabilities on site (Nguyen Thanh Binh 2010: 38). Another study finds that farmers in socio-economically less developed communities predominantly applied strategies which aimed at improving coping capacities, whereas better-off farmers tended to reduce income risks and increase their commercial productivity (Chinvanno et al. 2008b: 241ff). It has also been shown that many of the strategies were autonomously implemented but were driven by the governmental land use planning and promotion campaigns (Chinvanno et al. 2008a; Nguyen Huu Ninh 2007). The interaction between the response mechanisms of various formal and informal agents have, however, rarely been identified in more detail. Moreover, the identification of the quality of these strategies across time, space and society has often been neglected in research and practice. A comparatively small number of monitoring and evaluation (M&E) studies addresses these aspects and will be presented in the following section.

3.3.5 Evaluations and analyses of risk-related practices

So far, evaluations of coping and adaptation strategies in Vietnam have only played a minor role in the scientific literature. Some studies exist which are concerned with evaluating a formal adaptation strategy such as **dike system planning** (Pham Cong Huu 2011; Vo Thanh Danh 2012) or resettlement policies (Vo Thanh Danh, Mushtaq 2011). Pham Cong Huu (2011) argues, for example, that positive effects of dikes outbalanced adverse consequences. He therefore concludes that the Vietnamese government made a correct decision in implementing dikes in his study area. Furthermore, **resettlement policies** were evaluated. Vo Thanh Danh (2011) aims to integrate a multi-stakeholder perspective in his outcome-oriented evaluation of the "*Living with Floods"* policy. He accounts for the perceptions of program managers, resettlers and outsiders. Resettled people felt that they had a better life now and outsiders expected to resettle in the future. Program managers, in contrast, had the impression that people's livelihoods were not considerably improved but that infrastructure and hygiene conditions for resettlers became better. This study, accordingly, reveals the necessity of addressing more than just experts' judgements in evaluations of coping and adaptation strategies.

Nevertheless, without considering other adaptation options, including in the light of climate change, it is difficult to arrive at coordinated, integrated and future-oriented adaptation plans (Vo Thanh Danh, Mushtaq 2011).

Both of the previously introduced studies reveal examples for the problem of **second-order adaptation**, as Birkmann (2011a) calls it. He pledges that coping and adaptation strategies can result in cascading effects leading to a newly emerging need for adaptation. The analysis of resettlement policies (Vo Thanh Danh, Mushtaq 2011) shows, for example, that moving led, on the one hand, to a better adaptedness in terms of flooding but produced, on the other hand, higher vulnerability in terms of employment insecurity and often resulted in an income decrease. Second-order adaptation is consequently needed. Assessments of dike constructions also reveal such effects. They show that dikes have not only had protective effects but have often decreased fish resources, water and soil quality, and have increased erosion – all leading to new adaptation needs (Hashimoto 2001; Pham Cong Huu 2011). So-called “second-order dangers” (Taylor-Gooby, Zinn 2006: 401) have, however, not been sufficiently addressed in the scientific literature.

Evaluations also took place in the context of **climate change-related policies** implemented by the National Government. Fortier (2010) took, for instance, a procedural view on the climate change strategy of Vietnam. In his effectiveness-based assessment he finds that the processes are rather technocratic, inhibiting the acknowledgement of different interests, reinforcing existing power relations, and neglecting aspects of transparent and democratic decision-making. He argues that economic goals are still at the centre of interest and that the strategy provides more of “an illusion of intervention and security” (Fortier 2010: 243) than being a long-term oriented measure to reduce the risk of climate change impacts. McElwee (2010) followed a more comprehensive approach in her analysis of different climate change-related strategies in Vietnam. In her research, Multi-Stakeholder Participatory Scenario Development Workshops[38] formed the basis for an evaluation of various coping and adaptation options. They allowed, for instance, a comparison of future national climate adaptation policies in Vietnam and facilitated an evaluation of their appropriateness in a more local context (McElwee 2010: 109). This indicated clearly that it is too one-sided to simply focus on hard adaptations such as infrastructural measures - as has often been done in Vietnam (McElwee 2010: 100). The participatory scenario workshops also showed that different stakeholders see and value the benefits and costs of coping and adaptation strategies differently and that it is crucial to keep this in mind when taking decisions for a more sustainable adaptation to climate change (McElwee 2010: 104).

At the **national level**, the legal origin for **monitoring and evaluation** was established in a decree related to the management of Official Development Aid (ODA) and has since then also laid a foundation for other sectors (Nguyen Trinh Huong 2008; GoV May 2001). The National Strategy on Natural Disaster Prevention, Control and Mitigation (NS-DPCM) incorporates a section on monitoring and evaluation (M&E), but with comparatively general criteria and implementation guidelines. The defined criteria include, despite some process-based aspects (community participation, economic efficiency, sustainability, mainstreaming and governance), predominantly sectors and fields in which evaluation has to take place (legal system, forecasting, emergency response, local capacity building and awareness raising, science and technology and international cooperation). The monitoring and evaluation section in the National Target Program to Respond to Climate Change (NTP-RCC) is more detailed in giving implementation guidelines. The criteria for monitoring and evaluation include: 1) objectiveness and honesty in the evaluation process; 2) continuity, inheritability and consensus building among ministry/sector/locality; 3) unity and close collaboration among ministries/sectors/localities; 4) project/program implementation time; 5) local participation of

[38] The workshop included government officials, civil society, academia and local people. They identified formal and informal prioritised adaptation options and evaluated them according to their contribution to poverty reduction, their implementability, potential synergies and trade-offs (McElwee 2010: 85).

communities and social organisations. The M&E is to be carried out annually by the organisation in charge of the program and is to be forwarded to the government by the Steering Committee (MONRE July 2008: 55f). The importance of Environmental Impact Assessments (EIA) has also been acknowledged by the Vietnamese government. With regard to the policy regulations, the Vietnamese EIA system has been defined as a best practice example for other developing countries (Li 2008). Nevertheless, in practice there is still a wide range of challenges and drawbacks to be resolved (see Textbox 3.1). The problems of the Vietnamese EIA system depicted in Textbox 3.1 do not only hold for assessments in the environmental context but are representative of governmental M&E requirements and implementations across all sectors. Most notable are the lack of qualified staff, coherence between different authorities, and the lack of community participation.

Textbox 3.1: Environmental Impact Assessments in Vietnam – Regulations, chances and challenges

Environmental Impact Assessments had been practically implemented since 1984 (although only sporadically) and were formalised in the country's National Law on Environmental Protection in 1994 (Doberstein 2004: 184). In 2005, the EIA regulations were modified within the frame of the Law on Environmental Protection as to participation, monitoring activities, screening of documents, requirements for smaller projects, reorganisation of public responsibilities and decentralisation (Clausen et al. 2011). In 2011, a decree on the provision of EIA further changed the existing system by, for example, introducing more specific guidelines on the processes and increasing the monitoring and inspection requirements (GoV April 2011). According to those legal documents, three types of assessments were defined: strategic environmental assessments for strategies and master plans, environmental protection commitments for smaller projects and environmental impact assessments (EIAs). EIAs have to be conducted for larger projects which also comprise measures related to adaptation to water-related risks. Examples are projects to dredge canals, rivers and reservoirs (dredging area of 1 ha or larger) and projects to build dikes and sea and river embankments (with a length of 1,000 m or longer). For those projects an EIA has to be undertaken before the investments are decided upon. EIAs require activities such as the "assessment and prediction of the project's impacts on natural conditions, natural environmental components, the community and related socio-economic elements; results of consultation of the community" and a "proposal of measures to mitigate adverse impacts on natural conditions, natural environmental components, community health and related socio- economic elements" (GoV April 2011: 7). Formally, the Vietnamese regulations thereby fulfil the most essential criteria for a 'best practice' EIA system. Clausen et al. (2011) define nine criteria for a successful EIA system. All those aspects are addressed in the formal regulations. Nevertheless, the practical application is still weak. The largest drawback was noted with regard to the capacity of practitioners, consultants and government authorities – both as to the quantity of people in charge and their technical expertise (see also ADB 2013; Li 2008). Moreover, Clausen et al. (2011) demand for an increased independence of appraisal authorities and a strengthening of the mandate of monitoring institutions. Hostovsky et al. (2010) conclude, like other policy evaluations in a Vietnamese context, that the EIA process is technocratic and not transparent. Moreover, it lacks public involvement despite the formal requirement of community participation partly because the communal People's Committee is considered to be the representative of the communities - despite their political interests and bonds to the hierarchical political system. Li (2008: 9) argues further that a lack of coherence between EIA requirements at national level, regulations at province level, and practices on a local level exist. In a nutshell, all evaluations of the EIA system argue that it is good on paper but deficient in practice.

In international development projects, Monitoring and Evaluation is the most prevalent and established. The majority of projects and programs implemented by international NGOs and bi-/multi-lateral agencies follow the organisation's guidelines for monitoring and evaluation and adapt them (at least in most cases) to the local context (see section 2.3). These evaluations have taken place for both disaster risk management projects (e.g. JANI: CECI 2010; UNEP: Christoplos, Bach Tan Sinh 2004; Oxfam 2008) and climate change-related activities (Australian Red Cross, German Red Cross 2012); they have been conducted with more structured Logframe approaches (Australian Red Cross, German Red Cross 2012) or cost-benefit analyses (GIZ Tra Vinh 2012), as well as in more open participatory ways (CECI 2010; IFAD 2012a; Oxfam 2008). Most of these evaluations have been undertaken by external consultants or by the organisation itself and focused merely on the project target group. Textbox 3.2 depicts the characteristics, merits, and challenges of an M&E system using the example of an AusAid funded program by Oxfam Australia in more detail.

Textbox 3.2: M&E system of the Community-based Climate Change Action Grants Program of Oxfam Australia

Oxfam Australia has introduced the AusAid funded program to increase the resilience of 51,000 of the most vulnerable people (poor, landless, disabled and women-headed households) in coastal areas of the Vietnamese Mekong and Red River Deltas which are threatened by climate variability, change and disasters. The main objectives of this program are: 1) awareness raising and empowerment of the most vulnerable people in order include the community-specific needs with regard to CCA and DRR into local development planning and management; 2) strengthening livelihood and eco-system resilience of the target group; (3) ensuring that best practices and lessons learned enter nationwide in the improvement of community-based CCA, DRR and natural resource management (AusAid, Oxfam 2012: 2).

The project design acknowledges and involves M&E as a central element of the program which receives around 5% of the total budget. The so called MEAL framework (Monitoring, Evaluating, Accountability & Learning) includes the following activities (AusAid, Oxfam 2012: 12):

1) Baseline survey (general community information as baseline for measuring project success every six months)
2) Process monitoring (Logframe- and activity schedule-based regular reporting)
3) Output and outcome monitoring (Logframe-based with quantitative and qualitative indicators)
4) Final evaluation (by external consultants)
5) Beneficiary participation (in identifying the adaption options, quality criteria, fund utilization, progress monitoring and impact evaluation process)
6) Accountability mechanisms for beneficiaries (feedback and complaints mechanism for target population)
7) Learning and sharing (engage diverse media channels to share experiences with different communities worldwide)
8) Project fund audit (yearly independently conducted audit)

It is accordingly an M&E scheme which considers both process and outcome-oriented criteria, applies quantitative and qualitative methods, includes subjective and objective evaluations undertaken by local stakeholders, external experts and internal project staff, takes a coordinating role between households and authorities on different levels, and considers multiple dimensions. Many of the benefits depend, however, on the willingness of local authorities to adopt participatory and gender-sensitive approaches. Moreover, having a strong emphasis on awareness and capacity building, the success of the program depends crucially on the availability of competent staff and trainers. A further focus lays on climate change adaptation. Nevertheless, the M&E approach does not explicitly address CCA evaluation-specific challenges such as accounting for uncertainty and the need for flexible measures. Furthermore, interconnectivities and the effects on groups other than the target population may not be sufficiently taken into consideration under these guidelines. Despite these drawbacks, one can conclude that it is an M&E approach which accounts for most of the essential features of "good practice" M&Es (see section 2.3).

In summary, the previous sections set the regional and context-specific scene for this research. The chapter depicted rural livelihoods in their unique environmental, historical, and socio-economic nature and outlined the most prominent water-related hazard, i.e. flooding and saline intrusion. Moreover, a review of the current literature on water-related risks revealed the diverse appearances and perspectives on vulnerabilities and risk-related response mechanisms in the Vietnamese Mekong Delta. This analysis pointed out the value of and the need for gaining a better understanding of this diversity, particularly with regard to coping and adaptation processes in the light of rapid changes. The review of the conceptual and theoretical literature in chapter two revealed that evaluation research can provide pertinent approaches to grasp the character and value of local coping and adaptation strategies. In the VMD, evaluations have rarely been put in place and the ones who were put in place were often merely one-dimensional or neglected central context-specific and actor-oriented aspects. The following chapter will outline how a more comprehensive and multi-dimensional analysis and evaluation can methodologically be achieved.

4 A Mixed-Method Approach for an actor-oriented and context-specific evaluation

Let us be done with the arguments of participant observation versus interviewing...and get on with the business of attacking our problems with the widest array of conceptual and methodological tools that we possess and they demand

-- Martin Trow (1970: 7), *Comment on 'participant observation and interviewing: A comparison.'*

In accordance with the goal of *"attacking our problems"* a clear definition of the *"problems"* and an understanding of what *"they demand"* are vital prerequisites. Delineating the research problem is like "the identification of a destination before undertaking a journey", as Kumar (2010: 44) states, and should therefore also be the basis of designing the research methodology. The current problem is strongly linked to subjective realities of the people and the objective social structures in which they are embedded. It is therefore necessary to draw on a mixed-method approach using the *„widest array of conceptual and methodological tools that we possess and [that the research problems] demand"*. This section will consequently begin with outlining the necessity for applying both quantitative and qualitative approaches and will subsequently delineate the central research questions and their methodological implications. This is a starting point for outlining the research process, selection of research sites and major challenges and limitations of the field research.

4.1 The need for qualitative and quantitative research paradigms

The overall research problem requires not only the broadest variety of *"**methodological** tools that we possess and they [the research problems] demand"* (Trow 1970: 7) - including both qualitative and quantitative paradigms – but will particularly require an approach which is able to integrate both qualitative and quantitative paradigms expediently. A mixed-methods research paradigm can fulfil this requirement. It defines itself as being a common frame for an analysis of both quantitative and qualitative research approaches. This section will explain why both qualitative and quantitative approaches are necessary in the first place. How these approaches are deliberately integrated in a common frame will be outline in section 4.3 which explains the research process.

Qualitative research pledges itself to "the superiority of 'deep, rich observational data'" (Sieber 1973: 1335) and can be described as a "method of understanding", as Max Weber calls it (Kruker, Rauh 2005: 4). Against the background of the overall research context, which is foreign to the researcher and where only little is known in terms of the research problems, qualitative data which provides in-depth information and understanding serves explorative purposes (Flick 2007). A more thorough apprehension also provides an appropriate foundation to grasp complex social-ecological systems, dynamics and cross-scale interactions, as the conceptual framework requires (Johnson, Onwuegbuzie 2004). Furthermore, a qualitative paradigm[39] is based on constructivist and interpretivist lines of thought and allows people to "speak in his or her own voice" (Montello, Sutton 2006: 42). In this way it is possible to address what is meaningful in people's lives (and not in the researcher's) and conveys an understanding of the individual categories of meaning on site (Johnson, Onwuegbuzie 2004). This is of particular importance when aiming to reveal individuals' preferences and evaluations in a decision-making context. On the other hand, qualitative research also comes with several drawbacks and insufficiencies. It is, for example, highly contested whether the results are comparable and a lack of representativeness in the sampling prohibits larger generalisations (Flick 2007). Moreover,

[39] Paradigms can be defined as "the worldviews or belief systems that guide researchers" (Guba & Lincoln 1994, in Tashakkori, Teddlie 2002: 3).

subjectivity and participatory elements lead to the danger of biases arising from personal characteristics and perceptions of the researcher (Johnson, Onwuegbuzie 2004).

Quantitative research takes exactly those challenges as motivation for an objective and representative methodological approach (Atteslander 2006; Kelle 2008). It is pertinent to collect information which can be precisely appreciated (e.g. salinity and water measurement data) as well as information which can be recalled by interviewees relatively accurately (e.g. household information). Being able to isolate the impact of several variables also facilitates the delineating of credible cause-effect relationships (Johnson, Onwuegbuzie 2004). This is of particular interest when it comes to social-ecological system interactions as included in the given research foci. Relying, moreover, on representative sampling, quantitative data can create a sound basis of comparison based on detailed numerical data (Reinders, Ditton 2011). Accordingly, different socio-economic groups and geographic locations in the research area can be better compared in terms of actual and perceived vulnerability as well as with regard to the implications for the evaluation of strategy. This also facilitates to find specific and generic characteristics and processes (Raithel 2008). More time- and context-free generalisations (Johnson, Onwuegbuzie 2004) subsequently make it possible for the findings to be transferred to other regions in the Mekong Delta. Nevertheless, quantitative approaches are of limited relevance in the explanatory field (Silverman 2010; Flick 2007; Mayring 2002). Quantitative research may also not be the most adequate way of revealing implicit knowledge and sufficiently understanding complex processes and subjective meaning structures on site (Silverman 2010). Moreover, some essential phenomena or characteristics might be missed out because of pre-set research categories and a high degree of standardisation (Johnson, Onwuegbuzie 2004). These are, as described above, aspects that are meant to be resolved in qualitative research.

The previous discussion outlines that both methodological paradigms can contribute significantly to answering the research question and, at the same time, cause substantial drawbacks and challenges. A mixed-methods approach[40] can make use of the previously outlined advantages, is able to offset most of the stipulated disadvantages, can be self-complementing where necessary, and provides a basis to triangulate between each research approach to improve the reliability of results (see section 4.4 for more details about the specific advantages of a mixed-method research process).

4.2 Central research questions and their methodological implications

According to Johnson et al. (2007: 17), the research question is the most fundamental starting point when developing a mixed methods research design. Tashakkori and Teddlie (2002: 21) discuss a "dictatorship of the research question". This section therefore presents a specific methodological design which leads to answering the previously derived question (see section 1.2): "How and why do rural stakeholders in the Vietnamese Mekong Delta cope with and adapt to changing water-related risks in a beneficial way?" In order to come up with a well-adapted methodology, it is important to delineate the research question in more detail, i.e. break it up in more specific sub-questions, and then draw conclusions from each question for the research design (see Annex 12.1 for an overview of the methodological implications of the research questions).

[40] Johnson et al. (2007: 123) define, based on an extensive review of existing definitions, mixed methods research as "[...] the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration".

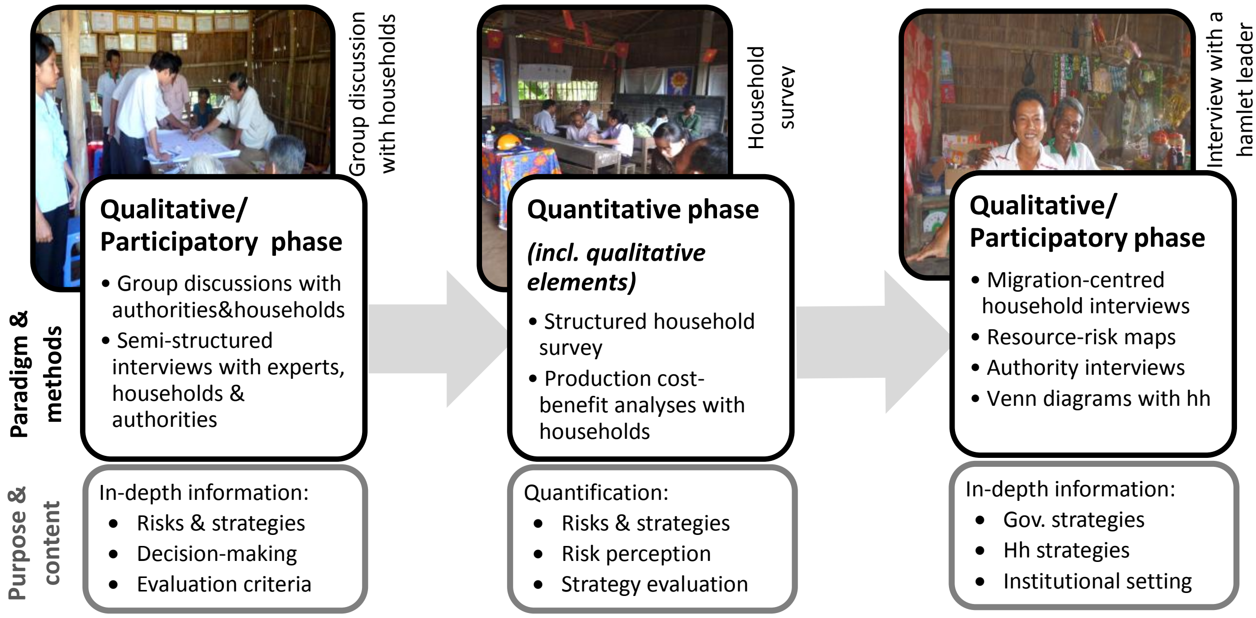


Figure 4.1: Summary of applied methods and collected information (Source: own pictures, M. Schwab 2012)

The results from the vulnerability assessment undertaken in the first phase of the WISDOM project provided the necessary information for a preliminary understanding of the risk context and the impacts that coping and adaptation strategies have on vulnerability. This knowledge was complemented by a secondary review of the literature which also helped to find an appropriate methodological and theoretical framing of the work. To gain a more in-depth view of structures, processes and vulnerabilities, reports were collected and interviews with authorities were conducted. The semi-structured interviews with local, communal, district and province authorities also facilitated better appreciation of the strategies undertaken by governmental institutions. Participatory focus group discussions with both commune authorities (in three communes) and local households (in four hamlets) conveyed an understanding of the causes, impacts and consequences of salinity and flooding, of its implications for applied strategies or potential options, and of how local stakeholders evaluate coping and adaptation strategies, in particular how they weigh relevant evaluation criteria. This know-how was complemented by more open and exploratory household interviews. Further participatory household focus group discussions with key informants facilitated an understanding of the institutional setting in the research areas by jointly developing Venn diagrams. Resource risk maps which were drawn and discussed with ten hamlet leaders showed geographically where salinity and flooding occurred and revealed aspects which shape exposure to these risks. A structured household survey (n=312) was undertaken in order to quantify the socio-economic characteristics, production details, governmental and household strategies and their evaluation. Production-cost-benefit calculation with local farmers and migration-centred household interviews as well as strategy-centred interviews with authorities facilitated a more in-depth analysis and evaluation of selected strategies on site (see Figure 4.1 for an overview of the conducted methods and the generated information; Figure 4.2 for pictures of interviews and group discussions; Annex 12.1 for a table of the methodological implications of each research question; Annex 12.2 for a comprehensive list of all interviews and group discussions undertaken in the current research context incl. type, period, number, interviewees, purpose, sampling method and length; Annex 12.3 for a detailed description of each method including the generated information).

4.3 A deliberate mixed-method research process

The PhD work was taken up in January 2011. A first step in the research process was to thoroughly acquaint oneself with the topic by reviewing existing theoretical, methodological and region-specific literature. This facilitated aligning this project in the current literature and defining central research questions and foci. Subsequently, the methodological process of field research was conceptualised and planned. In the vein of Grounded Theory (see Glaser, Strauss 1967), no theoretical framework was chosen or developed prior to the field research in order to openly develop the theory in the process of data collection and analysis.

The researcher chose a **multiphase design** within a single mixed-method study. This allows a flexible way of addressing interconnected research questions where one phase can inform or complement the other. In contrast to an embedded design, which has a focus on a specific quantitative/qualitative method, it is organised into different phases each having its specific methodological focus (Creswell, Plano Clark 2011: 74; see Figure 4.3 for a depiction of the research process). The integration of qualitative and quantitative data occurs in different stages of the research process. In most cases the integration takes place in the phase of data analysis or interpretation (Creswell et al. 2008). Integration might, however, also occur within the research question or within data collection.

The field research phase in the Mekong Delta comprised eight months from September 2011 until May 2012. The first field research phase followed an **exploratory design** building on the logic of induction (see Johnson, Onwuegbuzie 2004: 17; Kuckartz 2008: 5; Creswell, Plano Clark 2011: 69; Bryman 2006: 10 for more details). Exploratory, open interviews were conducted with experts from university and international organisations, local authorities and households (September 2011 until December 2012). Moreover, governmental reports were collected at various institutions and were reviewed. A provisional analysis of the interview and report data provided the informational basis to develop a new and adapted method of participatory strategy appraisal and evaluation. The identification of administrative challenges and boundaries of research and the establishment of first contacts with local authorities on site made it possible to organise and implement participatory focus group discussions with households and authorities based on this newly developed method. The group discussions were conducted between December 2011 and January 2012 (see Figure 4.2 for an illustration of group discussion situations). A preliminary analysis of the exploratory data set in the subsequent weeks provided a more in-depth knowledge of the issues around the research problems and conveyed an appreciation of how to design a novel questionnaire-based methodology to evaluate coping and adaptation strategies. Following this constructivist phase of research, a more positivist approach was chosen to test and generalise findings from the preceding qualitative research phase and apply it to different researched social groups. Accordingly, in late February survey assistants were selected and trained and a pre-test was undertaken. The actual survey followed from March until early April. Selected survey interviews, where the researcher was present, were questionnaire-based but went more thoroughly into striking or unclear answers and aspects by asking open ended questions (details about each method of data collection and the interview/discussion guidelines can be found in Annex 12.3 and 12.5).

The subsequent fourth research phase was based on the quantitative household survey. Accordingly, a **sequential explanatory design** was applied (see Creswell, Plano Clark 2011: 69; Kuckartz 2008: 5; Bryman 2006: 10; Johnson, Onwuegbuzie 2004: 17 for more details). A preliminary analysis of the quantitative household survey data revealed aspects that were unclear or results which were unexpected and previously not discovered. These needed further explanation, i.e. more in-depth qualitative research. Therefore, semi-structured household and authority interviews focusing on selected strategies as well as participatory group discussions on institutions were conducted (February until April 2012). Furthermore, quantitative enquiries of production costs and benefits were applied in April 2012. These included also open-ended questions to scrutinise surprising, interesting or ambiguous aspects. The survey also helped to identify potential key informants and could therefore guide purposeful sampling for the previously discussed methods of data collection. Subsequently, the qualitative data sets were mainly analysed in a qualitative way; and the cost-benefit interview data was mainly analysed quantitatively (May 2012 until February 2013). Some of the qualitative interview data were also analysed in a quantitative manner using MaxQDA mixed method tools. Otherwise, an integration of qualitative and quantitative elements was mostly undertaken in the phase of interpretation (details about each method of data collection and analysis as well as the interview/discussion guidelines can be found in Annex 12.3, 12.4, and 12.5).


1)


2)


3)

Figure 4.2: Pictures of 1) an interview with an aquaculture farmer; 2) a risk-related group discussion with local authorities; 3) an institution-centred group discussion with households (Source: own pictures, M. Schwab 2012)

A **convergent parallel research** design, as Creswell and Plano Clark (2011: 74) call it, was also included. The concurrent application of a quantitative household survey and the visualisation and discussion of resource risk maps with hamlet leaders were conducted in the third phase of data collection (March to April 2013). They mainly served 'enriching' purposes, as Marsland et al. (2000: 8) call them, i.e. the description of different aspects of the research problem. Moreover, it served an explanatory purpose, i.e. the fields of the surveyed households were located in the map. In the data analysis, the resource risk maps were analysed qualitatively, were classified and integrated in the SPSS data set, and were visualised together with quantitative georeferenced data sets. In the fourth phase, quantitative production-cost-benefit interviews were conducted simultaneously with in-depth interviews revolving around selected strategies and participatory group discussions about the institutional setting. As for the previous phase, this mainly had 'enriching' reasons. Moreover, it also served explanatory purposes, i.e. quantitative information from the survey on the respective key informants could be explicated by more in-depth interviews. Qualitative elements were subsequently analysed with MaxQDA whereas quantitative elements were analysed with MS Excel. An integration of the data sets was mainly undertaken in the interpretation phase (details about each method of data collection and analysis as well as the interview/discussion guidelines can be found in Annex 12.3, 12.4 and 12.5).

The research process was also used to generate theory and concepts in the vein of a 'Grounded Theory' approach. This means that the theoretical and conceptual framework of this research emerged from conclusions drawn throughout literature review, data collection and data analysis. Preliminary analyses were therefore used for an open coding of the gained information. This coding was guided but not dictated by previous literature reviews (theoretical sensitivity as to Glaser 1992). The continuous research process consequently made it possible to relate the codes to each other (axial coding) and select the core variables (selective coding). These steps fed incrementally into the development of the theoretical and conceptual framework (see section 2.4).

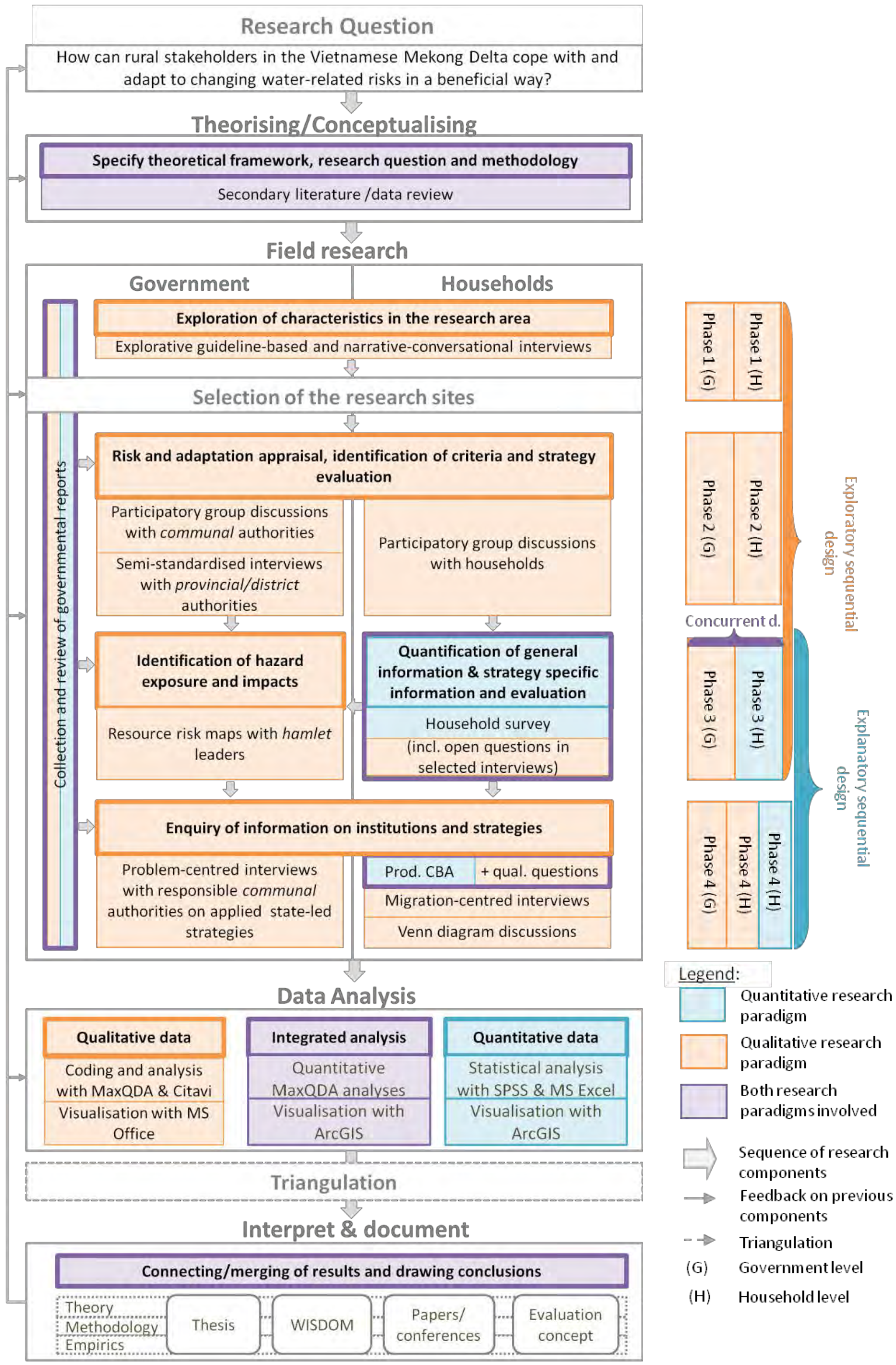
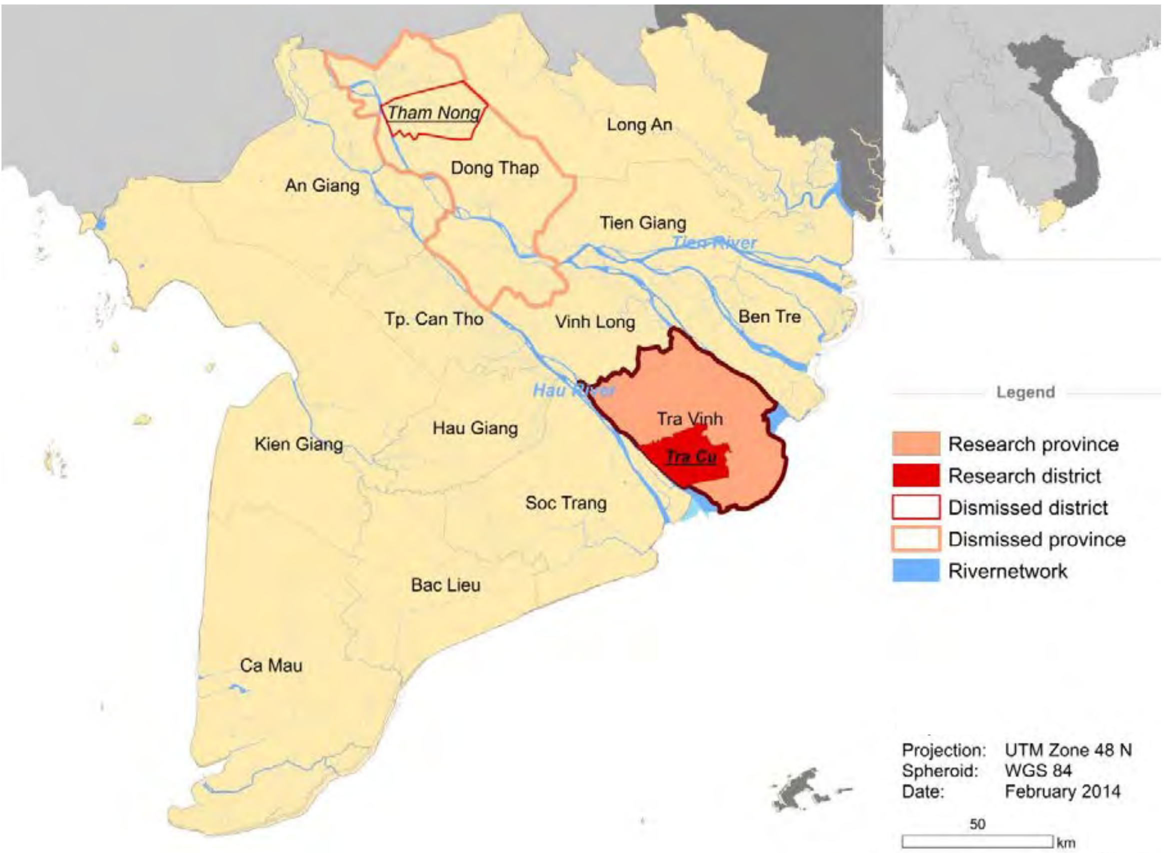


Figure 4.3: Illustration of the mixed-method research design and proceeding (Source: author)

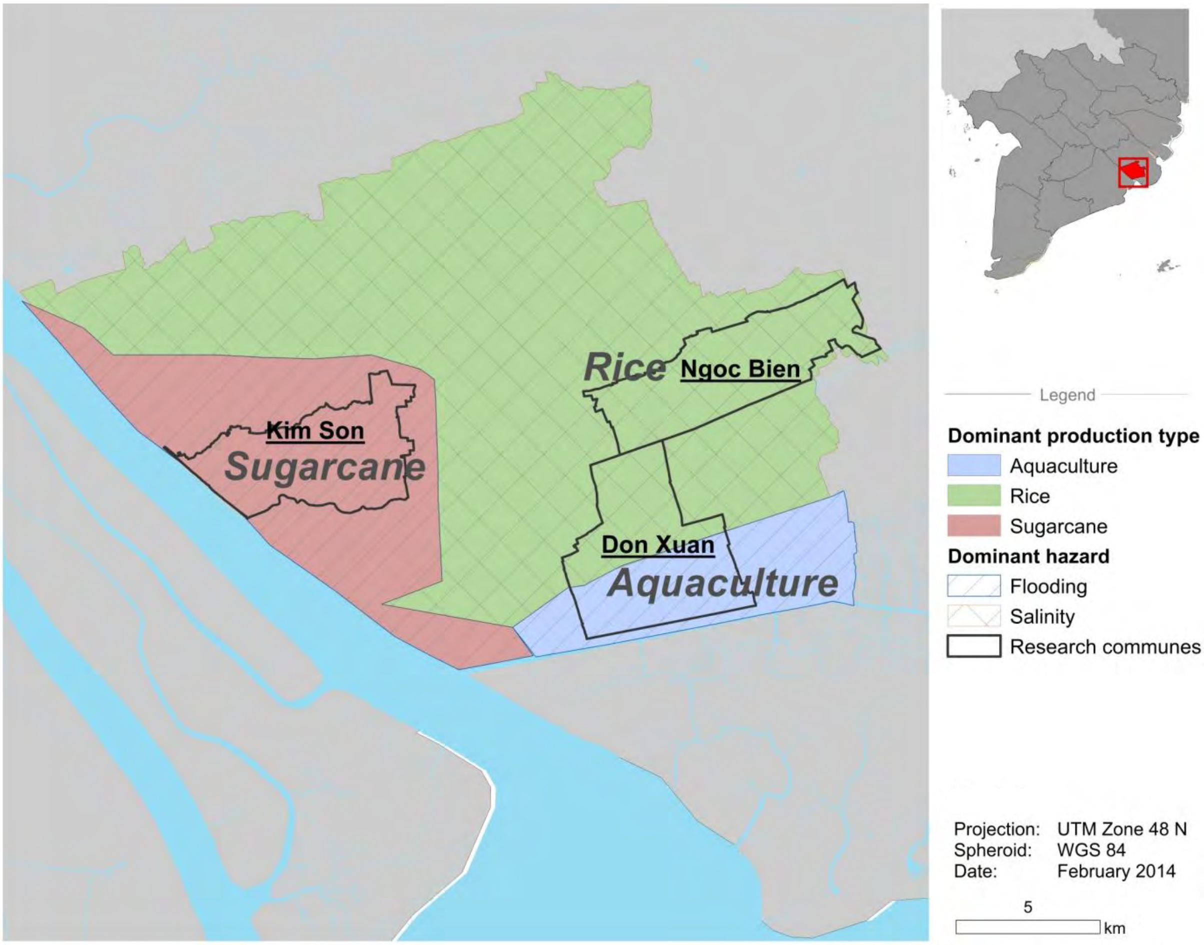
4.4 Vulnerability-oriented selection of the research area

Water-related risks are at the centre of this research. For this reason, the nature of the hazard was one of the major selection criteria. Section 3.2 reveals that slow-onset flooding and salinisation are two of the most relevant risks in the Mekong Delta. A preliminary analysis of the hazard profiles in the Mekong Delta revealed that flooding is most severe in the Plain of Reeds, whereas salinisation is a major problem to southern coastal zones (see section 3.2). Accordingly, one coastal area affected by salinisation and one inland area in the Plain of Reeds affected by slow-onset flooding were selected. These are the hazards and areas where the preceding scholars in the first phase of WISDOM also undertook vulnerability assessments. Building on these projects, the researcher chose to look at the same provinces and districts as in WISDOM I, namely Tam Nong district in the Plain of Reeds province Dong Thap and Tra Cu district in the coastal province Tra Vinh (see Map 4.1 for a depiction of their geographical location). This made it possible to draw on the previous vulnerability-related findings and arrive at a more in-depth understanding and evaluation of the given strategies in situ. However, a research permit could only be acquired for Tra Cu district in Tra Vinh province (see following section 4.6). For this reason, the research site in Dong Thap had to be dismissed.



Map 4.1: Research areas in Dong Thap and Tra Vinh provinces in the VMD (Source: author, administrative boundaries based on MOST 2010)

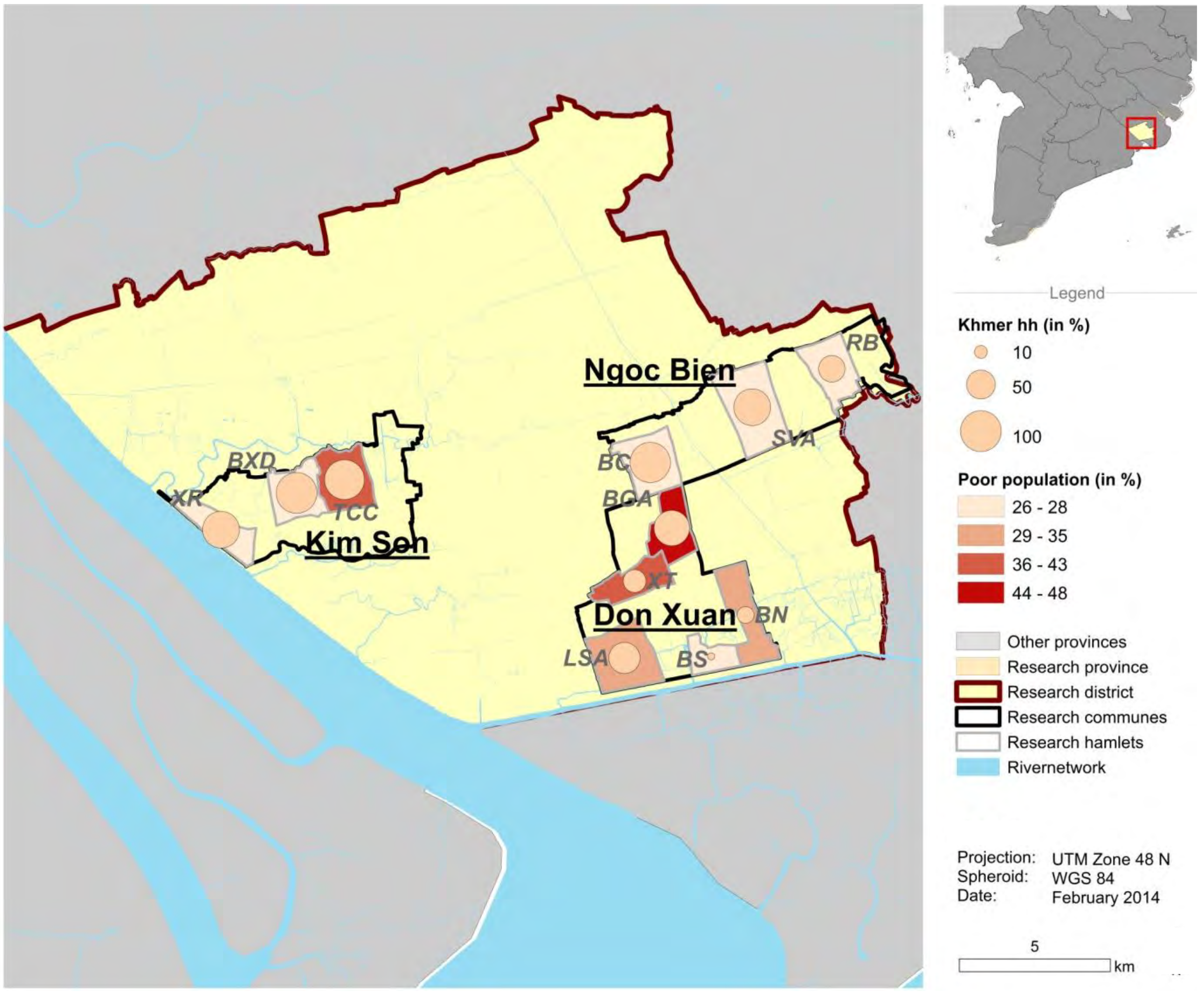
The overall research question asks for an evaluation of ***rural*** coping and adaptation strategies. For this reason, only rural areas were considered in the selection process. The research question also asks for an evaluation of both the governmental and household-level strategies which is why the choice of research areas depended on the formal institutional setting. Focusing at the local level, areas with different communal and hamlet governments were chosen. Moreover, the current PhD project is meant to build on research undertaken in the first phase of WISDOM. For this reason, some of the previously researched communes and hamlets within the selected research district were included in the sample. Being conceptually aligned in vulnerability research (see section 2.4.2), the selection of the communes and hamlets were based on a contrast according to selected vulnerability indicators. The choice of selection criteria and a preliminary characterisation of the vulnerability profiles of the communes and hamlets in the researched district were based on authority interviews, governmental reports and maps.



Map 4.2: Dominant production types and hazards in the researched district and communes (Source: author, production areas were estimated and simplified based on authority interviews and DONRE Tra Vinh 2007; administrative boundaries based on MOST 2010)

Firstly, communes with differential hazard exposure were delineated in collaboration with local authorities. The researcher decided to select, on the one hand, areas inside the dike which are mainly affected by salinisation (see cross-hatched green area in Map 4.2) and, on the other hand, areas outside the dike which have to deal with tidal flooding in addition to saline water conditions (see linear-hatched areas in Map 4.2). In each of the respective areas one commune which had a large share of the production area being affected by tidal flooding or saline intrusion was chosen. Kim Son commune was picked because it was the commune which had, according to governmental reports, the second largest area affected by embankment breakages due to tidal flooding in 2011 (OARD Tra Cu 2012, 2011b). Furthermore, it was, in contrast to the most affected commune, a research site from Nguyen Thanh Binh who undertook the Tra Cu vulnerability assessment in the first phase of WISDOM. Within the salinity affected area inside the dike, Ngoc Bien was reportedly the commune with the largest area affected (OARD Tra Cu 2011b) and was therefore taken as a sample site. Similar to most areas inside the dike, it was, however, only rarely affected by tidal flooding. Besides these two communes, another commune was selected which revealed areas both inside the dike affected by saline intrusion and outside the dike exposed to tidal flooding, i.e. Don Xuan commune. In this way, a comparison of two different hazard areas with a similar formal institutional setting was possible.

These areas also differed in terms of their susceptibility. The salinity sensitivity of the produced commodity is a decisive factor in this regard (see sections 2.4.2 and 3.3.1). In Ngoc Bien commune and in the areas inside the dike in Don Xuan commune, rice is the dominant product cultivated by farming households (see green area in Map 4.2); this is a highly sensitive crop. In the areas outside the dike, where brackish water conditions prevail throughout the whole dry season, aquaculture is the most common form of production (see blue areas in Map 4.2). In the dry season, salt water varieties are produced which are, in contrast to rice, not susceptible to salinity; they even depend on brackish water conditions (see section 3.3.4). In the flooding season, highly sensitive freshwater aquaculture is produced. The hazard with this is that once tidal flooding breaks or overflows the embankment, a large share or even all the production is lost. In Kim Son commune, sugarcane is the most commonly cultivated product (see red area in Map 4.2). The commodity is less sensitive to salinity than rice and the production is less severely affected by the impacts of tidal flooding than aquaculture (see section 3.3.4).



Map 4.3: Proportion of Khmer households and households with a poor certificate[41] (Source: author, data based on PC Kim Son 2011; PC Ngoc Bien 2011a, 2011a, 2011b, PC Don Xuan 2011c, 2011d; administrative boundaries based on MOST 2010; hamlet borders are based on PC Don Xuan 2011e and participatory hamlet risk maps, M. Schwab 2012)

Within the sample communes, 11 hamlets were picked by comparing them according to the following indicators for the capacity of response. Firstly, hamlets with different proportions of Khmer households were selected (see size of the circles in Map 4.3). Khmer households are often reported

[41] **Hamlets**: Kim Son: XR=Xoai Rum, BXD=Bai Xao Doi, TCC=Tra Cu C / Don Xuan: LSA=Lo Soi A, XT=Xom To, BGA=Ba Giam A, BS=Bau Sau, BN=Ba Nhi / Ngoc Bien: BC=Ba Cum, SVA=Sa Van A, RB=Rach Bot.

to have a lower wealth in terms of capital endowment than Kinh households (see section 3.1.4) which would, based on theoretical assumptions made in section 2.4.2, also lead to a lower capacity of response. Secondly, hamlets in the chosen communes were compared according to different proportions of poor households (see colour of the hamlets in Map 4.3). The poverty certificate is an often mentioned indicator for an individuals' capital endowment (see section 3.3.1) and consequently also for the response capacity[42].

4.5 Methodological challenges and drawbacks

The research process was accompanied by a multitude of methodological challenges. The specific research design, the methods applied during field research and the mixed-method paradigm entailed not only advantages but also methodological problems. The researcher had been aware of these challenges and addressed them to the best of her knowledge and beliefs. Nevertheless, the data are still bound to uncertainties and are not always representative. In order to be able to draw solid and reliable conclusions from the empirical results of this study, it is important to address these challenges at this point and keep them in mind while reading the rest of the thesis.

Firstly, the **mixed-method case study design** not only drew on the advantages of qualitative and quantitative research but was also accompanied by specific challenges. Having chosen to apply a multitude of methods in a case study approach under given time and budget constraints implied restricted representativeness. The research was conducted in only one province of one agro-ecological zone. For that reason, representative conclusions cannot be drawn for the whole Mekong Delta – a region of notable social, economic and natural diversity (see chapter 3). Moreover, the sample size cannot meet representativity requests with regard to all research objects for the chosen research area. Qualitative research does not typically underlie the requirement of being representative, but quantitative research does. This problem therefore arose most notably in the context of the structured household survey. The sample size was initially calculated to fulfil at least the minimum prerequisites for conducting most statistical analyses at a representative level (for the research area). Given the length of a questionnaire which aims to evaluate a large range of strategies, a trade-off emerged between being comprehensive, reliable and valid or being representative and able to provide a solid basis for certain statistical analyses. The researcher struck a balance by bisecting the survey population. Around 100 interviews were targeted for a long questionnaire-based interview of one to two hours and 200 interviews for a shorter interview of half an hour to one hour. The long and the short questionnaires were identical except for the fact that the long questionnaire included an evaluation part at the end of each appraised strategy section (see sample questionnaires in Annex 12.5.4). In this way, a sound basis of comparison with a sample size of 312 was achieved for assessing vulnerability patterns, risk perception, as well as governmental and household-level strategy options. The evaluation of strategies was based on a smaller sample size but did still allow for descriptive analyses and comparisons (see Annex 12.3 for more details).

From the perspective of an **explorative research design** (see previous section 4.4), it would have been pertinent to conduct more in-depth interviews prior to the standardised survey. This would have provided a more profound basis for ensuring sufficient comprehensiveness in the extent of questions and adequacy with regard to the formulation and answering categories. Nevertheless, the required change in research sites and the restrictive research permit requirements prohibited generating more qualitative data in the forefront (see section 4.6). Within the realms of the rigid system of governmental research restrictions, it was, however, possible to extend the scope of pre-tests before the survey. Two rounds of pre-tests were conducted, one which included fewer but more in-depth interviews conducted by the researcher; and a second round where enumerators undertook a larger range of standardised interviews according to the questionnaire. In that way, it was possible

[42] A more in-depth characterisation of the hamlets follows in chapter 5.

to improve the questionnaire design and compensate for some of the drawbacks resulting from a lack of qualitative research before the survey (see Annex 12.3 for more details).

A drawback which arose from aiming at a larger representativeness was the fact that not all interviews could be conducted by the PhD researcher. Most of the survey interviews and many of the production- and migration-centred interviews were conducted by **enumerators**. This entailed a lack of reliability especially from a qualitative stand. The notes taken throughout the interview were, for instance, not as detailed and it was difficult to judge the atmosphere during the interview. In order to ensure as much reliability as possible, experienced enumerators[43] were chosen and trained extensively. For the survey, one day of training was provided before the pre-tests and two days after the pre-test. Moreover, feedback rounds with the enumerators were undertaken in the lunch breaks and after each day of interviewing. On these occasions, everyone described his/her experiences with the interviewees and ambiguities were jointly discussed. In addition, two enumerator group leaders were appointed for the survey who crosschecked each questionnaire in order to counteract data gaps and clarify doubtful and indistinct points shortly after the interview (see Annex 12.3 for more details).

Moreover, the **complexity of some research aspects** reoccurred in the responses of several interviewees. This was most notable in the abstract notion of quality criteria. It was, for instance, difficult to appraise general quality criteria in the group discussions. Both government authorities and particularly the households had difficulties in defining general characteristics which make a strategy a “good” or a “bad” one. Illustrating the nature of criteria using the example of specific strategies would have directed the selection too much towards an evaluation of only this strategy and providing no example made it difficult to imagine what *criteria* were. Therefore, the researcher chose to provide examples from a list of criteria derived from a review of the literature and ensured that if examples for strategies were used, they were the same across all group discussions. Moreover, it was important to discuss potential explanations for criteria extensively with the translator and with other Vietnamese researchers to arrive at formulations as understandable, comparable and precise as possible (see Annex 12.3 for more details). In the survey, the researcher chose to ask for a ranking of specific advantages and disadvantages of each household strategy and a likert scale question format for the evaluation of government strategies. These questions were often difficult to answer for the survey interviewees. To ensure comparability and comprehensibility, the survey assistants were trained to use the same examples and formulations for each strategy which were thoroughly selected beforehand (see Annex 12.3 for more details). Also the institutional setting was a complex topic to assess. The sampling of interviewees was therefore of central importance. In order to select appropriate interviewees, the enumerators were asked to register the survey interviewees who were the most open, interested and knowledgeable with regard to the institutional setting. From this list of potential interviewees, one candidate from each commune and production type was chosen. These people were not interviewed in a one-to-one interview format but in a participatory group discussion to which the interviewee invited other people with whom he/she felt comfortable. The relational PRA method of Venn Diagrams appeared to be the most appropriate way of revealing implicit knowledge with regard to the complex network of institutions, responsibilities and interconnectivities (see Annex 12.3 for more details).

Furthermore, the **reliability of interview documentation** was restricted because neither interviews nor discussions were audio-recorded. Therefore, no word-by-word transcriptions were available for the content analyses. For that reason, not all information given in the interviews could be registered and several content analysis tools such as dictionary-based approaches were only possible to a limited degree. Reasons for restraining from audio-recording were most notably related to the fact that a recording deterred interviewees, particularly authorities, from providing more in-depth and critical information. Instead of recording, the researcher took detailed notes. In order to gain reliable information, the translators were instructed to translate as precisely as possible during the interview.

[43] The enumerators conducted several surveys for the GIZ in the past.

Moreover, each interview was discussed with the translator right afterwards to resolve unclear points, complement and crosscheck the notes, and jointly interpret the interview atmosphere and the openness of the interviewee.

Also the process of logging in questionnaire data was a source of restricted data reliability. It hinges on the quality of **data entry**. The assistants were therefore thoroughly selected and trained. The data entry was undertaken by the two enumerator group leaders who not only knew the survey design well but also cross-checked each of the questionnaires during the survey. To improve the quality of their work, a data entry excel sheet was created and translated in coordination with an experienced Vietnamese researcher from the Mekong Delta Development Institute. It was neatly ordered and numbered based on the questionnaire design, the questions and answer options were rationally and simply coded, missing values and the level of measurement was defined, and automatic error reports were programmed so that entry mistakes could be reduced. The data entry assistants then received a one day-training and conducted the first data entries together with the researcher. Throughout the data entry period, spot checks on a random basis and feedback rounds with the data entry assistants were conducted (see Annex 12.3 for more details).

4.6 Fieldwork in a Vietnamese context

Field research in Vietnam is an endeavour which has its own challenges and peculiarities, especially when the researcher is of foreign non-Vietnamese origin. It is therefore important to reflect on the methodology against the background of these aspects.

Vietnam poses some specific challenges in terms of accessing the field. The often cited role of the '**gatekeeper**' in the literature is in this regard an important aspect to be considered (Turner 2013; Miller et al. 2012; Burgess 2004). Gatekeepers are actors who are in a position to open the "gate" to the field or field research. They "provide directly or indirectly access to key resources needed to do research, be those resources logistical, human, institutional, or informational" (Campbell et al. 2006: 98). Most commonly, gatekeepers are government agencies and other institutions (including their staff), or non-affiliated individuals such as friends and key informants (Campbell et al. 2006: 99). In a socialist one-party state where access to the field is highly controlled and bureaucratic, these agents come into play at different research stages and administrative levels, as also reported by many other scholars who did research in the Vietnamese context (Turner 2013; Ehlert 2011; Reis 2010; Scott et al. 2006; Miller 2003).

Research visas and permits are essential bureaucratic prerequisites to undertake fieldwork in Vietnam. Before even going into the field, a research visa was mandatory. In order to receive such a visa, a clearly defined working schedule for a whole year was required and the overall application process had to be administered by an acknowledged Vietnamese institution. In the present research context, the Vietnamese host institution of the subproject, i.e. the Department for International Affairs of Can Tho University (CTU), took on this gatekeeping role. The institutional support of the Department for International Affairs was also needed for the research permits. These permits were required for each field visit, for each interview, and for several documents. In order to receive such a permit, a detailed work plan had to be submitted to the CTU including the date, time, location, name of institution/interviewee, name of interviewer/assistant, as well as information on the purpose of the visit and the content of the interview/report. With a letter from CTU, approval was requested at the provincial level. If the permission letter was obtained, a letter of introduction and the work plan were sent to each of the governmental institutions which were meant to be interviewed and/or in charge of providing access to the research sites or documents. Prior to each interview, the date and the person of contact in the respective institution had to be confirmed by telephone. It was not advisable to include phrases that point to sensitive content or at political curiosity in the plan because there was already a chance of not getting an approval at the level of the CTU. On the other hand, some authorities, particularly at the province level, refused to talk about subjects which were not named in the work plan. The fulfilment of all these requirements was not only time consuming but also inhibited the flexibility and openness which would be essential for the constructivist qualitative research phases and approach.

For the case of Dong Thap Province which was one of two envisaged research provinces, no permission was received at the provincial level to do fieldwork - even after months of waiting (see section 4.4). Given the budget and time constraints, the researcher chose to stop waiting for the research permit and focus on Tra Vinh only. This implied that the comparison of different hazard- and socio-economic patterns could not be illustrated using the example of two provinces. In consequence, the researcher selected research sites within Tra Vinh province and ensured that they differed significantly in their risk profiles. Moreover, the long waiting period and uncertainty about whether research in Dong Thap was possible determined the process of the fieldwork in Tra Vinh. If the researcher knew from the beginning that only one province was going to be at the centre of the research, more in-depth exploratory interviews would have been undertaken before the survey. Given the restrictive permits with the working schedules planned long in advance, this was not possible at the time when the researcher decided to dismiss Dong Thap as a research site.

Gatekeepers also played a central role for **gaining access to interviewees or reports**. In Vietnam, the interviews always have to move, just like every other procedure in the state bureaucracy of this country, from one hierarchical level down to the next (Scott et al. 2006: 30). This meant that the district level directed the researcher to governmental institutions at the communal level, the communal level to the hamlet level, and the hamlet leader to the interviewees. Each institution appointed one gatekeeper to accompany the researcher to the respective lower level and to report back to them about the activities and interviews. This could lead to household interview situations where, at the same time, one district, one commune and one hamlet official were present. One can assume that this had an influence on how households and government representatives answered and behaved. Nevertheless, many interviewees did not seem to pay too much attention to the chaperones and talked quite openly and also critically. In some cases it was also perceived as an opportunity to express discontent and draw attention to their problems. Being accompanied by these gatekeepers was, especially in the beginning, also important for logistical reasons. They brought the researcher to the interviewees and showed them the hamlet. Over time, many of the gatekeepers lost interest in the interviews, mostly because they saw that the interviews did not touch critical or sensitive issues. Therefore, the majority of the household survey interviews, the strategy-centred interviews as well as the group discussions about the institutional setting could be undertaken a bit more “away from the official gaze” (Turner 2013: 4). Moreover, when a trusting relationship was built up with the gatekeepers, they provided interesting insights and granted access to reports which would not have been available to the PhD student otherwise. Accordingly, the gatekeepers were able to transform the spaces of what was permitted and what not.

The hierarchical bureaucratic system also influenced the selection of the interviewees. Governmental interviewees and group discussion participants were selected by the respective head of the institution, i.e. if the researcher wanted to talk to a communal agricultural extension staff it was normally the head of the communal PC who decided who to talk to. Similarly, the selection of the interviewees for the explorative household and the participatory evaluation-based group discussions was undertaken by the hamlet leader or the communal extension staff according to general criteria given by the researcher. A notable selection bias was thereby observed for one household group discussion in the aquaculture hamlet where the hamlet leader chose mostly poor households so that they could earn some additional income from the allowance which each participant received from the researcher. There was no major bias recognised with regard to the selection of the other interviewees. Moreover, the information from the explorative interviews and group discussions were at a later stage cross-checked with the information received from the other interviews which did not underly an authority-led selection process.

At the provincial level, another "gatekeeper" came into play, the so-called *economic police*. It seemed to have received information about the research project and decided, according to the staff from DARD, that this research touched a sensitive topic related to China. Despite the fact that even the researcher did not come across what this sensitive issue was, the staff of the DARD was told not to give out any document and to provide a detailed report about our interview to the *economic police*. This made it difficult to include the provincial level in the research, as originally intended. The researcher therefore decided to focus on processes taking place on district, commune and hamlet levels.

Not only the availability but also the **reliability and quality of the secondary data** were restricted. Most of the governmental reports were vague and woolly in their formulation. Most of the documents included the majority of the established buzzwords which have found their way into Vietnam's political vernacular. However, contentful terms such as participation, sustainability or transparency were in most cases merely listed without definitions or clearly defined targets. Furthermore, the description of the development indicators and the fulfilment of the plans in the local reports resembled each other so closely in content and formulation that one could assume they were generated in a copy-paste manner. This is not very surprising given the large number of reports which have to be compiled each year by local government staff. The numerous reports also, however, provide an extensive database upon which one can draw (provided one can access it). Up-to date information is therefore available on the most local level. At the hamlet level, each hamlet leader keeps a regular account of the socio-economic and agricultural situation in the hamlet. They are supposed to visit each household once per month, ask them whether any changes occurred and keep a record of it. In many cases this was not strictly followed; nevertheless each hamlet leader possessed a more or less detailed hamlet book and most of the hamlet leaders shared this information openly with the researcher.

Another omnipresent part of this research was the **aspect of being a foreigner**. This is an often addressed and critically examined topic in the literature, particularly in anthropology (see e.g. Bernard 2006; Senft 2003). Information and knowledge necessary for appropriate appreciation of structures and processes on site are sometimes hard to access and appropriate for an outsider. Foreignness can preclude an in-depth understanding of local and individuals' realities which are critical to the research, in particular with regard to grasping individual decision-making processes and evaluations. This was related to both cultural and language barriers. Although the researcher aimed to confront this problem by learning about the culture and the language, it was necessary to work with an assistant who took over the role of a "cultural mediator" and translator. Despite the fact that the assistant was also unable to completely assume the perspective of an "insider", he/she was able to convey cultural sensitivity to the researcher in the preparation and conduct of interviews and workshops. Without a Vietnamese assistant, the administrative procedures would also not have been possible, particularly with regard to the research permits. Nevertheless, working with a translator and "cultural mediator" comes with many disadvantages. It made the interviews and discussions more time-intensive, the researcher had less flexibility and capability to respond to the interview situation, and a loss of information was unavoidable in many cases. Translation can entail deviations from the original meaning, not every aspect can be translated, and details in the way of communication as well as the interviewing atmosphere might not be grasped by the researcher. Matters were complicated further by the fact that most people in the research area were Khmer so that some of them spoke little or no Vietnamese. This meant that a second Khmer-Vietnamese translator had to be engaged in some of the interviews. Due to these difficulties it was essential to engage Khmer enumerators, train the translator well, and discuss each interview in detail right afterwards. In some interviews and group discussions it was also helpful to work with two translators so that a more precise and timely translation was possible.

Foreignness does, however, not only bring about disadvantages. It can be an essential prerequisite for objectivity which is of particular importance in qualitative research (Flick 2007). Flick depicts the researcher in this context as a “professional foreigner” (Agar 1980 cited in Flick 2007: 149) who is exposed to a conflict between foreignness and proximity. On the one hand, foreignness makes it difficult to understand peculiarities and become familiar with the field; but on the other hand, a process of approximation offers the possibility of acknowledging routines and aspects which are taken for granted by insiders. The foreigner is not acquainted with the normal courses of action so that the normal is more likely to be acknowledged and questioned. Being a foreigner also makes this questioning of the normal more accepted. Furthermore, the openness and welcoming nature of most households towards a foreign researcher facilitated the research. The local households did, for instance, not become tired of being addressed by the researcher (except for a few occasions when interviews exceeded a certain length or when people where busy with working). This was in many cases a consequence of being foreign and interesting to the interviewees. Consequently, groups produce one reality which is more easily accessible to foreigners and another reality which is more reserved for the insiders (Flick 2007). Therefore a stepwise adoption of an insider’s perspective, as described before, is essential for drawing profound scientific conclusions.

In conclusion, Chapter 4 demonstrates the methodology of the current research project along the lines of pertinent research concepts. It has been shown that the given conceptual and thematic framing of this research requires a multi-faceted and versatile methodological approach which extends beyond a solely qualitative or a mere quantitative paradigm. A mixed-method approach makes it possible to address both qualitative and quantitative paradigms in an integrated way and has therefore been shown to be appropriate in the current research project. This mixed-methods paradigm facilitates a unique and adapted methodological framework for a combination of a deliberately chosen set of methods and a conscious and flexible process of research. It has thereby provided an appropriate and reliable data basis to arrive at relevant empirical findings for the given research context. These empirical findings will be presented and interpreted in the next part (II) of this thesis.

PART II - PRESENTATION AND INTERPRETATION OF THE EMPIRICAL FINDINGS

A study from the first project phase of WISDOM which was concerned with the vulnerability of rural households in Tra Cu district (i.e. the research area of this thesis) indicated that "it is necessary to apply a [...] holistic and multi-disciplinary approach for future adaptation strategies that can benefit different social groups within the context of climate change" (Nguyen Thanh Binh 2010: 38). The present research has taken this claim up by developing a multi-dimensional conceptual framework and an adapted mixed-method approach (presented in the previous chapters 2 and 4). The collected empirical data have their origin in this more "holistic and multi-disciplinary approach". The data analysis was guided by this framing and by the research foci of this study (see section 1.3). Those foci include (1) response mechanisms to water-related threats, (2) strategies in a rural agrarian context, (3) a comparison of government- and household-led processes and perceptions, and (4) disparities between different socio-economic and ethnic groups. The study therefore chose to select the research sites and the social comparison groups according to differences in the production type, prevalent hazard, poverty classification, ethnicity and the local government. In addition to that, other indicators of response capacity, especially the education level, were also selected as distinguishing features whenever interesting and relevant differences were observed. This has provided the basis from which to derive the empirical findings.

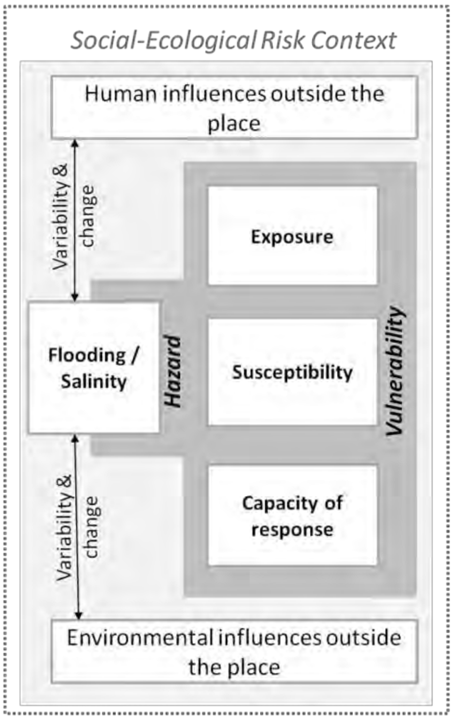
The conceptual framework acts as common theme of the subsequent chapter. It has been developed in the vein of 'Grounded Theory', as outlined in the previous chapters 2 and 4. This means that the following description of the empirical findings is *not* meant to verify or falsify existing theories but is guided by a theory which emerged continuously throughout the process of data collection and analysis. Existing theoretical and conceptual works merely inspired but did not dictate the concept. The theoretical framing of this research has aimed to 'fit' and 'work' as Glaser and Strauss (1967: 5) describe the central goals of grounded theories. It can predict, explain and is relevant. The theory therefore provides a pertinent basis for structuring the empirical analysis closely along the lines of its core variables. Firstly, the social-ecological risk context will be outlined. A presentation of the empirical findings in accordance to the social-ecological vulnerability concept presented in section 2.4.2 will depict the context in which coping and adaptation strategies take place. This illustration of the context is composed of a characterisation of the hazards and vulnerability patterns on site. Secondly, household decision-making processes and individuals' evaluations will be presented following the guiding principles provided in the adopted socio-cognitive decision-making model outlined in section 2.4.3. This presentation will convey a better understanding of how decisions are made and how strategies are subjectively evaluated. Thirdly, formal and informal response mechanisms are explored in the light of their implementation and outcomes. This section is guided by the evaluation framework presented in section 2.4.5 and aims to grasp the quality of outcomes and processes for different stakeholder groups, dimensions and timescales. Fourthly, the empirical findings will be summarised and interpreted against the background of the overall Mekong Delta context and conceptual implications (see part I).

The presentation and interpretation of the empirical findings in part II is accordingly the core of this research and forms another cornerstone on the way towards an understanding of how and why rural stakeholders in the Vietnamese Mekong Delta cope with and adapt to changing water-related risks in a beneficial way.

5 Social-ecological risks – empirical results of a vulnerability-centred analysis

Water-related risks determine the lives of the people in the research area considerably and demand a wide range of governmental and household-level actions. In order to understand and evaluate these measures it is important to first grasp "who" responds "to what", as suggested in the anatomy of adaptation and coping (Smit et al. 1999: 204; see section 2.4.1). This is essential for achieving a context-specific evaluation of strategies, understanding the reasons and relevance of taking action, and arriving at concrete locally adapted recommendations for overcoming barriers at various levels. Risk is defined as a function of those two variables, i.e. vulnerability - "who" - and the hazard - "to what" (see e.g. Blaikie et al. 1994; section 2.1.1). The "who" represents vulnerable households in the research area. The "to what" refers to the water-related hazard in the light of past and future changes. Analysing these two components will help along the way of finding an answer to the research question: "How are coping and adaptation processes on site interrelated with differential vulnerabilities to water-related hazards". This analysis will be based on the social-ecological vulnerability concept presented in section 2.4.2. It allows an integrated empirical analysis of social and ecological processes taking place on various spatial and temporal scales. In rural areas of the Mekong Delta where the social and ecological spheres are closely intertwined, an analysis along these lines is of particular importance.

The following chapter will first present water-related hazards (i.e. tidal flooding and saline intrusion) in the light of past events and future predictions to understand the "to what". The second part of this chapter will analyse the drivers of vulnerability and characterise the agents ("who") according to the three main components of vulnerability as defined in section 2.4.2, i.e. exposure, susceptibility and capacity of response (see Figure 5.1).



Research questions addressed in this section:

RQ1: How are coping and adaptation processes on site interrelated with differential vulnerabilities to water-related hazards?

→ What determines the vulnerability of households to water-related hazards in the research area and how do differential vulnerability patterns influence the coping and adaptation strategies on site?

- Hazards
- Exposure
- Susceptibility
- Capacity of response

Figure 5.1: Conceptual basis for analysing the risk context and answering related research questions (Source: author, conceptualisation based on Turner et al. 2003; Gallopin 2006)

5.1 Water-related hazards in the light of past events and future predictions

An understanding of the overall risk context requires, according to the conceptual framework of this study (see section 2.4.2), firstly, an understanding of the most prevalent hazards on site. A hazard is one of the two components forming the risk context; it is defined as a "potentially damaging phenomenon" (see definition in section 2.4 based on UN-ISDR 2004; Turner et al. 2003). In the Coastal Zone, where the research area is located, drought, whirlwinds, heavy rainfall and most importantly tidal flooding and saline intrusion are the most prevalent water-related hazards (see section 3.2). Tidal flooding and saline intrusion will therefore be analysed more in-depth in the subsequent paragraphs. Both hazards stem from three main sides: firstly, lying at the low end of the large Mekong River, coastal flooding and saline intrusion are determined by the hydrological regimes upstream which influence water levels in the rivers and canals downstream. Secondly, being also located close to the sea, the research area is influenced by the tide of the South China Sea. And thirdly, local rainfall patterns shape the water regime and accordingly also tidal flooding and salinity (see sections 3.1.1 and 3.2 for more details). In the following section, these hazards will be presented against the background of both past events and future scenarios.

5.1.1 History of tidal flooding and saline intrusion

Tidal flooding occurs most commonly between September and December, i.e. in the late rainy and early dry season. At that time, high precipitation often coincides with a large inflow of water from upstream. High tides contribute to even higher water levels leading to a maximum at the beginning and middle of the lunar month. In late January, February and March of 2011 and 2012 some rather unusual peaks in water levels occurred, as Figure 5.2 depicts for Cau Quan station[44] close to the research area. This led to unusual flood events in the dry season. The highest water levels were recorded in 2011. In that year, precipitation was exceptionally high and the water discharge from upstream was far above normal. In this rainy season the northern Mekong Delta provinces experienced the most severe flooding since the large flood in 2000 (see section 3.2.1). Data from the Hydro-Meteorological Centre (HMI) in Tra Vinh show a maximum water level of 184 cm – the highest value at Cau Quan station of the previous 30 years (HMI Tra Vinh 2012a, 2012b). Moreover, the HMI data reveal that there were more days of flooding[45] than in previous years, i.e. 18 days in 2011 compared to, for instance, 14 days in 2010.

Saline intrusion typically occurs in the dry season between February and June when precipitation and water discharge from upstream are at their lowest. This allows saline sea water to intrude further inland than in the other seasons[46]. The highest salinity levels are commonly measured in April (HMI Tra Vinh 2012b; DONRE Tra Vinh 2012; Le Anh Tuan et al. 2007). Being also under the influence of the tidal regime, salinity reaches its peaks at the beginning and middle of the lunar months in this season. The spring tide can also be reinforced by the Gio Chuong, a south-western wind from the South China Sea, which occurs from December to January (see section 3.2.1). The HMI records of the average daily salinity levels for the years 2010-2012, for example, show that the salinity levels are higher than the defined threshold for irrigation water[47] throughout most of the dry season. These data also reveal that variations in timing and intensity can be significant (see Figure 5.3). In 2011, for instance, it was

[44] Cau Quan station in Tieu Can district is a gauging station close to the Can Chong gate which is one of the most relevant sluice gates for the research area.
[45] The Hydro-Meteorological Centre defines flooding in Tra Vinh as water levels of more than 160 cm (AI-P-HMI-0417).
[46] Regular measurements of salinity levels were undertaken in these months only (February to May) until 2012.
[47] Drinking water threshold: < 0.5 g/l (non-saline); irrigation water: 0,5-1,5 g/l (slightly saline); primary drainage water and groundwater: 1,5-7 g/l (moderately saline); secondary drainage and groundwater: 7-15 g/l (highly saline); very saline groundwater: 15-35 g/l (very highly saline); seawater: > 35 g/l (brine) (Omani 2005: 6).

reported that salinity was already at a high level in January (AI-P-HMI-0417[48])[49]. The salinity levels in 2012 were, in contrast, low until April (mainly due to high water availability from upstream) and revealed only two comparably small peaks until June. On average, the salinity levels were highest in 2010 (compared to the last six years). The average and maximum records were higher than in 2011 and 2012 for the vast majority of days. In March 2010, the highest salinity level of the last six years (11.8 g/l) was measured at Cau Quan station.

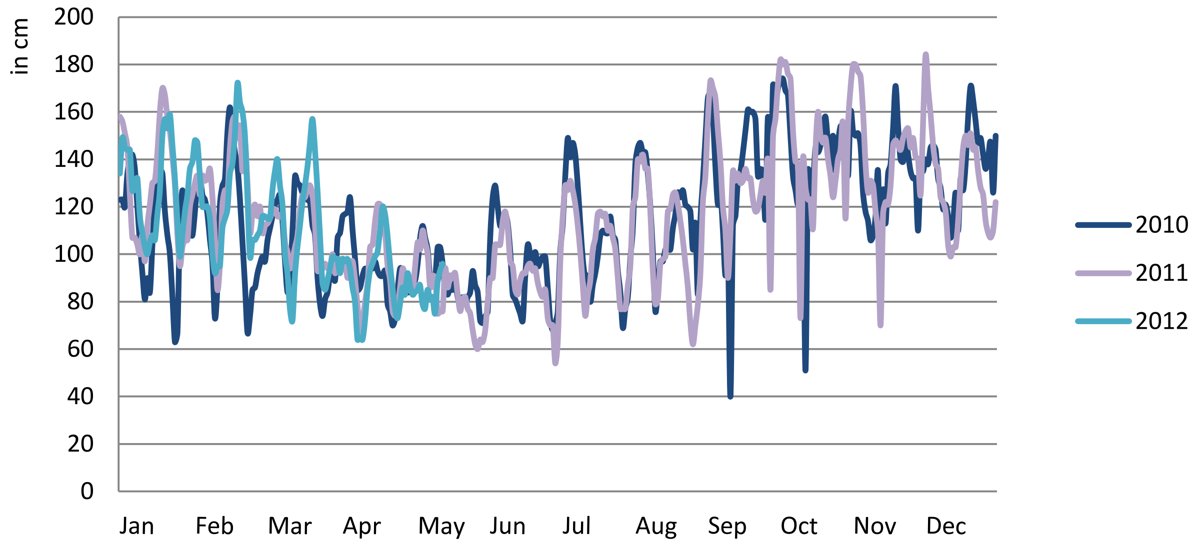


Figure 5.2: Daily maximum water levels at Cau Quan Station for the years 2010, 2011 and 2012[50] (Source: author, based on data from HMI Tra Vinh 2012b)

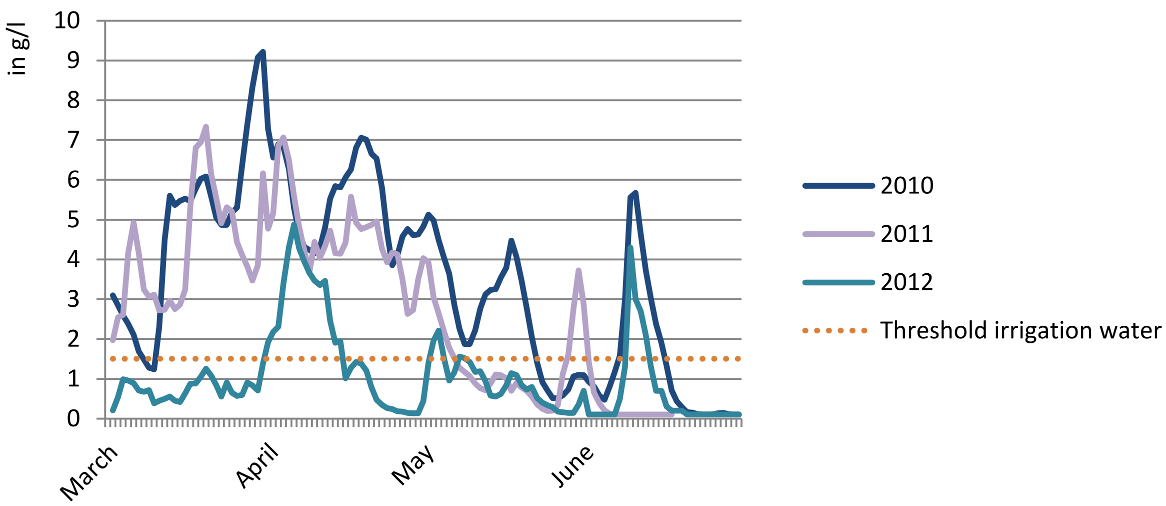


Figure 5.3: Average daily salinity levels at Cau Quan Station between March and June for the years 2010, 2011 and 2012 and the defined threshold for irrigation water (Source: author, based on HMI Tra Vinh 2012a; Omani 2005: 6)

[48] The interviews on province level are coded as followed: "AI": Authority Interview; "P": Province level; "XXX": name of the institution; "mmdd": date of interview.
[49] For that reason, the Hydro-Meteorological Centre started to take records from January onwards in 2012.
[50] For the year 2012, only measurement data until May was available at the HMITra Vinh.

5.1.2 Future Scenarios

Against the background of climate change, tidal flooding and saline intrusion in the research area are expected to increase in intensity, frequency and variability. Being a low-lying coastal region, sea level rise is a major concern in the region (see Map 5.2). In Tra Cu district, a sea level rise of 65 cm[51] is predicted to inundate nearly 13% of the entire district area (DONRE Tra Vinh 2012). Storm surges, which are anticipated to increase in intensity and frequency, can periodically raise the sea level even further (ibid.). Moreover, precipitation patterns will presumably change. In the medium emission scenario for 2100, Tra Vinh is predicted to experience in the dry season between December and February nearly 11.5% less rain (20% in the A1FI high emission scenario), whereas in the rainy season precipitation is expected to increase by 12.7% between June and August in the medium emission scenario (21.6% in A1FI scenario) (DONRE Tra Vinh 2012). The temperature in Tra Vinh province is predicted to increase in all seasons by a yearly average of 2.2°C in the B2 scenario (MONRE 2012). Furthermore, the variability of both precipitation and temperature is likely to increase.

In conclusion, higher temperatures, less precipitation in the dry season and sea level rise will most likely increase the danger of saline intrusion for the research area. The peril of tidal flooding is also expected to be reinforced due to sea level rise and increased precipitation in the rainy season. Both of these hazards will increase not only in intensity but also in variability (DONRE Tra Vinh 2012).

5.2 Vulnerability of households in the research area

A description of the hazards on site explains one side of the risk context. The second variable in the risk function is vulnerability (see e.g. Blaikie et al. 1994; section 2.1.1). In section 2.4, it is defined as the "endogenous and dynamic character of a system which determines the exposure, the capacity to respond, and the scope of impacts related to hazards" (definition based on UNU-EHS 2004 in Thywissen 2006: 34 and Turner et al. 2003). Following this definition which is based on the social-ecological vulnerability concept introduced in section 2.4.2, the analysis of vulnerability will cover the three main components: 1) hazard exposure, 2) susceptibility and 3) capacity of response (see Figure 5.1). Each of these components will be reflected against the background of past patterns and future scenarios. An understanding of vulnerability provides, on the one hand a basis, for understanding why and how actions are taken. On the other hand, an identification of vulnerability indicators is prerequisite for a vulnerability-oriented evaluation concept. It facilitates a description of the outcomes and impacts of risk-related strategies along the lines of the identified vulnerability indicators.

The specific vulnerability indicators for this analysis stem from theoretical literature, local reports and empirical findings. An analysis of the reported impacts of flooding and salinity in the research area is in this regard of particular importance because it points out present and future vulnerabilities. The vulnerability assessment will therefore start with an analysis of past hazard impacts and revealed vulnerabilities before characterising the research area according to exposure, susceptibility and capacity of response patterns.

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[51] In the high emission scenario A1FI, a sea level rise of 65 cm by 2100 was predicted for Tra Vinh province in the MONRE climate change scenarios of 2009. This was also taken as the baseline for impact predictions in Tra Cu district (DONRE Tra Vinh 2012). In the updated climate change report by MONRE from 2012, the sea level is assumed to rise even more, i.e. already in the B2 scenario a rise of 59-70 cm is predicted for the coastline from Ke Ga to Ca Mau, and in the high emission scenario it is even up to 99 cm (MONRE 2012; see section 3.2.2).

5.2.1 Past hazard impacts and revealed vulnerabilities

An analysis of past impacts can reveal valid indicators for vulnerability; indicators which are more specific to the current research context than those suggested in theory. Moreover, past impacts can indicate potential future impacts of salinity and flooding. They are therefore an important reference point in the assessment of changing vulnerability patterns. For these reasons, the vulnerability analysis will begin with a characterisation of past impacts.

Large dike systems divide the area into freshwater zones inside the dike and saltwater areas outside of it[52]. In the saltwater area, people experience tidal flooding and saline intrusion throughout most of the year. Inside the dike, people and their farms are meant to be protected from saline intrusion and tidal flooding[53]. Map 5.1 shows how the areas outside the dike in Don Xuan were affected by water levels with a salinity content higher than 4 g/l throughout the whole dry season, using the example of the year 2005; in Kim Son Commune these levels were maintained for several months during that year. The areas inside the dike in Ngoc Bien did not experience salinity levels to this extent at all; and in Don Xuan farmers inside the dike had to deal with salinity levels greater than 4 g/l for only one or two months in 2005 (if at all). Nevertheless, in some years when salinity levels are high and the sluice gates are not operated properly, highly saline water was able to reach the fields inside the dike. This happened most recently in the year 2011.

Among all the sectors considered (agriculture, aquaculture, housing, infrastructure and health), the interviews, local reports and on-site observations revealed that agriculture and aquaculture were most affected by flooding and salinity. In 2011 (the focus of this research), the amount of production lost due to salinity was significantly higher than due to tidal flooding. Tidal flooding caused more than 80 % of production losses for 40.7 per cent of all households (p[54] ≤ 0.01); in the case of saline intrusion, more than 90 % lost more than 80 % of their production ($p \leq 0.01$). In contrast to the severe impacts on agriculture/aquaculture, only a few houses and forms of infrastructure were affected by flooding. These impacts only occurred in areas outside the dike. Moreover, no interviewee reported any detrimental effects on overall health, from either flooding or salinity. Vulnerability will therefore only be analysed in the context of the agricultural and aquacultural production sphere.

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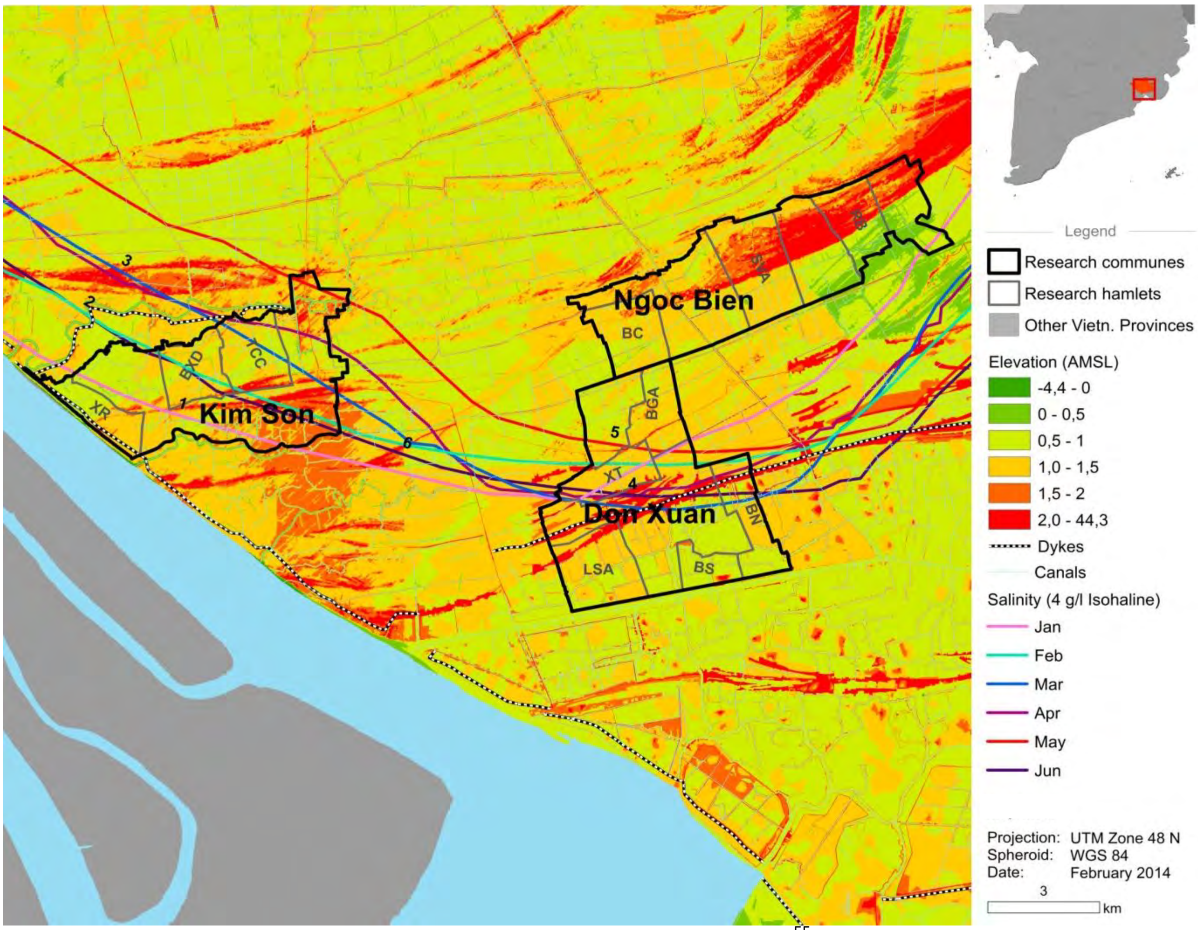
[52] The most important dike is the Nam Mang Thit dike (see section 3.1.2 for more details about this dike). A red line of higher elevation going through Don Xuan commune in Map 5.1 depicts the dike and therefore also shows the main division between freshwater areas in the northern and saltwater area in the southern district area.

[53] Noone reported flooding in the areas inside the dike.

[54] *p* represents the significance level observed for the described relationship between the variables. The statistical significance tests are based on Pearson's Chi Squared test – like the ones in the following pages.



Map 5.1: Elevation and saline intrusion map (year 2005) of Tra Cu district[55] (Source: author, based on data from DONRE Tra Vinh 2005, hamlet borders are based on PC Don Xuan 2011e and participatory hamlet risk maps, M. Schwab 2012)

The impacts of **tidal flooding** were most severe in the years when the flood levels were high, came unexpectedly, and stayed for a long duration. The impacts were substantially reinforced when the communal or individual embankment (levee)[56] failed. This could happen in two ways. The waters either overtopped the crest of the embankment or the interplay of wind and water breached the embankment. Such levee breaches happened when part of the embankment broke away. This left an opening for the water so that it could intrude into the field.

For **sugarcane**-producing households, the survey showed that the most recent flood/salinity occurrence caused an average of 55 % production loss and 23 % of the households lost all their production ($p \leq 0.05$). The production-centred interviews and the cost-benefit analyses (CBAs) further reveal that the sugar content was decreased when saline water entered the fields and stayed there for too long. For that reason, the price of the product fell to a lower level than normally. Increased costs for repairing the damaged or broken earth walls added to the income losses from the crop failure and the lower output prices. The CBAs also demonstrated that further costs occurred because more fertiliser had to be applied or because crops had to be reproduced. Many of the interviewees and group discussion participants also mentioned that salinity affected the soil quality of the land in the following seasons and was often accompanied by plant diseases. This reduced productivity and

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[55] **Hamlets**: Kim Son: XR=Xoai Rum, BXD=Bai Xao Doi, TCC=Tra Cu C / Don Xuan: LSA=Lo Soi A, XT=Xom To, BGA=Ba Giam A, BS=Bau Sau, BN=Ba Nhi / Ngoc Bien: BC=Ba Cum, SVA=Sa Van A, RB=Rach Bot.

[56] Communal embankments protected several fields and were constructed and maintained by either a group of farmers or by the government. The individual embankment (which surrounds each field/pond) was, in contrast, meant to protect only one field/pond and was therefore also only constructed and maintained by the farmer who owned it (or by another farmers who’s field bordered it).

increased the costs for pesticides, fertiliser and land preparation in the following year(s).

In **aquaculture** hamlets, an average of 81 % of the production was lost, and nearly half of all affected interviewed households lost the whole production ($p \leq 0.05$). This resulted from the fact that, firstly, shrimps, fish and crabs escaped from the pond once the individual embankment was breached; and secondly, households lost production because the shrimps died due to a "disturbed water environment in the pond", as most of the households termed it (e.g. HI-S-BN-L131, HI-S-BN-L39)[57]. This was said to comprise high salinity levels, high turbidity, or a high level of organic and inorganic pollutants[58]. The CBAs showed that the costs of repairing the breached or damaged embankments around the pond were even higher than for sugarcane production and often seemed to exceed the financial capacity of households (see section 7.1.2 for more details).

In the rice-producing hamlets, **saline intrusion** brought about major impacts only in the year 2011. In that year, farmers unknowingly pumped saline water from the canals in their fields. In the beginning of 2011, salinity levels of reportedly more than 3 g/l were observed in the canals (AI-H-BC-0306). The saline water came from the South China Sea or from the Hau River and discharged inland via first, second and third level[59] canals until it finally reached smaller canals (HI-S-XT-S143). The survey revealed a significant negative correlation between the amount of production lost due to salinisation and the distance to the nearest canal[60]. It was further reported that the size/level of the nearest canal increased the extent of losses. The higher the canal level, the earlier saline water arrived in the field and the higher the losses were, according to experts and authorities. The irrigation with saline water coincided with the fact that the rice was only 10-15 days old at that point (according to the CBAs) and therefore highly sensitive to saline water. The result was that the surveyed farmers lost an average of 96 % of their production due to saline intrusion ($p \leq 0.05$). In the following season, the soil quality was still lower than normal and reduced the productivity of rice cultivation. In addition to this, the interviewed households said that they required more herbicides and fertiliser for production in the following rice seasons, which raised the costs (GD-H-SV-1229; CBAs).

5.2.2 Hazard exposure

The previous section showed that flooding and salinity had severe impacts on the research areas. These impacts were not the result of the existence and the characteristics of these hazards alone but were produced by the endogenous and dynamic character of the system in question and existing coupling processes which were previously described as vulnerability (UNU-EHS 2004 in Thywissen 2006: 34; Turner et al. 2003, in section 2.4). One of the three components of vulnerability is exposure. Only if households or objects which are of value to those households are exposed to tidal flooding and salinity will they also experience the impacts (Birkmann 2013: 25; IPCC 2012: 559; see definition in section 2.4). The following section will indentify which "people, livelihoods, environmental services and resources, infrastructure, or economic, social, or cultural assets fall within the geographical range" (see section 2.4) of these hazards. This "spatial dimension of vulnerability" will be analysed by identifying, firstly, the indicators of exposure, and secondly, the exposure patterns

[57] The household interviews on a commune level are coded as followed: "HI": Household Interview; "X": interview type (E=Exploratory, P = Pretest, S=Survey, CB=Cost-Benefit interviews, M=Migration interviews, KI=Key informant interviews); "XX": Hamlet name (Ngoc Bien: BC= Ba Cum, RB= Rach Bot, SVA= Sa Van A; Kim Son: TCC= Tra Cu C, XR: Xoai Rum, BXD= Bai Xao Doi A; Don Xuan: BGA= Ba Giam A, XT: Xom To, BS=Bau Sau, BN= Ba Nhi, LSA= Lo Soi A), "Xn" Sequence number /Questionnaire ID.

[58] The exact reasons for a "disturbed water environment" could not be analysed within the scope of this study because no water quality samples were collected.

[59] The canals are categorised according to their size as first, second, third and fourth level canals. Second level canals divert from first level canals, third level from second level canals, and fourth level from third level canals.

[60] Spearman-Rho coefficient (C^{SR}) = -1.94; Significance level $p \leq 0.05$ for the variables 'distance to the nearest canal' (interval) and 'percentage of production lost' (ordinal) - both not normally distributed.

on site.

The **indicators** were derived from the reviewed literature (see sections 2.4.2, 3.1.1 and 3.3.1) and from the observed impact patterns in the research area (see previous section 5.2.1). This analysis revealed that the hydrological and geomorphologic settings are decisive determinants of exposure. The low-lying nature of the region, the location in a large river delta, the proximity to the South China Sea, and the wide river and canal network were, in this regard, the most important determinants of exposure to tidal flooding and saline intrusion, even more so in the light of an expected sea level rise (the same holds true for most of the areas in the Coastal Zone of the Mekong Delta; see section 3.1.1 for more details). On a local level, the elevation of an area plays a more important role in the context of tidal flooding than in the context of saline intrusion (as saline water is pumped into the fields). The threat of sea level rise gives increasing significance to this indicator and will expose areas to tidal flooding which were not exposed in the past. The following paragraphs describe the reasoning behind the selection of indicators and characterise the research area along the lines of these indicators.

The large **dike systems** which had been constructed in the 1990s in Tra Cu district altered the exposure patterns in the region substantially (see section 3.1.2). The areas inside the dike were protected from tidal flooding and saline intrusion throughout most of the year whereas the areas outside the dike were still exposed, sometimes to an even higher degree than before (see section 5.1). The intensity and timing with which saline water and tidal flooding reached the fields was reportedly dependent on the **distance of the field to the sea**, the level of the nearest irrigation canal, and the proximity of the field to this **canal**. This was confirmed by the revealed impacts outlined in the previous section 5.2.1. The closer the field was to the nearest canal, the higher the production losses were for the farming households. The semi-structured interviews with different stakeholders also revealed that the production losses were higher, the larger the nearest canal, i.e. fields close to first level canals lost more of their harvest than fields located close to second or third level canals. For sugarcane and aquaculture areas, the extent of losses was mainly related to higher flood levels and water pressure as well as to a greater likelihood of being affected at the high level canals. In the case of rice production, the extent of losses was, according to the semi-structured interviews with authorities and households, also related to the fact that saline water arrived earlier in the fields close to larger canals. For this reason, the rice crop was affected at a stage of higher sensitivity in the cropping cycle. The location of the production area and the hydrological and geomorphologic setting was, according to authority and expert interviews as well as survey results, not determined by the socio-economic characteristics of households. For this reason, socio-economic features were not analysed as indicators of local exposure patterns.

Present and past exposure patterns

Kim Son commune has several low lying areas and is located right at the large Hau river estuary in close proximity to the open sea (see Map 5.1). The commune was therefore widely exposed to tidal flooding and saline intrusion. Since 2006 it has been exposed to a lower degree than before because five smaller dike systems were built in the commune (AI-C-KS-T-0420[61]); others are planned to be built in the next years (AI-H-TC-0419, AI-H-TC-1104). The majority of fields (between 50% and 75%) in the researched hamlets lay close to the canal. Houses were only exposed to flooding in some areas of Xoai Rum hamlet. In the other hamlets, the houses were in locations of higher elevation. Table 5.1, Map 5.1, and the hamlet resource risk maps in Annex 12.7.1, 12.7.2, and 12.7.3 describe the exposure patterns of each researched hamlet in Kim Son in more detail.

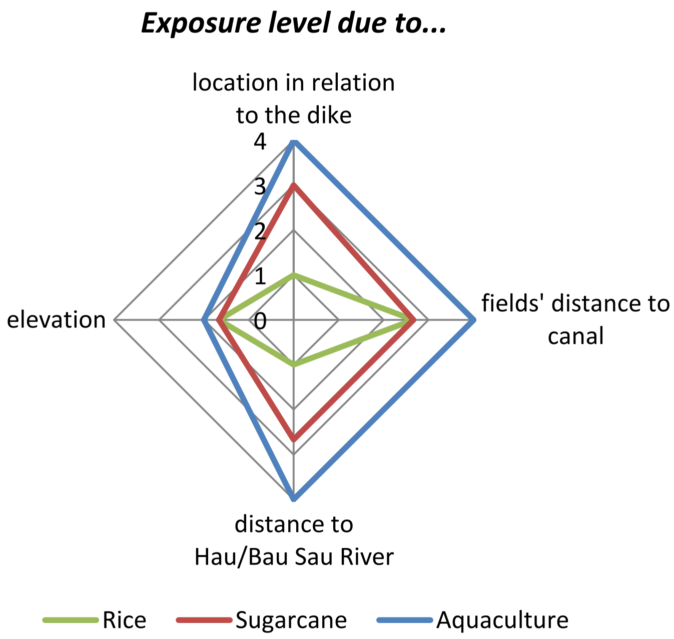
[61] The authority interviews at a commune level are coded as followed: "AI": Authority Interview; "C": Commune level; "XXX": Initials of the commune name; "X": initial of the interviewee (optional, only if there were more interviews at that day in that commune), "mmdd": date of interview.

Table 5.1: Exposure profiles of the researched hamlets[62]

Commune	Hamlet	Location in relation to the dike	Percentage of fields lying close to a canal	Distance to the Hau River / Bau Sau River	Elevation (AMSL)
Kim Son	Xoai Rum *(XR)*	Mainly outside	Ca. 75%	0.0 – 1.0 km	1.0 – 1.5 m
	Bai Xao Doi A *(BXD)*		Ca. 50%	1.5 – 5.5 km	0.5 – 2.0 m
	Tra Cu C *(TCC)*		Ca. 75%	4.3 – 6.3 km	0.5 – 1.5 m
Don Xuan	Lo Soi A *(LSA)*	Outside	Ca. 80 % (large + small canals)	0.0 – 2.1 km	0.5 – 1.5 m
	Bau Sau *(BS)*		Ca. 70% (large river/canal)	0.0 – 1.5 km	0.5 – 1.0 m
	Ba Nhi (south) *(BN)*		Ca. 80%	0.0 – 1.5 km	0.5 – 1.5 m
	Ba Giam A *(BGA)*	Inside	Ca. 70%	4.3 – 6.3 km	0.5 – 1.5 m
	Xom To *(XT)*		Ca. 30%	3.3 – 4.2 km	1.0 – 1.5 m
Ngoc Bien	Ba Cum *(BC)*		Ca. 70%	6.3 – 8.2 km	1.0 – 2.0 m
	Sa Van A *(SVA)*		Ca. 70%	7.1 – 10.2 km	0.5 – 40.0 m
	Rach Bot *(RB)*		Ca. 50%	8.3 – 10.6 km	- 4.0m – 40 m

4 - Very exposed 3 - Exposed 2 - Moderately exp. 1 - Little exposed 0 - Not exposed

Source: author, based on DONRE Tra Vinh (2005), participatory hamlet risk maps (M. Schwab 2012)



Explanation: The labelling of the axes depicts the average degree of exposure as classified in Table 5.1, i.e. 0=not exposed to 4=very exposed. The size of the polygon represents the overall degree of exposure in the respective production area.

Figure 5.4: Illustration of the exposure profiles of the production areas based on Table 5.1 (Source: author, based on DONRE Tra Vinh 2005, participatory hamlet risk maps, M. Schwab 2012)

Don Xuan commune is located closer to the sea than the other two research communes but did not lie directly at the Hau River (see Map 5.1). It is connected to the Hau River via the large Bau Sau River on the southern border of the commune. Don Xuan is divided by the South Mang Thit dike into a

[62] The degree of exposure (depicted in different shades of grey) is based on an indicator-based judgement relative to the other hamlets.

freshwater and a saltwater zone (see the red line through Map 5.1 and section 3.1.2 for more details about this dike). The potential to be affected by tidal flooding and saline intrusion is therefore highest in the southern area outside the dike. The low elevation of this area **outside the dike** adds to the already high exposure. In the research hamlets of this region, between 70 % and 80 % of the fields are located either at a canal or at the large Bau Sau River. Here, both residential and production areas were exposed to tidal flooding (Table 5.1, Map 5.1 and the hamlet resource risk maps in Annex 12.7.9 and 12.7.10 describe the exposure patterns of each researched hamlet in more detail).

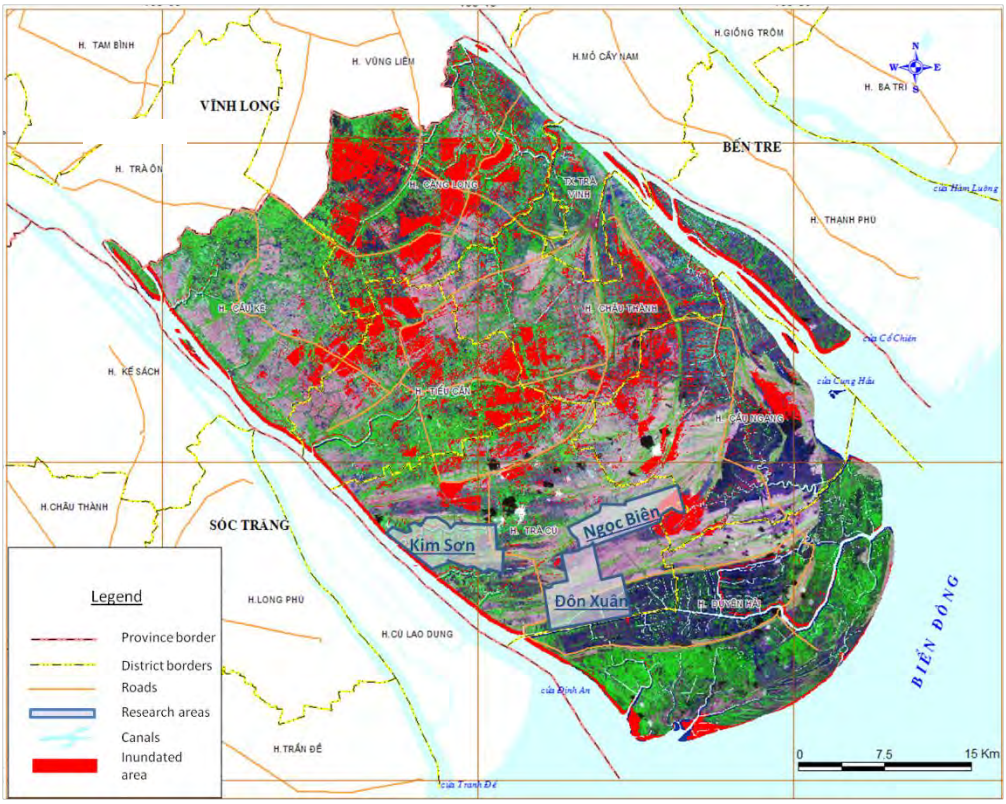
The research hamlets **inside the dike in Don Xuan and Ngoc Bien** were less exposed to tidal flooding and saline intrusion. Despite being largely protected by the dike, there is still the possibility of saline water reaching the irrigation canals, however. This was the case in 2011 (see section 5.1). The distance to the large rivers is higher than in the other communes and the areas are located at higher elevations. In three of the researched hamlets, around 70% of the fields were located close to smaller canals; in the other two, 30% respectively 50%. The residential areas in all these hamlets were located close to the streets at a higher elevation and were therefore not affected by tidal flooding. Table 5.1, Map 5.1, and the hamlet resource risk maps in Annex 12.7.4 to 12.7.8 describe the exposure patterns of each researched hamlet in more detail.

The exposure polygons depicted in Figure 5.4 show, in summary, that rice producers are the least exposed (area delineated by a green outline) whereas aquaculture producers are the most exposed to tidal flooding and salinity intrusion (area delineated by a blue outline).

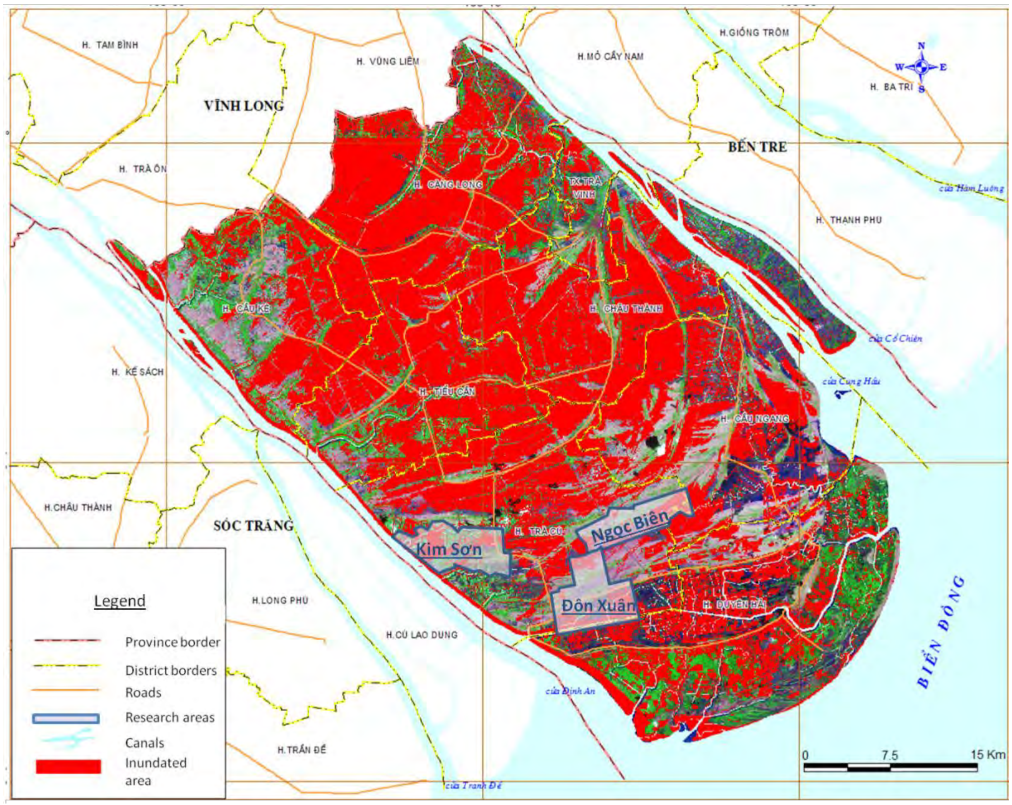
Scenarios for future exposure patterns

From the environmental perspective, anticipated **climate change** will most likely bring about notable changes in the exposure patterns. Sea level rise is of particular importance in this respect. A sea level rise of 70 cm (likely scenario for 2100[63]; see section 3.2.2) is expected to inundate most of Rach Bot and parts of Sa Van A (both in the rice-producing commune Ngoc Bien) which are among the lowest-lying areas in the whole province (see Map 5.2a). But the other hamlets will also be more exposed to tidal flooding as water levels in the canals and rivers will rise. An expected increase in rainfall in the rainy season will most likely enhance this effect (MONRE 2012; DONRE Tra Vinh 2011; see section 3.2.2). If sea levels rise by 100 cm (likely scenario for 2100 in the high emission scenario), a radically different picture will appear according to MONRE (2012). These extra 30 cm more would inundate nearly the entire Tra Vinh province and would thus also inundate most of the research areas - yet to a lesser degree than most other areas in Tra Vinh due to the higher elevation and the Nam Mang Thit dike (see Map 5.2b).

[63] Based on the B2 scenario for the Mekong Delta, a sea level rise of 62-82 cm is predicted for 2100 (MONRE 2012).



a)



b)

Explanation: The depiction of the inundation areas is based on two sea level rise scenarios which are laid over a topographic elevation map. Infrastructural development plans (e.g. sea dike, new embankments or canals) and hydrological factors (e.g. tidal influences, storm surges, flooding or river regimes) are not considered in this model.

Map 5.2: Inundated areas in Tra Vinh province for (a) 70 cm and (b) 100 cm of sea level rise (Source: translated and added to by the author, data and cartography by MONRE 2012)

Resettlement was also expected to change the current exposure patterns in the research area. It was likely to be enforced as part of the plans to build an industrial zone and a large harbour in the southern parts of Tra Vinh province by 2020 (Tra Vinh Economic Zone Authority 2012). The so-called Dinh An economic zone is, according to the plans (PC Don Xuan 2011e: 52), estimated to cover around 43% of the total area of Don Xuan commune (of a total area of 15,400 ha; see Annex 12.10 for a detailed map of the planned Dinh An economic zone). To give way to this economic zone, a major resettlement of the local population would be required. This would affect Bau Sau, Ba Nhi and most notably Lo Soi A hamlet (PC Don Xuan 2011e; AI-H-LS-0331). Despite the fact that it was not long before the construction was planned to start, the households and the local authorities mentioned that they did not know when resettlement would start, who would be affected, and to which place they would be resettled (e.g. AI-C-DX-N-0418, AI-H-LS-0331).

Kim Son commune was also likely to be affected by forced resettlement in the near future. Being located directly at the Hau River made it part of the area where the large sea dike is planned to be built (AI-C-KS-T-0420; see section 3.1.3 for more details on the sea dike). For this reason, several households were expected to be resettled in the following years. There was no information available on when this would be the case, however (AI-C-KS-T-0420). In the same hamlet, an oil depot was planned to be built by Cawaco Company. The construction plans state that around 40 ha of land would be required for the depot alone (PC Tra Vinh 2011; AI-H-7). Given an average production land area of 0.6 ha in Kim Son commune (see Table 5.3) and given that around one-third of the required land was at that time used as farmland (see HRMap-XR in Annex 12.7.3), more than 20 households would have to sell their farmland. Another third of the required land was residential land which means that many other (or the same) households would have to move away and build new houses. Where those households would move to and where or whether they would buy new farmland was not clear at that time.

5.2.3 Susceptibility

The previous section revealed substantial disparities in the exposure patterns of local households in the research area. Nevertheless, even if two households have the same or similar exposure profiles they might experience different impacts. The observation of hazard impacts showed, for instance, that areas inside the dike registered the highest losses (see section 5.2.1) - despite comparatively low exposure. An analysis of susceptibility, i.e. the second of the three components of vulnerability, can serve as an explanation for this. Susceptibility is defined as the "characteristics which determine the degree to which the livelihood system is modified or affected" by flooding or salinity (see definition of susceptibility in section 2.4; based on Gallopin 2006: 295; Birkmann 2013: 25). In the following section, the most relevant susceptibility indicators will be derived and will then serve as a basis for identifying susceptibility patterns in the research area.

The **susceptibility indicators** were, in the first place, deduced from the literature review (see sections 2.4.2 and 3.3.1). In a second phase, an analysis of the empirical data (most notably of the observed impacts outlined in section 5.2.1) facilitated the selection of the most relevant indicators for the research context, a specification of those indicators, and a detection of indicators which are not explicitly mentioned in the literature so far. This reasoning revealed that the degree of harm depends, firstly, on the sensitivity[64] of the main commodity produced in the dry/flooding season. Secondly, susceptibility depends on the diversity of income sources and production structures, i.e. the number of different commodities produced, and the number of plots/ponds possessed. For flood-affected households it is, thirdly, important to consider the quality of the embankments (see the following paragraphs for more details about the selection of each of those indicators).

[64] Sensitivity refers here to the FAO salt tolerance rating which describes salt tolerance by "plotting its relative yield as a continuous function of soil salinity" (FAO 1999: 135) and which uses the classification of sensitive, moderately sensitive, moderately tolerant or tolerant crops (ibid.: 137).

Sensitivity of the produced commodity

The literature concerned with vulnerable food and agricultural systems (FAO 1999; Lang et al. 2004; NSW - DPI 2006; Omani 2005) suggests that the degree to which the yield of production responds to external phenomena is determined by the sensitivity of the produced commodity. The empirical data reveal that this sensitivity was also of central importance in the current research context. The disparities in the average loss of the yield were significant between sugarcane, rice and aquaculture hamlets (see section 5.2.1). This seemed to be also determined by the characteristics/plant physiology of the commodity produced in the flooding/salinity season.

Rice is classified as a crop that is sensitive to saline intrusion (FAO 1999). It starts being affected by a salinity level of 3 g/l in the irrigation water and is significantly affected by a level of 6 g/l[65]. Growing rice in the dry season when the likelihood and severity of salinisation is highest therefore poses a substantial threat to production. As already outlined in section 5.2.1, nearly all of the households that produced rice in the dry season lost 100% of their production. The most relevant indicator of the sensitivity of a rice-producing hamlet is therefore the percentage of households that produced rice in the winter-spring season. The hamlet leaders of Sa Van A, Rach Bot, Xom To and Ba Giam A reported that between 40 and 50 % of all households grew winter spring rice in 2011 whereby most of them only started in 2010 and 2011 (AI-H-RB-1221, AI-H-SVA-1221, AI-XT-0114, AI-H-BG-0206). In Ba Cum which is less exposed to salinisation, it was nearly 70 % of the households and most of these households produced winter-spring rice already before 2010 (AI-H-BC-0210)[66] (see Table 5.2). In total, only 16 interviewed households in the rice-producing hamlets decided to grow vegetables in the dry season and only two others grew corn - all in addition to and not instead of rice production.

Sugarcane is categorised as only moderately sensitive to salinity (FAO 1999). For this reason, households which were located outside the dike and which were more regularly affected by salinisation and tidal flooding mainly chose to grow sugarcane and not rice. In Kim Son commune, for instance, there were only around 100 ha of rice production in contrast to 1,100 ha of sugarcane production (PC Kim Son 2011; see Table 5.2 for the shares in the different hamlets). In contrast to rice production, it was not saline intrusion in the dry season but tidal flooding in the rainy season which affected sugarcane production. Saline water was not pumped into the field; it either overtopped the crest of the individual and/or communal embankment or intruded because the embankment was breached. Once saline water reached the field, it inhibited plant growth. Nelson and Ham (2000) found that nearly 80% of variations in sugarcane yields were related to sodic and saline conditions (solutes which are also found in tidal flood water). The survey showed that the households in the research area lost an average of 55 % of their production due to tidal flooding - in comparison to 96% in rice-producing hamlets (see section 5.2.1 for more details)[67].

In areas which were located in the brackish water zone outside the dike, **aquaculture** was the dominant form of production. In the flooding season, the extensive production of giant freshwater prawns (*Macrobrachium rosenbergii*) prevailed (household survey; PC Don Xuan 2011a). This species requires brackish water in the early stages of the life cycle but needs fresh water for rearing the

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[65] The extent of being affected is also influenced by the specific rice variety. There are more saline-resistant varieties on the market which start being affected at a salt concentration of 5g/l. This study did not consider the impact-related differences between the rice varieties because it would have exceeded the scope of this research. Moreover, the fact that all households lost nearly all their production suggested that once saline water reached the canals it exceeded the critical threshold level for all rice varieties grown in the region.

[66] There was no analysis of crop sensitivity-related disparities between different socio-economic and ethnic groups because all interviewed households in the areas inside the dike produced rice – irrespective of their ethnicity, education level and poverty classification.

[67] There was no analysis of the crop sensitivity-related disparities between different socio-economic and ethnic groups because all interviewed households in Kim Son commune produced sugarcane – irrespective of their ethnicity, education level and poverty classification.

prawns at later stages. They can be reared in water with a salt concentration of 3-4 g/l but at the expense of lower outputs compared with freshwater conditions (New 2002). In addition to their sensitivity to higher salt concentrations, they are sensitive to pollution, particularly from agricultural chemicals. Tidal flooding can cause levee breaches or overtop the crest of an embankment. In these cases, the threat of being exposed to a higher level of salt concentration and water pollution is much higher than normal[68]. In Lo Soi A hamlet, a large share of households either produced rice (33 % of all interviewed households) or followed integrated rice - shrimp production (37 %) in the flooding season[69]. Rice production was not possible in Ba Nhi and Bau Sau hamlets, however. For integrated rice-shrimp production, the fields had been reshaped with a trench between the embankment and the rice field. The trench was connected to the river with a sluice gate and a trap. This enabled integrated rice-shrimp farming in the flooding season and saltwater aquaculture production in the dry season. The losses due to the most recent tidal flood event were higher for integrated rice-shrimp farming (on average 94 %) than for rice production (on average 78 % according to the household survey) and for freshwater aquaculture (on average 80 %).

Accordingly, rice seems to be more sensitive than freshwater aquaculture, and freshwater aquaculture seems to be more sensitive than sugarcane production.

Quality and height of the protective infrastructure

The previous section reveals that the quality and height of the embankment around the field/pond had a considerable effect on the extent of tidal flood-related impacts. The interviews point out that the quality, i.e. the use of solid construction material and thorough maintenance, reduced the chances of future levee breaches. Once a breach happened the likelihood of future breaches increased substantially. It was therefore important to repair the embankment in a timely and diligent fashion. The height of the dike determined whether high water levels and waves could overtop the crest of the embankment. In contrast to the rice production hamlets, where saline water was pumped into the fields, sugarcane and freshwater aquaculture were only affected by water of high salt concentration if the levee was either too low or had been breached due to high water pressure, flood level and/or waves. In addition to the protective infrastructure around the individual fields/ponds, the larger dikes at the commune or district level also influenced the extent of impacts. The review of the regional literature revealed that the extent of impacts from flooding is greatest if a dike is damaged or breaks (see section 3.2.3). Such incidences were also reported to have happened in the research area. The damage to the dike occurred in most cases due to the low quality of the dike, according to households and authorities. The following paragraphs will characterise the research area according to two susceptibility indicators: Firstly, according to the quality of the communal/district-level dike; secondly, according to the quality and height of the individual embankment around the pond.

In the first instance, the empirical data and reports revealed that there were several **communal and district level levees** in Don Xuan and in Kim Son commune which seemed to be of bad quality and were likely to breach or had already been breached in the past. The dike in Xoai Rum hamlet was one example of a dike of reportedly low quality. According to the hamlet leader, the dike had already been breached several times, despite the fact that it had only been built in 2004 (AI-H-XR-0404). In addition, the dike in Bai Xao Doi A also seemed to be of low quality, according to the hamlet leader (AI-H-BXD-1220), but it had not yet been breached, despite the assumed low quality. In Lo Soi A hamlet, the dikes at the river and at some canals were locally said to be of low quality and were likely to be breached, most notably the dike south of the Khoen River (HRmap-LS, AI-H-LS-0331).

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[68] The extent of losses due to these factors could not be analysed within the scope of this study.

[69] Considering that the commodity grown in the flooding season was the same for nearly all households, it was not possible to reveal disparities between different socio-economic and ethnic groups with regard to the production type.

Overall, all fields close to low-quality dikes therefore seemed to be more susceptible to tidal flooding than the other households, particularly those that were located by the dike in Xoai Rum hamlet[70].

A characterisation of the research area according to the second indicator, i.e. the quality and height of the **individual embankment** around the field/pond, revealed that 52 % of the flood-affected interviewees in the sugarcane hamlets reported a breached embankment due to the most recent tidal flood event[71]. In those cases, part of the levee suddenly broke or was gradually eroded away. The largest share of embankment breaches occurred among households which were not classified as poor (59% of all interviewees compared to 41% among poor households)[72]. Most of the households with a broken embankment said that this breach was related to the low quality of the building material. In sugarcane hamlets, the embankments were commonly made of coconut husks which decomposed over time. Many households did not renew the levee often enough so that it became increasingly prone to breaches. The other 48 % of the flood-affected interviewees had embankments which were not high enough so that water could overtop the crest of the levee. In the aquaculture hamlets, 54% of households seemed to have experienced flood events which did not breach but rather exceeded the dike. The other 46 % reported a levee breach. The CBAs revealed, in this respect, that they invested more in the maintenance of the embankment than the sugarcane producers. Moreover, only one third of the aquaculture farmers said that the breaches were related to a low quality of the embankment. They thought that the main reason for these losses was the extreme nature of the tidal flood event. The differences between the hamlets were substantial. In Ba Nhi around 64% of all interviewed households reported breached levees at their pond, whereas in Lo Soi A only 39% of the households seemed to be affected by a breach[73].

Accordingly, aquaculture farmers seemed to have repaired and maintained their embankment more thoroughly and regularly than sugarcane producers and were therefore less susceptible with regard to their individual embankment.

Number of different plots/ponds and commodities produced

A review of the literature in the field of vulnerable food systems (see e.g. Fraser et al. 2005; see section 2.4.2) indicated that diversity is a decisive determinant of susceptibility. In the current research context, two main diversity-related sets of indicators were identified: Firstly, diversity related to the production system; secondly, diversity related to income sources. In the following section the first set of production-related diversity indicators will be analysed. It comprises two main components: the number of different plots/ponds and the number of different commodities produced. The reasoning behind this selection is that households which produce only one product in only one location are more likely to have their whole agricultural production affected by salinity or tidal flooding than those who have more than this one plot or product. Assuming that the production in one field is lost, there could still be another field which is not affected and which provides yield and income.

The empirical data show that many households were not able to compensate for production losses on one plot/pond with the production generated on another (non-affected) plot/pond – because many households did not have another plot/pond. In the crop-producing hamlets, 54 % of the

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[70] The quality judgement of the dikes was only based on interviews with hamlet leaders. The DONRE Tra Vinh reported that there were regular assessments of the state of the dikes (AI-P-DONRE-1101) but it was not possible to acquire them (see section 4.6). A more technical assessment of the state of the dikes was beyond the scope of this study.
[71] The survey asked for the most recent tidal flood event which in most cases was the year 2011.
[72] In the sugarcane area, there were no major differences observed between the different hamlets, ethnicities and education levels with regard to the share of households which reported of a broken dike.
[73] There were no major differences observed between the different poverty-related groups, ethnicities and education levels with regard to the share of households which reported of a broken dike.

interviewed sugarcane producers and 34 % of the rice-producers did not have more than one plot. The diversity of crops was even lower. In rice-producing areas, only four out of 140 households said that they produced commodities other than rice. In three of these cases, they produced vegetables which were not sold on the market but which were used for their own consumption. In the sugarcane hamlets, only three out of 99 households produced commodities other than sugarcane on an additional plot. There too, it was not produced for income generation purposes. In aquaculture hamlets 67 % of the households did not posses more than a single pond. Moreover, the species produced in the rainy season were in nearly all cases the same. Households which were classified as poor were in all hamlets the least likely to have additional sources of agricultural or aquaculture income[74]. There were no significant differences with regard to ethnicity or education, however.

Different sources of income

The second set of diversity-related susceptibility indicators is linked to the number of different sources of income. Like the reasoning behind the other diversity-related set of indicators, it can be assumed that the degree of harm caused by flooding and salinity is higher if income from agriculture is the only source of income. If a farmer loses all his production, he could still compensate for the losses and sustain a living with income from other sources. In light of low diversity in the production system, as is outlined in the previous paragraph, this indicator takes on even greater importance.

In contrast to the production structures, diversity in the sources of income was comparatively high. In total, only 9 out of the 312 interviewed households had a single source of income. This was mainly the case for households with fewer than three members of working age. Over half of all interviewees even possessed three or more different sources of income. There was no significant correlation between production type, land size, poverty classification or the highest education of a household member. The number of income sources was only correlated with the number of adults of productive age[75]. Among the different sources of income, nearly 90 % of the interviewees had at least one source of income which was not affected by salinity or tidal flooding. In the rice hamlets it was only 8 % who did not have such other sources of income whereas in the aquaculture hamlets the percentage was nearly 17 %[76].

Accordingly, households in the aquaculture hamlets were the most susceptible with regard to their production structures and sources of income. The opposite held true for rice producers. They were the least susceptible with regard to sources of income and production structure (see Table 5.2).

Susceptibility patterns - key findings, interpretation, and future outlook

Susceptibility varied widely across the different hamlets and production areas (see Table 5.2 and Figure 5.5). Rice producers were highly susceptible with regard to crop sensitivity but were the least susceptible with regard to the diversity of the production system and income sources. Furthermore, these hamlets revealed the smallest share of households producing a sensitive crop in the most hazardous season. In Kim Son, sugarcane was produced - a crop which is, in contrast to rice, only moderately sensitive to salinity. Despite the lower crop sensitivity, the degree of harm caused by flooding was considerable because all households in this area produced it in the flooding season. In addition, there were only a few people who produced more than one product on more than one plot. In the aquaculture area, freshwater species were most commonly produced in the flooding season. They are highly sensitive to salinity and water pollution (both caused by tidal flooding). Moreover, most households raised only shrimp in the flooding season and did not have more than one pond.

[74] There was no significant link found between the number of plots/ponds/products and the ethnicity/average education level.
[75] C*=-0.27, p > 0.01.
[76] There was no significant link found between the number of non-farming income sources and the poverty/ethnicity/average education level.

The quality of the communal and district dikes was, as in the sugarcane areas, relatively low. The quality of the embankments around the ponds seemed to be higher than the quality of individual levees in the sugarcane areas, however. There were only small disparities in susceptibility between the different socio-economic groups. A significant correlation could only be found between the number of ponds/fields and the poverty classification.

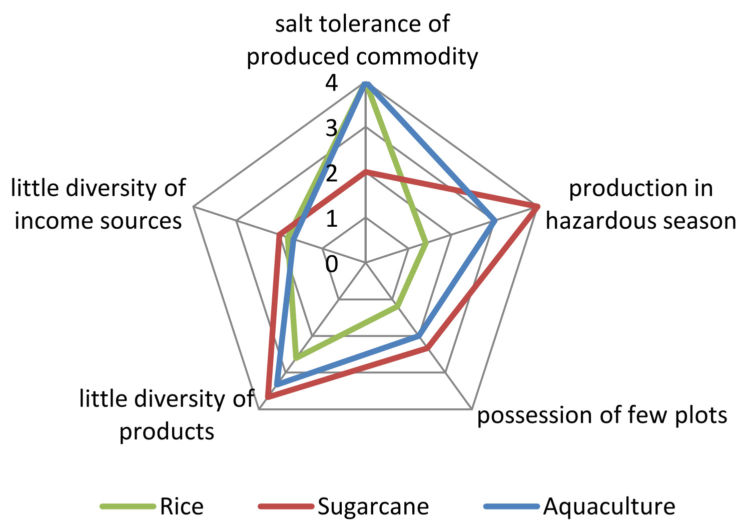
Table 5.2: Susceptibility profiles of the researched hamlets

Commune	Hamlet	Salt tolerance of the produced commodity [3]	Prod. in hazard. season[2]	Quality of protective infrastr. [2]		% with more than 1 plot[1]	% with more than 1 product/ season[1]	Average number income sources[1]
				Individ.	Commune / district			
Kim Son	Xoai Rum *(XR)*	Moderately sensitive (sugarcane)	All hh	Low	Very low	50 %	20 %	2,6
	Bai Xao Doi *(BXD)*		All hh	Low	Low	18 %	0 %	2,5
	Tra Cu C *(TCC)*		All hh	Low	Moderate	62 %	7 %	2.6
Don Xuan	Lo Soi A *(LSA)*	Sensitive (freshwater aquaculture)	Most hh	Moderate	Low	42 %	43 %	3,0
	Bau Sau *(BS)*		Most hh	Moderate	n.r.	27 %	0 %	2,7
	Ba Nhi *(BN)*		Most hh	Moderate	Moderate	21 %	0 %	2,1
	Ba Giam A *(BGA)*	Sensitive (rice)	42 %	n.r.		59 %	15 %	3,0
	Xom To *(XT)*		49 %			42 %	19 %	2,4
Ngoc Bien	Ba Cum *(BC)*		68 %			77 %	27 %	2,8
	Sa Van A *(SVA)*		53 %			59 %	30 %	2,8
	Rach Bot *(RB)*		43 %			54 %	11 %	2,8

4 - Very susceptible | 3 - Susceptible | 2 - Moderately s. | 1 - Little s. | 0 - Not s. | Not relevant

Source: [1:] Household survey, [2:] interviews with hamlet leaders, [3:] FAO (1999)

Susceptibility level due to...



Explanation: The labelling of the axes depicts the average degree of susceptibility as classified in Table 5.1 5.2, i.e. 0=not susceptible to 4=very susceptible; the quality of the infrastructure is not considered because it is only relevant for a restricted number of hamlets. The size of the polygon represents the degree of susceptibility.

Figure 5.5: Illustration of the susceptibility profiles of the production areas based on Table 5.2 (Source: author, based on household survey, interviews with hamlet leaders, FAO 1999)

Figure 5.5 shows, in summary, that the susceptibility polygon representing rice producers is smallest compared with the ones of aquaculture producers and sugarcane producers.

The data also revealed that numerous **coupling processes** account for differential susceptibility patterns. Susceptibility has been shown to be a result of the interaction of diverse social and bio-physical factors. Product sensitivity only acted as a factor for susceptibility if the farmers decided to cultivate it in a hazardous season. Similarly the quality of the dike was only a relevant factor of susceptibility if the field lay in an area which had been exposed to tidal flooding.

Based on the conceptual discussion, it also is important to account for the temporal **dynamics** of susceptibility patterns which are closely intertwined with social-ecological and spatial coupling processes (see section 2.4.2)[77]. The socio-economic and agricultural developments in the region are likely to be the most influential in this regard and are likely to bring about a reduction in the overall susceptibility of households in the research area. This reduction is strongly linked to the fact that the agricultural production area is expected to decrease in Tra Cu (OARD Tra Cu 2011a). Having more employment opportunities outside agriculture would mean that the number of income sources per household could increase, i.e. agricultural losses are more likely to be compensated for by income from off-farm employment. Don Xuan commune[78], for instance, anticipates a significant change in the economic sector structure due to planned industrialisation until 2020 (Tra Vinh Economic Zone Authority 2012). This is widely in line with the industrialisation plans for the whole Mekong Delta (see section 3.1.2). In Don Xuan Commune, the industrial zone was planned to cover around 43% of the total commune area (PC Don Xuan 2011e: 52; see Annex 12.10 for a detailed map of the planned Dinh An economic zone). The commune therefore expected a decrease in the share of agricultural production in comparison with the other sectors and a reduced agricultural production area of 50%. The aquaculture area was expected to decrease by more than 80% whereas the rice production area was predicted to decrease only insignificantly (PC Don Xuan 2011e: 51f). In the course of the planned restructuration of the area, the other communes are also likely to experience diversification in income sources. The building of a large port close to Kim Son Commune, an airport close to Ngoc Bien, several industrial zones (one of them in Don Xuan commune), as well as a tourist area, and new or larger urban centres will bring about a increase in employment opportunities in the tertiary and secondary sectors (see Annex 12.10). Moreover, the oil depot which is being built in the sugarcane-producing hamlet of Xoai Rum will lead to a reduction of the agricultural production area and additional employment opportunities (PC Tra Vinh 2011; hamlet leader Xoai Rum 4.4.).

5.2.4 Capacity of response

The previous sections reveal why and how farmers in the Mekong Delta are threatened by tidal flooding and saline intrusion. The hydrological and geophysical characteristics in combination with the location related to the hydraulic infrastructure shaped exposure patterns and made aquaculture farmers particularly exposed to salinity and flooding. In addition to disparities in the exposure patterns, susceptibility differed widely. An analysis of product sensitivity, infrastructural quality and livelihood diversity shows that it was again aquaculturalists who seemed to be the most susceptible. Being the most threatened by hazards does not necessarily mean that the households are also the most vulnerable. As outlined in the theory chapter (see section 2.4), there is a third highly important component of vulnerability, i.e. the capacity of response. It is defined as "the combination of all the strengths, attributes and resources available to a social system which can be utilised to adjust to and cope with an expected or experienced hazardous event, attenuate potential damage, and seize given opportunities" (Gallopin 2006: 295; IPCC 2012: 556).

Based on the suggested conceptual framework the major determinants of the capacity of response are assumed to be related to the wealth of a household in terms of its capital endowment. This

[77] Adaptation to water-related hazards and climate change will not be considered at this stage but will be thoroughly assessed in chapter 7.

[78] Don Xuan commune compiled, as only one of the three researched communes, a report on the socio-economic prospects and land use planning until 2020.

endowment is defined as comprising natural, physical, human, social and financial capital. Exchange and transformation of these types of capitals form the foundation for both coping with and adapting to flooding and salinity. The identification of the capital components most relevant to the present research context was based on an analysis of the empirical data – most notably on the assessment of revealed capacities relevant to the local application of coping and adaptation strategies. This reasoning revealed that the most decisive indicators determining the capacity of response were related to poverty classification, income, access to loans, land size, endowment with productive assets, livestock capital, group membership, education, production know-how and the number of adults of productive age (see Table 5.3 for a characterisation of the research area according to these indicators). In the following section, the relevance of these indicators will be outlined. This will serve as a basis for characterising the research area with regard to disparities in the capacity of response.

Table 5.3: Capacity of response profiles of the research area[79]

Capital type[#]	Indicators		Rice prod.	Sugarcane prod	Aqua-culture	$P^{\#\#}$	Khmer	Kinh	*p*	Total
FC	Poverty certificate (% of pop. classified as poor and near-poor)		42.2	41	27.8	**	38.5	39.5	/	38.7
NC + PC	Land size (average land size in ha per hh)		1.3	0.6	1.1	**	0.9	1.2	/	1.0
	Prod. Assets (% of hh having > 0)	Agric. machine	15	3	1.4	**	12.3	6.5	/	8.0
		Pump or motor	45.0	92.0	88.9	**	30.9	29.4	/	29.7
	Livestock (average livestock wealth coefficient per hh[80])		2.18	2.03	0.98	**	1.93	2.21	/	1.98
HC	Education (average education level per hh)[81]		2.7	2.6	2.6	/	2.7	2.6	/	2.7
	Training class (average nr per hh in last 5 years)		4.5	4.2	5.3	/	4.4	5.2	/	4.6
	Dependency ratio[82] (average per hh)		47.4	35.1	47.6	/	42.4	43.9	/	43.5
SC	Group membership (aver. members per hh)		1.09	1.44	0.85	*	1.04	1.19	/	1.14

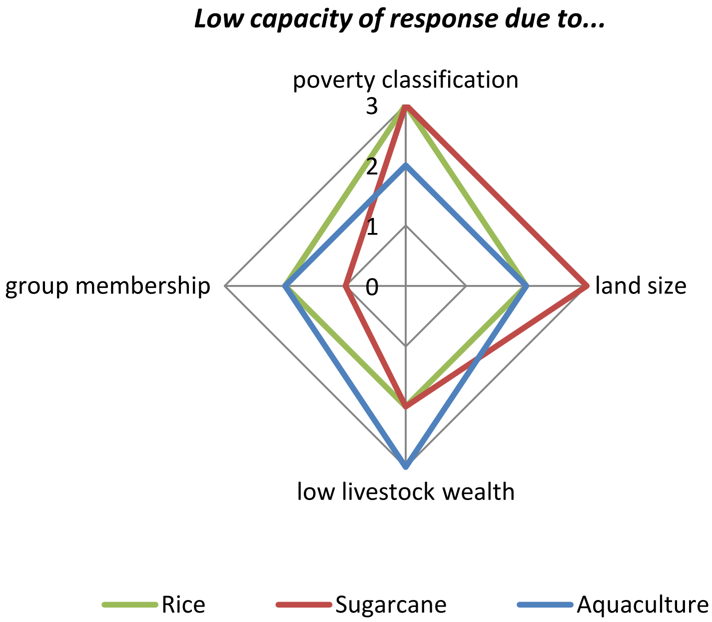
3-Low endowment   2-Moderate endowment   1-High endowment *(for statistically significant relationships only)*

[#]FC=Financial capital; NC=Natural capital; PC=Physical capital; HC=Human capital; SC=Social capital

[##]Significance levels * *p* <0.05; ** *p* <0.01 (statistical significance tests are based on Pearson's Chi Squared test)

Source: Household survey, M. Schwab (2012)

[79] This table presents the empirical findings on a more aggregate level (level of production areas instead of hamlet level) than the tables in the exposure and susceptibility section. The higher number of indicators and potentially relevant comparison groups makes this necessary for reasons of clarity and comprehensibility.
[80] Based on the FAO (2005) livestock categorisation and weight for East and Southeast Asia: Cattle = 0.65; Pig = 0.25; Chicken/Duck = 0.01.
[81] 1= never went to school; 2=primary school finished; 3=secondary/high school degree; 4=(vocational) college degree; 5= university degree.
[82] Nr. of Children + Nr. of Elderly) / Nr. of members in working age (15 – 64 years); the higher the ratio, the higher the number of dependents.



Explanation: The labelling of the axes depicts the average lack of capacity of response as classified in Table 5.1 5.3, i.e. 1=high endowment to 3=low endowment; only significant differences between the production areas are considered in this figure; endowment with productive assets is not considered here because it is mainly determined by the requirements for the respective production type and is an interesting indicator only for a comparison between Kinh and Khmer or poor and non-poor groups within one production type. The size of the polygon represents the degree of a lacking capacity of response.

Figure 5.6: Illustration of the capacity of response profiles of the production areas based on Table 5.3 (Source: author, based on the household survey, M. Schwab 2012)

Financial capital

Endowment with financial capital is often assumed to be the most important prerequisite for adaptation and coping (DFID 1999). Financial capital is defined as an actor's access to financial resources, making various livelihood opportunities available (Carney 1998: 7). This includes both financial stocks and flows. Stocks are stores of wealth at hand which comprise cash money, deposits, credit and jewellery. Financial flows are regular inflows such as income, transfers, remittances or pensions (DFID 1999: 2.3.5). Financial capital owes its importance as a means to cope and adapt to its convertibility into other asset types (Ellis 2000:34). In the current research context, it also seemed to be a decisive indicator for the capacity of response. The interviews in the research area showed that it was essential to be able to refer to financial stocks for fulfilling basic needs in times of crisis and for acquiring essential productive inputs to attenuate the effects of saline intrusion or flooding. Financial capital was also crucial for repairing and maintaining the embankment and for reproducing in case of crop failure. If the financial stocks were not available, access to loans or the possibility of borrowing food and inputs could temporarily compensate for a lack of savings. Besides coping strategies, most adaptation strategies were also based upon the conversion of financial capital. Migration, opening an own shop, and investing in productive assets and livestock all required financial means.

In Vietnam, the most common measure to judge the financial capital endowment of a household is the possession of a poverty certificate. The allocation of these certificates is based on the income per household member. In 2010, the poverty line in Vietnam was defined as 400,000 VND (around 15 Euro[83]) per person per month for rural areas (GSO 2010: 20). However, a rural household in Vietnam does not simply receive a pay check by the end of each month which states whether the income is

[83] At an average exchange rate of 2010.

higher or lower than 400,000 VND. Households receive money from a multitude of often irregular sources without any proof of income. This makes an income-based classification difficult. In the research area, it was reported that the classification relied more commonly on indicators such as the quality of the house and most importantly on the subjective judgement of the hamlet leader. To ensure that the poverty classification is a valid indicator for financial capital endowment, it was therefore important to cross-check the possession of a poverty certificate with other measures of poverty (see Table 5.4). The household survey results show, in this regard, that having a poverty certificate was significantly and most strongly correlated with the size of the production area, i.e. near-poor and poor households owned a smaller production area than others. The data also show that endowment with agricultural machines and livestock was correlated with the poverty classification to a significant degree.

Overall, the poverty certificate therefore seemed to be a good proxy variable to judge the poverty of a household (see the following section on social capital for more details). In the following analysis, households who possessed a poverty certificate will therefore be categorised as poor households.

Table 5.4: Correlation of official poverty classification with other selected indicators of response capacity

		Natural and physical capital				Human and social capital		
		Average production area	Possession agric. machine	Possession pump/ motor	Livestock wealth	Average education level	Participation training classes	Group members per hh
Poor / near-poor/ not-poor	Correlation (Spearman-Rho)	-0.453**	-0.150**	-0.114*	-0.184*	-0.049	0.037	-0.061
	Significance (2-sided)	0.000	0.008	0.044	0.036	0.388	0.609	0.285
	N	313	313	313	130	312	190	313

Significance levels: * p<0.05; **p<0.01

Source: Household survey, M. Schwab 2012

The possession of a poverty certificate had opposing implications for the capacity to cope and adapt. On the one hand, it was a marker which indicated that a household had only limited financial capital to realise certain actions as outlined in the previous paragraph. Being classified as poor, on the other hand, also had a more advantageous notion because it made a household eligible for certain governmental support measures. Households with a poverty certificate were able to obtain loans from the Vietnam Bank for Social Policies at low interest rates and received financial support to build a new house from program 135 (AI-H-8-RB, AI-C-14-NB). They also got monthly support for electricity (30,000 VND/month - around one Euro), and received financial support for buying seeds (80,000 VND per month – around three Euro) (AI-C-14-NB). Moreover, governmental program 54 granted poor households financial support in emergency situations, after severe natural disasters, and in the case of serious health-related problems. In Ngoc Bien, poor and near-poor households were exempted from school fees[84] and in all communes the chances of receiving a loan for going to university were higher for those who were poor. In addition, poor households received healthcare insurance free or at a lower rate[85] (AI-H-8-RB, AI-C-14-NB).

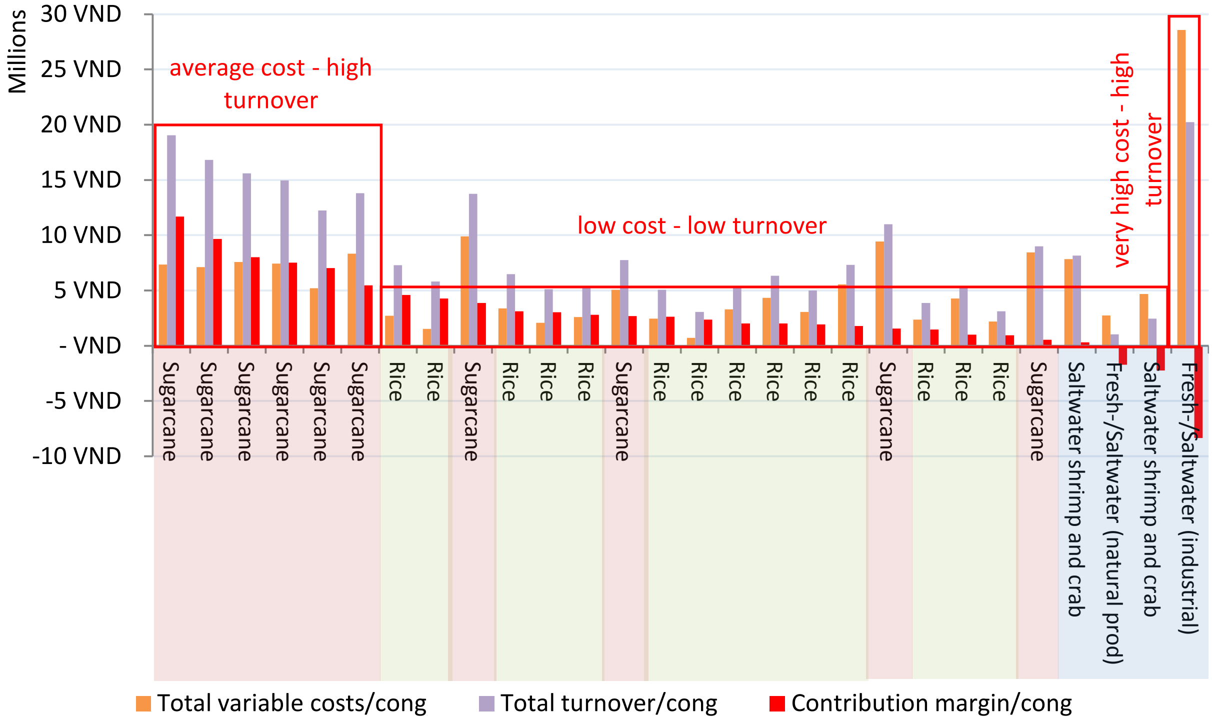
Among the interviewed households, as many as 40 % were classified either as poor or as near-poor. In the aquaculture hamlet, this share was significantly lower. Here, only 27% possessed a poor certificate whereas the rate in the crop-producing hamlets was at nearly 42%. There were, however, no significant differences between Kinh and Khmer households observed (see Table 5.3).

The income was mainly received from agriculture/aquaculture. The production cost-benefit analyses

[84] In Don Xuan and Kim Son commune, no one has to pay school fees because they are classified as poor communes.

[85] All Khmer households have free access to healthcare anyway.

(CBAs) with the households showed that the average contribution margin varied substantially between the different production types (see Figure 5.7). The highest agricultural income per hectare (ha) was generated by sugarcane producers. On average, they made profits of 58 Mio VND/ha in 2011 (n=10; around 2,000 Euro[86]) whereas rice producers made only 24 Mio VND/ha in the summer-autumn and autumn-winter season[87] (n=14; around 830 Euro[88]). Considering the larger land size in rice producing hamlets in comparison with sugarcane production (1.3 and 0.6 ha, respectively), levels the differences to some degree. On average, rice producers thus earned 31 Mio VND and sugarcane producers earned 35 Mio VND per year (1,100 Euro respectively 1,200 Euro). The lowest income in 2011 was generated by the interviewed aquaculture farmers with an average loss of 30 Mio VND per ha and 33 Mio VND per household (n=4; around 1,050 Euro[89] and 1,150 Euro, respectively). The CBAs revealed losses for three out of four producers. Many households reported that aquaculture may be cost intensive, highly dependent on fluctuating world market prices and sensitive to a wide range of hazards (see e.g. section 5.2.3) but it also had the potential to generate high revenues.



Explanation: In the production-centred interviews, the households were asked to describe each step in their production, the productive assets and inputs required and the costs of each asset/input. Subsequently, the interviewees were asked about the yield, the amount sold, consumed or used for other purposes. All costs and revenues were enquired for 2011 and for the years of highest and lowest price/amount. All results are stated per cong (0.1 ha). The calculation of the contribution margin was, in most cases, undertaken afterwards by the researcher. The figure depicts 28 contribution margin calculations (categorised according to production type). They are arranged according to the height of contribution margins.

Figure 5.7: Contribution margin calculation for rice (summer-autumn & autumn winter season), sugarcane and aquaculture for the year 2011 (Source: based on production-centred household interviews, M. Schwab 2012)

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[86] At an average exchange rate of 2011.
[87] Winter-spring season is not considered because it would negatively bias the calculations as households lost all of their production in 2011.
[88] At an average exchange rate of 2011
[89] At an average exchange rate of 2011

Off-farm income is also central to the people in the research area. A key employer in the region is the shoe factory My Phong. It employed around 14,000 people most of whom were young women (AI-P-DPI-0110). Employees of My Phong reported that sewers normally earned between 1.0 and 1.5 Mio VND/month, i.e. 12-18 Mio VND/year (around 400-600 Euro[90]; HI-M-BGA-KST, GD-H-BS-1230-1230). This was around half as much as an average crop farmer earned in one year. However, for farming more than one person was in most cases needed to generate this income. The income people could make when they migrated to the cities was higher than that of farmers and non-farm employers in Tra Cu district. The largest share of migrants was observed among rice producers and aquaculturalists (41% respectively 39% of all interviewed households had members which migrated). Most of the jobs were found in Ho Chi Minh City (60%) and in Binh Duong (11%), according to the household survey. The migration-centred interviews showed that the majority of the migrants earned between 3-7 Mio VND/month (around 100-250 Euro[91]; n=15) for unskilled labour in factories, on construction sites, as housemaids, or as agricultural wage labourers. This amounts to 36-84 Mio VND per year (around 1,250-2,900 Euro). The survey indicated that nearly 70% of the migrants from the interviewed households worked in those jobs. Only four percent worked in jobs which required a higher qualification. There were a few major differences between Kinh and Khmer, poor and not-poor households, and between the different production hamlets and education background with regard to the type of job. One larger disparity could be found in the case of migration for higher education, i.e. nearly 90% of these migrants were from not-poor households and most of those came from households with a higher education level. Moreover, there seemed to be considerably fewer migrants working in factories among the sugarcane producers (15% compared with 43% among aquaculturalists) and among households with a lower average education level.

Loans were mainly received from the Bank for Agriculture and Rural Development (Agribank) and the Vietnam Bank for Social Policies (VBSP). The Agribank granted loans against collateral so that better-off farmers had better access to those loans than poor farmers with little land. Those farmers were able to receive loans from the VBSP. The loans were most commonly provided as part of poverty-reduction programs from the government or mass organisations (AI-C-NB-0419-MT, AI-C-KS-0420-SN). The household survey showed, however, that most loans were received by not-poor households. The amount of the loan ranged from 3 Mio VND to 360 Mio VND (104 to 12.500 Euro[92]), and more than 75 % had a loan smaller than 17 Mio VND[93]. The average amount of the loan was substantially higher in the aquaculture hamlets, i.e. 58 Mio VND, than in sugarcane hamlets, i.e. 12 Mio VND, and rice-producing hamlets, i.e. 14 Mio VND. Moreover, households which were not classified as poor received on average a higher loan than poor households, i.e. 24 Mio VND compared with 8 Mio VND (see sections 7.2.1. for more details)[94].

Natural and physical capital

Endowment with natural and physical capital is of further relevance to an assessment of the capacity to cope and adapt. According to the Sustainable Livelihoods Framework, natural capital is defined as "natural resource stock from which resource flows and services [...] useful for livelihoods are derived" (DFID 1999: 11). In rural areas where natural resource-based activities form the main source of livelihood, this type of capital is key to being able to cope with and adapt to natural hazards. In the scientific literature (Bebbington 1999; Burton et al. 2003), including in the Mekong Delta context (Vo Van Tuan 2013), it has often been proved that the possession and the quality of production land are the most essential criteria. Physical capital describes the infrastructure and producer goods required

[90] At an average exchange rate of 2011.
[91] At an average exchange rate of 2011.
[92] At an average exchange rate of 2011.
[93] The data refer to the most recent loan received from a governmental programme.
[94] There were no major differences observed between Kinh and Khmer and between the households with different education level.

to sustain a livelihood (DFID 1999: 2.3.4). Infrastructure, i.e. a goal-oriented change to the physical environment, is a (most commonly public) good which facilitates, amongst other things, coping and adaptation measures (ibid.). In the research context, canals, dikes and sluice gates were the most relevant (these infrastructural circumstances were already discussed in section 5.2.2 and will therefore not be addressed here). Producer goods are individual or collective resources which are used to perform productive activities (ibid.). In the research area, the most important means of agriculture and aquaculture production were agricultural machines, water pumps, motors and livestock.

In the following paragraph, the endowment with land and productive assets of households in the research area will be introduced against the background of its relevance to coping and adaptation strategies on site. Firstly, land and productive assets were essential prerequisites for any agricultural/aquacultural production activity. The interviews with households (especially the CBAs) confirmed that generating income vitally depended on the endowment with these capitals, most notably on the endowment with production land. Accordingly, these assets could be transformed into financial capital which was, as mentioned above, essential for most coping and adaptation activities. Secondly, land, livestock and assets could be alienated in the event of difficulty to meet the basic needs of the family members. The more land a household had, the more would it be able to alienate without losing the minimum requirement for sustaining a living. Thirdly, having a land title served as collateral for gaining access to loans. In the case of financial losses, households with more land were better able to take a private loan at the agricultural bank than households with little or no land (see previous paragraph for more details on the relevance of financial capital to the coping and adaptation strategies on site).

In the researched hamlets the endowment with natural and physical capital can be described as followed (see Table 5.3 and Table 5.4): the interviewed households possessed an average land size of 1.0 ha. In the sugarcane hamlets, the land size was significantly smaller with an average of 0.6 ha than the land size in aquaculture and in rice-producing hamlets (1.1 ha respectively 1.3 ha). The survey further revealed that households with poverty certificates possessed only 0.5 ha on average whereas not-poor households had an average of 1.3 ha. In addition, endowment with productive assets differed widely. In both sugarcane and aquaculture hamlets, significantly fewer households possessed large machines (3% respectively less than 2 %) than in rice-producing hamlets (15 % of all households). Smaller assets, such as a pump or a motor, were essential for aquaculture and sugarcane production only and this is why most households there possessed these assets. A pump and a motor may therefore not be sound indicators of the wealth of a household but were still essential for the capacity to adapt, i.e. without them it would not be possible to change from rice to sugarcane production. In terms of livestock endowment, both sugarcane and rice hamlets revealed an average livestock wealth index[95] of around two per household whereas households in the aquaculture hamlets had an average index of only one. For all indicators, there was no significant difference between Khmer and Kinh households and between households with different education background (see Table 5.3).

Human capital

Human and social capitals are further components in the capital endowment of a household which play a central role in coping and adaptation. Human capital is defined as “the skills, knowledge, ability to labour and good health that together enable people to pursue different livelihood strategies and achieve their livelihood objectives”, according to the Sustainable Livelihood Framework (DFID 1999: 2.3.1). It owes its importance to essentially being a prerequisite for utilisation of the other capital types, i.e. only when being physically able to utilise the available assets and only when knowing how

[95] Livestock wealth index is the sum of weighted livestock types. The ‘livestock units coefficients’, as suggested by the FAO (2005) for East and South East Asia, are based on the body weight of an animal.

to utilise them, is it possible to respond to risks in a beneficial way. Building on common human capital indicators in the literature (DFID 1999; Siegel, Alwang 1999; Trap 2006; Sen 1997) and crosschecking these with empirical data allowed for the identification and specification of the following criteria: dependency ratio, formal education, vocational education and agricultural know-how development. The relevance of these indicators for the capacity to respond to flooding and saline intrusion will be outlined in the following paragraph.

The dependency ratio is an often applied indicator for the physical capability of conducting coping and adaptation measures at the household level (see e.g. DFID 1999; Scoones 1998; Bryceson et al. 2003). It points out how many members of a family are of working age compared with the number of household members who are dependent on those of working age, i.e. old people and young children. The dependency ratio therefore had important implications for generating financial capital. Agricultural/aquaculture-related work was often too hard for old people and children and the large majority of off-farm employment opportunities were only accessible to people of working age. Among the researched households, the dependency ratio was at an average of 43 dependents per 100 people, i.e. there were more people of working age than there were dependents[96]. In the sugarcane hamlets, the dependency ratio was the lowest with an average of 35 dependents per household; in contrast to an average of 47 in rice and aquaculture hamlets. This coincides with the higher out-migration rates in these hamlets (see previous section). The dependency ratio also seems to be related to poverty. While there was an average of 41 for near and not-poor households, poor households had a ratio of 51. There was no significant difference between Kinh and Khmer and between households with different educational backgrounds (see Table 5.3).

Formal school education is another relevant indicator of human capital endowment according to the livelihood framework (DFID 1999; Ellis 2000). Several studies argue that it is an important prerequisite for moving into non-agricultural jobs (Burton 1997; Huynh Truong Huy 2009a). This opinion seemed to be shared by the majority of households in the in-depth interviews and was confirmed by the household survey. For instance, only household members with a higher level education held positions as teachers or government staff, according to the survey. Being employed by the government may not have provided a high but a reliable source of income which was not threatened by flooding or salinity. The median for households in these professions lay in having a college diploma (teacher) or high school degree (government staff). The household members involved in non-farm and off-farm employment also most usually possessed a high school degree. For people engaged in crop farming or aquaculture the median was, in contrast, at primary school level. Formal school education was, on average, relatively similar for households in the different hamlets and for households classified as poor and not-poor. There were significant, yet not strong, differences with regard to the highest education level achieved in a household. The survey revealed that 13 % of all households classified as not-poor had at least one member who held a diploma from university whereas only 8 % of the near-poor and none of the members in the poor households had achieved an educational level as high as that.

There were no significant differences between Kinh and Khmer, regarding neither the average education level nor the highest level achieved in a household. Nevertheless, it was observed that several of the interviewees did not speak or only barely spoke Vietnamese which may have substantially restricted the employment opportunities outside of the research area (where Khmer are the minority and not the majority). Non-Vietnamese speaking people were most commonly above the working age, however. Moreover, there was a strong and significant correlation between the age of a household member and his/her formal education; i.e. the older a person, the lower his/her education (C^{SR}=-0.857; p<0.01 for all household members over 18). There were further significant differences observed between men and women. The median educational level for men was at the level of high school education whereas the median for women was only at the level of primary school

[96] This was only slightly higher than the Vietnamese average (41.7) (World Bank 2013).

education.

In the research area (as in the whole of Vietnam), education from agricultural extension programs was another highly relevant human capital-related basis for adaptation and coping. There was a culture of regular agricultural training classes accessible to farmers in the research area (AI-C-DX-0529, AI-C-KS-0529). Around 60 percent of the interviewed farmers participated in these classes. They mainly conveyed knowledge of how to generally improve production activities whereas salinisation and flooding were merely mentioned (see section 7.2.3 for more details on their relevance and the disparities between different social groups). Furthermore, vocational training classes contributed to an increase in human capital for coping with and adapting to adverse salinity and flooding events. There were only a few of these classes conducted in the research area and only eight percent of the survey interviewees participated in these classes, however (see section 7.2.3 for more details on their relevance and the disparities between different social groups).

Social capital

Social capital refers to the “reciprocity within communities and between households based on trust deriving from social ties” (Moser 1998: 4). In different studies, also in the Mekong Delta context, social capital has been shown to grant access to other forms of capitals, increase cooperation, and provide a kind of ‘safety net’ in times of crisis (Ngo Thi Phuong Lan 2011b; Nguyen Van Kien 2011; Pham Khanh Nam 2010). Accordingly, it determines the feasibility of many adaptation and coping actions. Social capital is according to many scholars an asset which is, however, ambiguous in nature (DFID 1999; Bohle 2005). It can on the one hand be a beneficial, security-providing and emancipatory resource for some actors while at the same time being bound to social commitments and exclusion. Most commonly, social capital is operationalised by looking at membership of formalised groups, access to networks and social connectedness (ibid.). In the research area, the following indicators have been shown to be of particular importance: membership of mass organisations, interest groups, social networks and state institutions.

Membership of mass organisations is an important indicator of social capital in Vietnam. Mass organisations are advocacy groups which represent specific interests and which are closely related to the party state (Norlund 2007; see section 7.2.1 for more details). The most important mass organisations in the research area (as in most other rural areas) were the Women’s Union and the Farmers’ Association. Both were key for accessing other forms of capitals because they granted access to loans, information, training classes and other governmental support measures. In Don Xuan commune, the average participation rate among the interviewed households was, at 18 %, the lowest of all communes. Kim Son commune had, in contrast, an average participation rate of 35%. In total, 23 % of all female adult household members were in the Women’s Union and around 10 % of the male adult family members were in the Farmers’ Association. There were no major differences in the participation rate of Kinh and Khmer households.

Moreover, social capital seemed to be influenced by access to governmental positions and by personal connections to officials[97]. In the research area, this became most visible at the hamlet level. The hamlet leader determined the allocation of the poverty certificates and other public support schemes; he was the judge in local disputes, and collected fees if necessary. Unclear regulations and too much scope for discretionary behaviour could therefore facilitate nepotism and unjust enrichment at the local level. The allocation of poverty certificates illustrates these points well. In some of the hamlets, most notably in Bai Xao Doi and Sa Van A, the poverty certificates seemed to have been given to households which were not as poor in their capital endowment as one would expect. The survey showed that the correlation between possessing a poverty certificate and

[97] Previous studies in the Vietnamese context show that a job in governmental institutions provides more than just a salary. Gainsborough et al. (2009: 380) found that it is often more of a “vehicle for personal enrichment” which provides access to resources for oneself and for the patronage network.

endowment with land and productive assets was either weaker or even insignificant in these hamlets. Particularly in Rach Bot and Ba Cum, the possession of a certificate seemed to better reflect the economic situation of the households. Here, the correlations were a lot stronger and significant. This impression was also reflected in the more in-depth interviews. Some households reported that the allocation of poverty certificates was further dependant on connections to mass organisations. Yet the survey showed that social capital in the form of group membership was not significantly correlated with the possession of a poverty certificate. At the commune level, there seemed to be a bias in the placing of governmental staff. In Don Xuan commune, for instance, all of the members of the PC were Kinh and only 12 staff members in the commune administration were Khmer (PC Don Xuan 2011b)[98] – although 60% of the population in Don Xuan commune was Khmer (PC Don Xuan 2011d).

Capacity of response patterns - key finding, interpretation and future outlook

The previous paragraphs show that the capacity of response differed in a wide variety of aspects between households in the research area. The largest disparities were found between the three production areas. The aquaculture hamlets seemed to be financially better-off than the other hamlets, at least with regard to the official poverty rate (% of households with poverty certificates) and access to loans. The income from primary production in 2011 was, in contrast, the lowest of all production areas. This seemed to be due to high income fluctuations in aquaculture rather than to structurally low levels of income. Endowment with physical and natural capital seemed to be the highest in the rice-producing areas. Here, households possessed the largest average land size, the most agricultural machines, and the highest livestock wealth index – despite a comparably low income from rice production. This might be explained by a high share of migrants and a supposedly higher extent of remittances. By far the smallest land area was observed in sugarcane-producing hamlets where the poverty rate was also comparably high. An off-set for this lack of financial and natural assets was provided by a dependency ratio which was notably lower in sugarcane than in the other areas. Further disparities with regard to social and human capital were not observed between the production areas. Human capital seemed to vary more substantially between poor and not-poor households (although not to a significant level). The family members in poor households revealed an often lower level of education than the others. The disparities in the capital endowment of Kinh and Khmer were merely minor. The only major bias to the detriment of Khmer seemed to have occurred in the placing of governmental staff at the commune level.

The data also revealed a range of **coupling processes** across scales and dimensions. The possession of a poverty certificate seemed, for instance, to be strongly linked not only to access to other financial capital sources like loans and financial support but also to social capital particularly the relationship to the hamlet leader. Moreover, financial capital seemed to be strongly linked to and mainly acquired from the endowment with natural and physical capital, particularly land and productive assets. The endowment with human capital has also been shown to be intertwined with financial capital because it is the prerequisite for getting a well-paid job in the cities and it is an essential determinant of how successful natural and physical capital can be transformed into financial capital especially with regard to agricultural production.

Coupling has also occurred at the level of spatial and temporal interconnectivities which depict the **dynamics** of the capacity of response. In the vein of the overall industrialisation plans for the Vietnamese Mekong Delta (see section 3.1.2) the research area is expected to experience economic growth and a rise in the share of secondary and tertiary sector employment (see e.g. PC Tra Vinh 2011, OARD Tra Cu 2011a). Don Xuan commune[99], for instance, expected average growth rates of 14%

[98] Comparable data could not be acquired in the other communes.
[99] Don Xuan was the only one of the three researched communes to compile a report on the socio-economic prospects and land use planning until 2020.

per year until 2015 and 17% until 2020 (PC Don Xuan 2011e). Most important in this regard will be the planned industrial zone in Dinh Anh (see Annex 12.10 for a detailed map of the planned Dinh An economic zone, PC Don Xuan 2011e). A large harbour, an airport, new commercial centres, tourist attractions and a non-tariff zone are likely to bring about a large variety of non-farm jobs for the whole province. Assuming a higher average income from jobs in the tertiary and secondary sector compared with primary production (as is the case at present), these developments might lead to a reduction in the overall poverty rate and an increase in the financial capital endowment of households in the region. Moreover, the planned industrialisation did and might continuously raise land prices. This will likely have divergent implications. The households which possessed a large amount of production land at present will most probably be financially even better-off in future, whereas land-poor and landless households might not be able to acquire land anymore and have more difficulties in moving out of poverty.

A rapid transformation of the economic structure, as is planned in the research area, will also have notable implications for human capital requirements. Today, the know-how to produce primary products is highly critical and well-developed. Households possessed a large stock of experiences, had developed their skills over years, and had received much agricultural training. The amount of agricultural and marketing training was, however, expected to decrease in the next few years. IMPP[100], a major initiator and donor of training classes in the research area, planned to withdraw support in Tra Vinh province in 2012 (AI-C-KS-0529, IFAD 2012b). Moreover, the increasing importance of the secondary and tertiary sector will raise human capital demands which differ substantially from those currently available in the research area. The need for vocational training will therefore be larger than ever. The interviewed commune authorities in charge did not know whether the number of these training classes will increase or whether the content will be adapted to the changing needs, however (AI-C-KS-0529, AI-C-DX-0529).

5.3 Social-ecological risk patterns and developments - key findings, interpretation and future outlook

The previous chapter reveals manifold insights about the vulnerability of households in the context of water-related risks. Based on the social-ecological vulnerability concept presented in section 2.4.2, the analysis focused on, firstly, the hazard characteristics and, secondly, on the vulnerability of local households to the hazards. The data show that substantial disparities existed in the risk context which different social groups and geographic regions were embedded in. The largest disparities occurred between households in the different production areas.

Aquaculture and sugarcane producers were most adversely **affected by tidal flood events**. In these areas, the most severe tidal flooding occurred in 2011. In this year, flood levels were at their highest and the duration was longest. This caused substantial losses, particularly for households in the aquaculture area. The hydrological and geophysical setting as well as the location with regard to the hydraulic infrastructure made the households in this region the most exposed to tidal flooding.

In addition to this high exposure, the majority of people in the **aquaculture hamlets** produced a highly sensitive crop in the flooding season, i.e. freshwater shrimp. A lack of diversity and the low quality of communal infrastructure made them even more susceptible to tidal flooding. However, a comparably high capacity of response seemed to partly compensate for this high degree of threat. Most notable in this regard were the low official poverty rate and good access to loans. However, the high level of indebtedness at present inhibited taking further loans, income from aquaculture seemed

[100] IMPP-TV (Project for Improving Market Participation of the Poor in Tra Vinh province) is a project funded by the IFAD (International Fund for Agricultural Development) and by the German government via the implementing agency GIZ (Gesellschaft für Internationale Zusammenarbeit).

to be subject to large fluctuations, and endowment with physical assets was comparably low.

The **sugarcane producers** were less exposed to tidal flooding and grew a less sensitive crop. Merely the quality of the individual embankments and livelihood diversity seemed to be a little lower than in the aquaculture area. In contrast to most aquaculture producers, the households here possessed less financial capital to respond to these threats. The poverty rate was higher, the land area smaller, and the households seemed to migrate less commonly to the cities (both seasonal and permanent migration). Despite seemingly fewer remittances, the lower migration rates seemed to have led to a lower dependency ratio, though. Moreover, households there generated the highest income from agriculture (at least in the year 2011).

In the **rice-producing area**, the salinity levels were recorded to be highest in 2010, whereas the impacts of saline intrusion were by far the largest in 2011. These impacts were higher than in any of the other production areas - despite the lowest exposure to water-related hazards. This could largely be explained by the fact that most households inside the dike started producing winter-spring rice in the dry season of 2010/2011. This raised substantially susceptibility. It even seemed to off-set the effects of having the highest livelihood diversity. In addition, the capacity of response was comparably low. The official poverty rate was high and human capital seemed to be lower than in the other regions – not because of a lack of formal education (this was nearly the same in all hamlets) but because of a lack of experience in dealing with saline intrusion.

The analysis also reveals some vulnerability-related **disparities between the socio-economic and ethnic groups**. Households which were classified as poor seemed to be financially worse-off and possessed less land and productive assets than the other households. Moreover, the data show that the education level was lower among poor households than among better-off households (although not to a significant level). There were no other major differences observed between the poverty classification and the most decisive indicators for human and social capital. Some, yet very few, disparities were observed between Kinh and Khmer. One bias was identified with regard to the allocation of governmental staff positions. They seemed to be nearly exclusively given to Kinh households. Moreover, there were several Khmer interviewees who did not or only barely spoke Vietnamese, inhibiting their off-farm employment opportunities in other regions of the VMD. The survey data, however, show that there were no significant relationships between ethnicity and any of the selected indicators of susceptibility and response capacity.

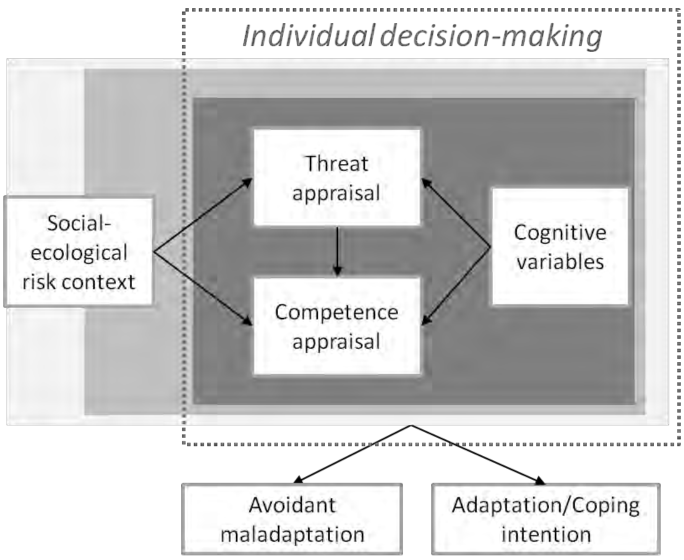
The data also revealed that **coupling processes** took place on multiple scales and different dimensions. Firstly, risk has been shown to be a function of biophysical characteristics (e.g. hazard, natural capital endowment) and social characteristics (e.g. financial and human capital, socio-economic planning). Hazard exposure, for instance, may be determined by the biophysical setting such as elevation and location in relation to the large rivers. But only if it is viewed in relation to hydrological developments and management can it explain why rice producers, despite being in a low elevation zone or close to the rivers and the sea, are less exposed to salinity intrusion than some areas at a higher elevation which are more distant from the rivers. Secondly, vulnerabilities also arose due to spatial coupling processes. The exposure has, for instance, only increased in parts of the sugarcane areas because dikes were meant to reduce exposure in the rice-producing areas. Thirdly, coupling processes occurred on different spatial scales. For instance, national-level policies influenced regional development and hydraulic planning, which in turn influenced on local livelihoods.

The coupling processes were also apparent in consideration of the **dynamic** nature of risk patterns. The most decisive variables influencing future vulnerability were climate change and the economic transformation. Climate change (most notably sea level rise) is expected to increase the frequency, intensity and variability of tidal flooding and saline intrusion. These alterations in the hazard characteristics will also change existing exposure patterns, i.e. areas which were not exposed to flooding and salinity in the past might be exposed to these hazards in the future. Among the socio-economic transformations, the planned economic zone in Dinh An commune plays the most decisive role for changing vulnerability patterns. The large land consumption of this project will require a major resettlement and will accordingly also bring about changes in the exposure patterns. How these changes will look like is not clear at present, however. Moreover, the industrialisation plans will be accompanied by major transformations in the economic and employment structure of the region. Plans such as the construction of a large port, new commercial centres and a tourist area will create many jobs in various fields of the secondary and primary sectors. This might raise the diversity of income sources and increase the financial capital of the households in the research area, i.e. it has the potential to reduce susceptibility and increase the response capacity. However, the extent of these changes will largely depend on the human capital development.

These characteristics and dynamics of the social-ecological system are essential in order to understand ‘who responds to what’ but they cannot explain ‘why’ some measures are taken and others not –a fundamental question in the analysis and evaluation of coping and adaptation (see the anatomy of risk-related response mechanisms in section 2.4.1). To find answers to this question, the following chapter will analyse household decision-making processes in the context of water-related risks.

6 Subjective perspectives on coping and adaptation – empirical results in the context of decision-making

The social-ecological risk context, which is described in the previous sub-chapter, provides essential stimuli to take action. For an assessment and evaluation of coping and adaptation mechanisms, it is therefore a vital basis of analysis. However, these risk-related stimuli can be perceived and understood in manifold ways so that similar vulnerability patterns may have different implications for different agents and their actions (see section 2.2). To understand why this is the case, the present research takes a socio-cognitive lens on risk-related decision-making processes. The suggested model builds on a social-psychology perspective reasoned and structured by social-ecological system thinking. This allows linking processes at an actor-based level to processes on local, regional and global scales (see theory section 2.4.3). At the centre of this analysis are the perceived threats (outlined in section 6.1) and the perceived competences (outlined in section 6.2) which are both examined against the background of social-ecological variables and cognitive determinants. This will provide the basis for understanding why adaptation/coping intentions are formed and why certain actions are implemented (outlined in section 6.3). In addition, this conceptual lens makes it possible to derive individual, actor-specific and subjective evaluations of local coping and adaptation strategies (outlined in section 6.2.3). Given the current research foci and methodological constraints (see sections 1.3 and 4.2), the analysis will centre upon the decision-making processes of local households and will address governmental processes in less detail. Despite this restriction, the following subchapter will provide important answers to some of the most central research questions posed at the beginning of this thesis (see Figure 6.1).



Research questions addressed in this section:

RQ1: How are coping and adaptation processes on site interrelated with differential vulnerabilities to water-related hazards?

→ What influences the individual decision-making of different stakeholders in the context of water-related risks?

RQ2: How can different strategies be evaluated?

→ Which quality criteria are important to different stakeholder groups and how do they evaluate household and government strategies?

→ Which evaluation-based mismatches arise?

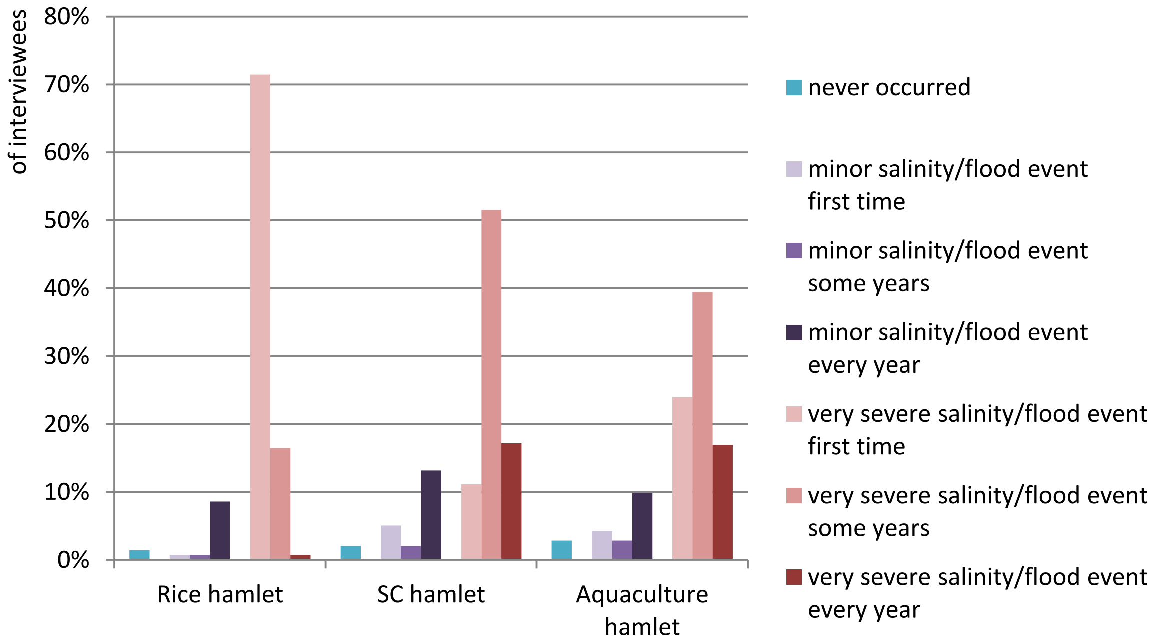
Figure 6.1: Conceptual basis for analysing decision-making processes and related research questions (Source: author, conceptualisation based on Grothmann, Patt 2005; Grothmann, Reusswig 2006; Krömker, Mosler 2002)

6.1 Appraisal of water-related threats

The socio-cognitive model outlined in section 2.4.3 acts on the assumption that there are two major components deciding about the intention to respond to given hazards: the threat appraisal and the competence appraisal. In a first step, it is key to assessing the threat appraisal because it provides the basic motivational energy to take actions, i.e. a hazardous event, however large it might be, will only bring about a social response when it is also perceived as a threat by the respective agent. The threat appraisal is also an indicator for the perceived relevance of adaptation and coping actions, i.e. an important quality criterion in evaluation. The higher the perceived threat, the more relevant is taking action perceived to be. The conceptual discussion delineates appraisal as “an agent’s internal definition of what is dangerous [...]” (Dessai et al. 2004; Grothmann, Patt 2005: 4; Grothmann, Reusswig 2006: 104; see definition in section 2.4). It comprises, firstly, the perceived hazard exposure and, secondly, the perceived susceptibility. In the following pages, these components will be analysed at the household level against the background of social-ecological drivers and cognitive variables.

6.1.1 Perceived hazard exposure

The perceived hazard exposure is one of two central components of an individual threat appraisal which determine if and how people decide to respond to given hazards. It describes the perceived hazard characteristics and the perceived probability of being affected by those hazards. In the current research context, the largest differences were observed between the different production areas (see Figure 6.2)[101].



Explanation: The interviewees in the survey were asked “Does tidal flooding/salinity occur regularly and in which intensity?” The percentages on the y-axis represent the share of households in the respective production area who ticked the given options depicted on the x-axis. The total population is 312 (rice: 140, sugarcane: 100, aquaculture: 72).

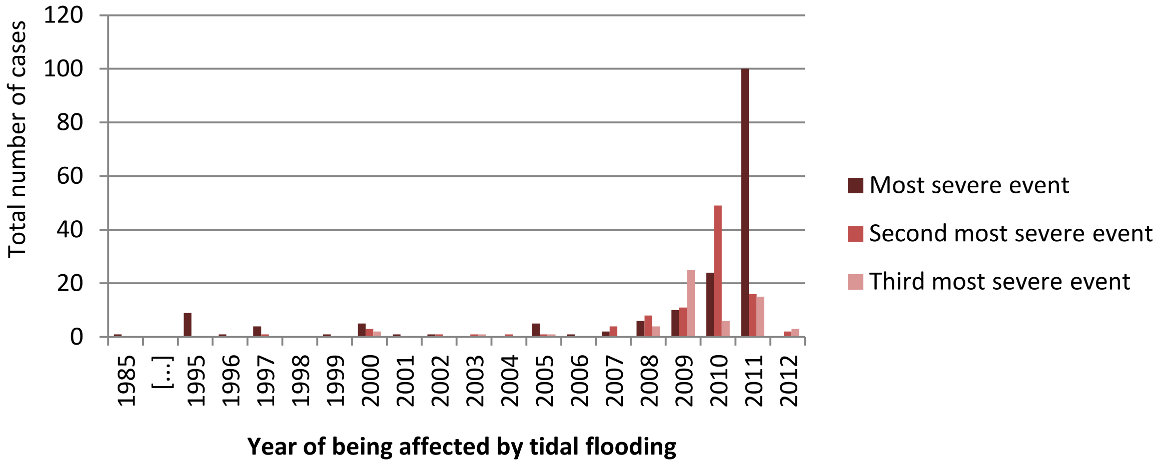
Figure 6.2: Experienced frequency and noxiousness[102] of previous salinity/flood events in the different production areas (Source: Household survey, M. Schwab 2012)

The perceived hazard exposure in aquaculture and sugarcane areas seemed to be high. For households in those areas, **tidal flooding** was a common event. More than 60 % of the survey interviewees experienced flooding in at least some years and more than 15 % even experienced it every year (see Figure 6.2). The severity of the tidal flood events was also commonly perceived to be

[101] There were no significant differences found between Kinh and Khmer and none between poor, near-poor and not-poor households.

[102] Noxiousness and severity refer in the following sections to hazard characteristics which were adverse to the local livelihoods. The household survey revealed that those adverse features included a high level, a long duration, and an unexpected or earlier timing of flooding/salinity. The most important of those characteristics seemed to be the higher level of flooding/salinity.

high. Around 80 % of the interviewed households reported having been affected by severe events rather than by minor ones. Moreover, the most near-term flood occurrences were perceived to be the most noxious, i.e. the majority of interviewees said that 2011 was the year with the most severe tidal flood event; the second and third most severe events were reportedly experienced in the previous years 2010 and 2009 (see Figure 6.3).

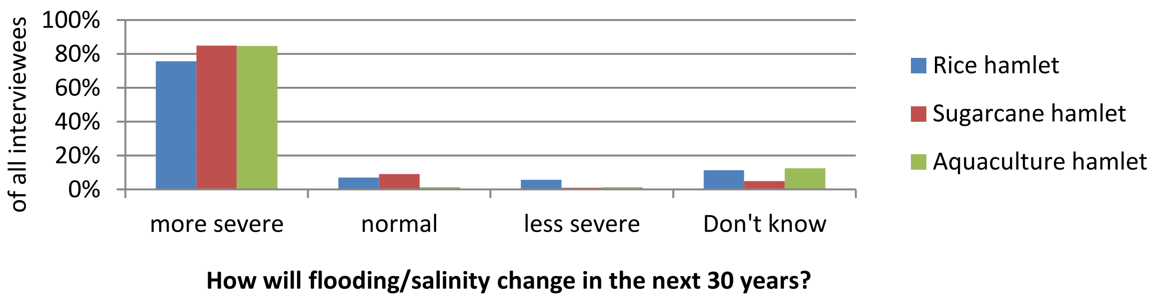


Explanation: The interviewees in the survey were asked "In which years was it [tidal flooding] most adverse?". The three most adverse years were then ranked. The total population is 170. Every household named the most severe event. The second and third most severe events were only named by the households which experienced tidal flooding more than once respectively twice.

Figure 6.3: Ranking of the perceived noxiousness of tidal flood events (Source: Household survey, M. Schwab 2012)

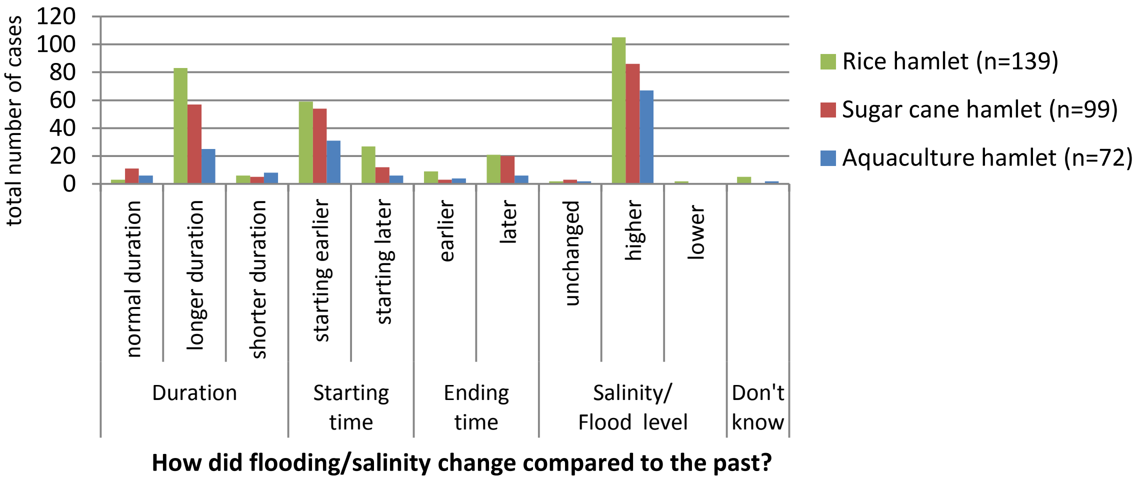
At present, the perceived hazard exposure also seemed to be high in the **salinity affected** areas. More than 90 % of all interviewees thought that they had to deal with severe salinity events when being affected. The majority of those households did not have many reference points for judging their hazard exposure, though. The survey revealed that more than 70 % of the interviewed households experienced saline intrusion for the first and so far only time in 2011 (see Figure 6.3), i.e. only shortly before the survey was conducted. This near-term event was exceptional in its noxiousness. According to the household survey, 97 % of all households found that 2011 was the most severe year they had ever experienced. The government officials and the households in the group discussions also shared this opinion and ranked 2011 as most noxious salinity event that had ever occurred in the research area.

Besides the perceived hazard exposure today, it is important to consider how tidal flooding/saline intrusion **change**d throughout history and how they are expected to change in the future. Generally, more than 90 % of all households, regardless of their socio-economic and cultural background or agricultural production type, found that flooding and salinity had become more severe compared to the past. For the future, most people expected that these hazards would become even more severe than they are today. Only a few people expected that they would stay the same or change for the better (see Figure 6.4).



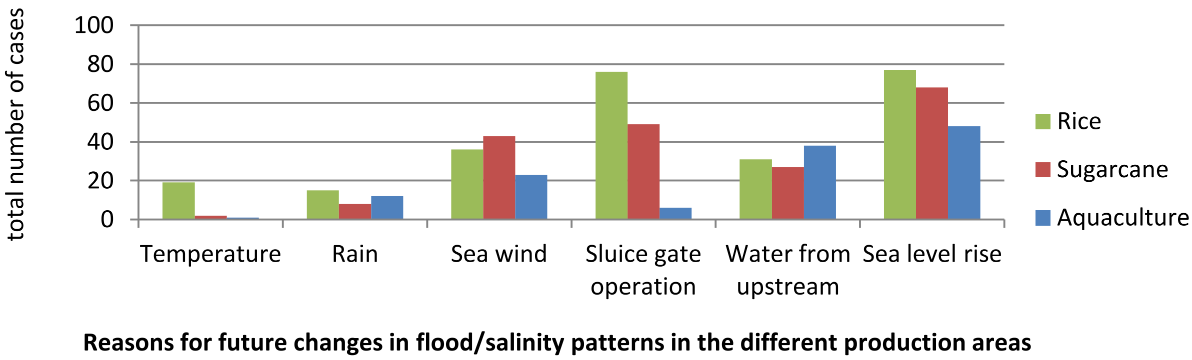
Explanation: The percentages on the y-axis represent the share of households in the respective production area who ticked the given options depicted on the x-axis. The total population is 312 (rice: 140, sugarcane: 100, aquaculture: 72).

Figure 6.4: Expected positive/negative changes of flood/salinity in the next 30 years (Source: Household survey, M. Schwab 2012)



Explanation: The households were asked to tick a maximum of three options from the ones depicted on the x-axis. The number of cases on the y-axis represents the total number of households who ticked the respective option. The total population is 312 (rice: 140, sugarcane: 100, aquaculture: 72).

Figure 6.5: Changes in the flooding/salinity patterns compared with the past in the different production areas (Source: Household survey, M. Schwab 2012)



Explanation: The households were asked to tick a maximum of three options from the ones depicted on the x-axis. The number of cases on the y-axis represents the total number of households who ticked the respective option. The total population is 309 (rice: 138, sugarcane: 100, aquaculture: 71).

Figure 6.6: Reasons for changes in salinity patterns perceived by households in the different production hamlets (Source: Household survey, M. Schwab 2012)

In the **salinity affected** rice-producing areas, most interviewed households found that salinity started earlier, lasted longer and occurred at higher salinity levels compared with the past (see Figure 6.5), i.e. the majority of households thought that salinity had become more severe. For the future, nearly half of the interviewed households believed that salinity levels and the duration will continue to increase in the next thirty years. Climate changes (mainly sea level rise, sea wind and temperature) and less water from upstream were perceived to be responsible for these changes by the majority of the interviewed households. These determinants were named as reasons for salinity deteriorations by around 80 % of the households who thought that saline intrusion became more severe compared to the past and by around 72 % of the households who thought that it would become even more severe in future. Nearly as many households (77% and 61%, respectively) thought that the sluice gate operation was responsible for this deterioration. Among the households who found that saline intrusion became better or stayed normal, there were only 33% of households that reported that the sluice gate operation was responsible for these changes. With regard to future changes, the sluice gate operations were more often made responsible for an improvement (69% of all interviewees). Accordingly, the sluice gate operation was also more often perceived to be a reason for a future reduction in the severity of the salinity patterns than for a future increase.

Also **tidal flooding** was perceived to arrive earlier, stay for a longer duration and occur with higher water levels compared with the past (see Figure 6.5). The reasons for the expected changes were different for sugarcane producers than for aquaculture producers. More than 50% of households in the sugarcane area thought that the sluice gate operation was a reason for these changes whereas only 5% of the aquaculture producers thought that the sluice gate played a role. The large majority of both sugarcane (77%) and aquaculture producers (71%) stated that sea level rise is a determinant for past changes. In addition, more water from upstream was judged to be an important driver of past changes in flood patterns, especially for aquaculture producers (33% of sugarcane and 65% of aquaculture producers thought so). For the future, nearly half of the interviewed households expected that the trend of longer durations and higher water levels would continue. Like the determinants for past changes, the large majority of both aquaculture and sugarcane producers said that sea level rise was one of the reasons for the expected changes (see Figure 6.6). The sluice gate operation seemed to play a major role for sugarcane producers but not for aquaculture producers (i.e. for 54% of the sugarcane producers compared to 10% of the aquaculture producers reported this). In the sugarcane-producing hamlets, some households believed that flood duration would decrease and that water levels would not change in the next 30 years. These households seemed to expect that climate- and hydrology-related factors (most notably sea level rise, sea wind and rainfall) were the main determinants for the changes. In contrast to the rice producers, they did not think that the sluice gate operation was responsible for positive changes in the flood patterns.

6.1.2 Perceived susceptibility

An often neglected factor in the perception of risk is the perceived susceptibility, i.e. the individuals' judgement of the factors which determine the "degree to which a system is modified or affected by flooding and salinity" (see definition of susceptibility in section 2.4; based on Gallopin 2006: 295; Birkmann 2013: 25). It is the second of two components in the individual threat appraisal which influence an agent's decision to cope with or adapt to given hazards. The following section is based upon an analysis of the individuals' perception of the susceptibility indicators presented in section 5.2.3.

Generally, households were well aware of their susceptibility with regard to **tangible factors**, i.e. households knew how many plots they possessed, were aware of the number of different commodities produced, and knew how many sources of income the family had. Accordingly, they were also well aware of the fact that they did not have any or had few other farm-based sources of income in the event of crop failure due to salinity/flooding. In these cases most of the households also did not seem to bank on the government. In the group discussions and in the interviews, households reported that compensation for crop failure was only paid in the rice-producing hamlets and in this case it was the first time that such support was received. Moreover, the majority of households knew that the government would not provide compensation again if the rice farmers decided to produce winter-spring rice in the following dry seasons. The households furthermore found that the amount of support was, in any case, too low to compensate for the large losses. In the group discussions and in the interviews, the participants agreed to the fact that there were no other short-term support measures in the event of losses.

In contrast, there was less knowledge of the **sensitivity of the produced commodity** in the season of highest flooding/salinity exposure – a central determinant of susceptibility (see section 5.2.3). The interviews pointed out that this was most notable in the **salinity affected** rice-producing areas before 2011. In 2011, when most people lost all their rice production, this awareness changed (see section 5.2.1). The group discussions with households and government authorities (conducted in early 2012) revealed that most participants were aware of the effects of salinity on crop productivity, soil quality and related diseases (GD-A-DX-0114, GD-A-NB-0113, GD-H-SV-1229). Based on these assumptions, most of the participants judged that winter-spring rice is highly sensitive to saline intrusion. Moreover, there was only little knowledge about the salinity resistance of different rice varieties, according to the production-centred interviews. Governmental officials, especially the agricultural staff, showed more awareness and knowledge of the sensitivity of different rice varieties[103].

Among the **flood affected** households the awareness and know-how of the sensitivity of crops and aquaculture species seemed to be higher than in the rice-producing hamlets. Generally, the degree of production loss in the most recent case of adverse tidal flooding (most commonly the households referred to 2011) was felt to be higher by aquaculture producers than by sugarcane producers, according to the household survey and the CBAs. The know-how about the sensitivity of different varieties was higher in the flood-affected areas than in the rice-producing areas, most notably among sugarcane farmers[104].

For sugarcane and aquaculture production, the **quality and height of the individual embankment** or earth wall around the field/pond was a central driver of susceptibility to tidal flooding (see section 5.2.3). In the sugarcane-producing hamlets, most households judged their susceptibility as low due to the low quality of the embankment. Only six households in the survey thought that they were affected because the quality of the construction material was too low so that the earth wall became more prone to gradual erosion and sudden breakages. The other 48 households where the levee was breached anticipated that it was only a result of the high water level and pressure irrespective of the quality of the embankment. The government officials on hamlet and commune levels opined that the main reason for the high number of damaged embankments was the low quality of the embankments (GD-A-KS-0112, AI-C-KS-1103, AI-H-BXD-0419). The households which did not report having had a levee breach thought that the embankment was too low so that water could overtop the crest of the embankment, i.e. the height of the embankment was judged to be of higher relevance to the perceived susceptibility than the quality. In the aquaculture hamlets, more households seemed to think that the quality of their embankment made them more susceptible to tidal flooding. Around one third of all households who reported an embankment breach believed that the reason was its low quality. This awareness was shared by the local authorities who often argued for better preparation of the embankments (GD-A-DX-0114, AI-H-LS-0331). Like the sugarcane producers, the majority of aquaculturalists who did not report a breached dike thought that the height of the dike was the main reason for their losses.

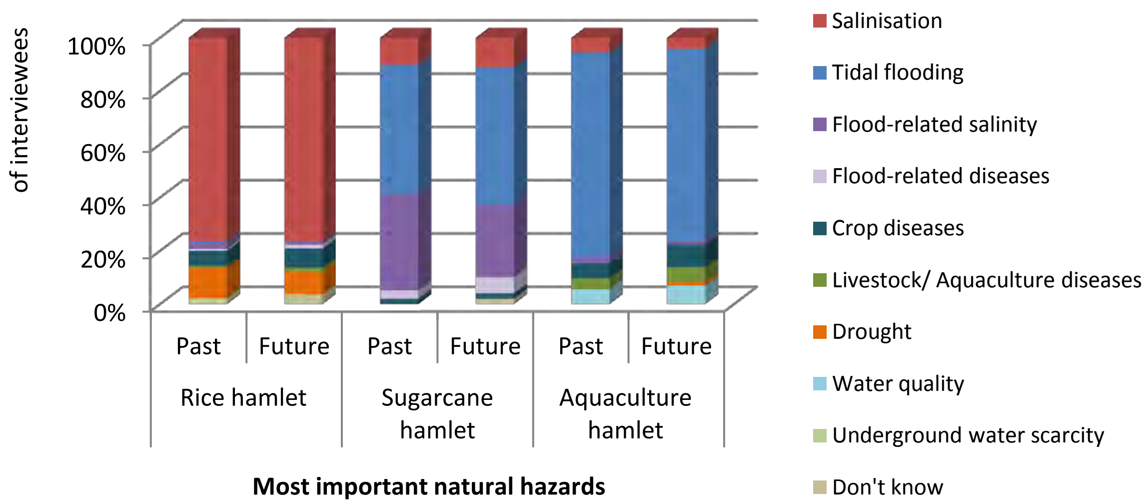
[103] This know-how of variety related sensitivity of households and authorities was not further validated with more in-depth interviews, though.
[104] There were no in-depth interviews on this subject-matter, however.

6.1.3 Overall perception of water-related threats

Salinisation and flooding were ranked to be among the **most important**[105] **threats at present** for the people in the research area (see Figure 6.7). The survey showed that more than 85% of the households ranked either flooding or salinisation as the most important natural hazard[106] in the past 10 years. There were no significant correlations between socio-economic characteristics or ethnicity but there were significant disparities between the different production areas.

In the **sugarcane-producing areas** nearly 90 % of the interviewed households judged that flooding, flood-related salinity, or flood-related diseases were the most important natural hazards to them. In the group discussions tidal flooding was ranked by household participants as the third most important threat. In the **aquaculture hamlets**, around 80 % of the households found that flood-related threats were the most important natural hazards to them. In the **rice-producing hamlets** salinity was perceived to be the most important natural hazard by the large majority of households. Over 80 % of the interviewees thought so and it took first place in all group discussions[107].

The survey also revealed that most people anticipated that the threat of flooding/salinisation would continue to be the most important natural hazard in the **future**, most notably in rice- and sugarcane-producing hamlets (see Figure 6.7). This opinion coincides with the expectations of an adverse change in the hazard exposure (see section 6.1.1). In the aquaculture hamlets some (yet very few) of the households, furthermore, expected that aquaculture/crop diseases and water quality would gain in importance so that these threats will become more important than tidal flooding in the future.



Explanation: The interviewees in the survey were asked "Which major natural hazards did you experience in the last 10 years?" and "Which natural hazards will be of significant importance in the next 10 years?". The percentages on the y-axis represent the share of households in the respective production area who ranked the given options depicted in the legend as most important natural hazard. The total population is 312 (rice: 140, sugarcane: 100, aquaculture: 72).

Figure 6.7: Most important past and future natural hazards in the different production areas (Source: Household survey, M. Schwab 2012)

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105 The answer category "most important" in the survey referred to what each person thinks is important. Important can hereby refer to different aspects in their livelihoods such as income losses, health effects, environmental impacts or food security.

106 The term "natural hazard" is used here synonymously for threats stemming from natural hazards compared with threats stemming from socio-economic hazards.

107 The household survey did not reveal any significant differences in risk perception between different socio-economic groups and ethnicities.

6.1.4 Threat appraisal – key findings and interpretation

The previous sections indicate that flooding and saline intrusion were perceived to be the most important threats in the research area, particularly by rice producers. This seemed to be mainly owed to the perceived hazard exposure but was also influenced by the perceived susceptibility. The largest disparities with regard to threat perception were observed between the different production areas. The socio-economic and ethnic groups varied only little and insignificantly with regard to their threat appraisal.

Under consideration of the findings presented in chapter 5, the previous sections also reveal that there are sometimes considerable biases and mismatches between the perception of threats and the recorded and measured data. This was most notable in the rice-producing hamlets. The farmers there perceived a hazard exposure which widely dissents the data provided by the HMI Tra Vinh. The recorded data indicate that the salinity levels were high in most years of the recent past and that the most severe event was in 2010 (see section 5.1.1) whereas rice producers thought that it had been only the year 2011 in which they were affected by saline intrusion. Moreover, the knowledge with regard to some of the most crucial susceptibility factors seemed to be comparatively low. The perceived crop sensitivity seemed to be lower before 2011 and higher after 2011 than the secondary literature may suggest (see section 5.2). In contrast, flood affected households revealed a more "data-reflecting" perception of hazard exposure and susceptibility.

The previous sections 6.1.1 and 6.1.2 indicate that there were several **socio-cognitive reasons** for the overall perception of threats and for these biases. Firstly, the **availability effect** (see section 2.2.2) made itself felt due to the near-term nature of the respective last event. In all hamlets, the most recent hazardous event of flooding/salinisation occurred only in the previous year and people were still able to feel the consequences of this event in their daily lives. This caused the perception of a high severity and influenced the perception of the distinct nature of flood/salinity occurrences (see section 6.1.1 and 6.1.2). In the rice-producing hamlets, for instance, the general perception of salinity patterns seemed to be based mainly on the latest and in most cases only salinity event. The households therefore thought that salinity arrived and will arrive earlier and at a much higher level than normally.

Secondly, the **reliance of households on governmental short-term and long-term measures** seemed to be comparably low, particularly in the flood affected hamlets. This raised the overall threat perception. It was, for instance, commonly believed that dikes and the operation of the sluice gates were responsible for negative changes in hazard patterns, specifically with regard to salinity. Despite the continuous improvements in protective infrastructure in recent years, the perceived effects of climate change seem to somehow outweigh the belief in dikes and sluice gates. Government officials, in contrast, put more trust in protective infrastructure and in its continuous improvement in the future. This was named to be the most important reason why they expected a lower threat of salinity and flooding in future (see section 6.1.1 and 6.1.2).

Thirdly, the **perceived probability** of hazard occurrence was high in the flood affected hamlets. They had to deal with it in most years and also therefore believed more commonly in a higher probability of flood occurrences. This led to an increase rather than a reduction of risk perception as is suggested by several scholars in the field of socio-cognitive decision-making (see section 2.2.2). In the rice-producing hamlets, a fourth and particularly important factor came into effect: the **noxiousness of the latest hazard event**. Even though the rice producers had to deal with a lower frequency of events and the reliance on protective infrastructure was higher than in the other areas, saline intrusion seemed to be perceived as a larger threat than tidal flooding in the other hamlets. This indicates that the experienced severity of an event is the most decisive variable in the subjective appraisal of threats.

Fifthly, the biases and lack of knowledge about flooding/salinity threats were subject to the stock of personal **risk-experiences.** The larger biases and the lack of awareness in the rice-producing hamlets seemed to be owed to the fact that most farmers did not grow anything in the dry season before 2011 and therefore also did not realise when and how salinity affected the region. There were only a few households who reported that they had to deal with severe salinity before. These households were mainly located in Rach Bot and Sa Van A hamlets (Ngoc Bien commune) where a third season of rice production was also grown in previous years (see section 5.2). The more "data-reflecting" perception of the hazard in the flood affected hamlets seemed to be mainly owed to the larger stock of hazard experiences. Flooding occurred, as mentioned in section 6.1.1, nearly every year or at least in several years in the recent past. The farmers in those hamlets were therefore more experienced in dealing with flooding than rice producers with saline intrusion. The risk experiences also shaped the know-how with regard to the susceptibility. In the flood affected households the awareness and know-how related to the sensitivity of crops and aquaculture species seemed to be higher than in the rice-producing hamlets. The sugarcane farmers possessed the most detailed know-how due to the extensive stock of personal risk experience and due to a frequent change in sugarcane varieties according to the production-centred and more in-depth interviews.

Moreover, a lack of **social discourse** around flooding and saline intrusion influenced the individual threat appraisal notably. In the salinity affected areas, saline intrusion did not play a major role in the daily interaction among farmers before 2011. Moreover, training classes seemed largely to have left out saline intrusion from their schedules (see section 5.2.4). Authorities at the hamlet and communal level reported having addressed this topic in the years before 2011 (e.g. AI-C-TQ-0419, AI-H-XT-0309, AI-H-BC-0306, AI-C-FA-1101). Despite of this and the reportedly high awareness of salinity exposure among government authorities (e.g. AI-P-DA-1102, GD-A-NB-0113, AI-HL-BGA-0206, HI-S-SV-L16), households said that they did not receive much information from authorities and were not involved in ongoing public debates about saline intrusion, however. This did not only cause a misperception of hazard exposure but lead also to a lack of awareness with regard to susceptibility. The knowledge of crop sensitivity was in most cases only based on a single experience and was rarely backed up by technical know-how from training classes (see section 5.2.4). Taking into account the fact that most of the households had lost 100 % of their production in this single event of reference may suggest that perceived crop susceptibility after 2011 was even higher than the actual susceptibility.

In the flood affected hamlets, farmers did not only experience the degree of harm which tidal flooding could cause to their own production more commonly but they also learned from the experiences of neighbours, family and friends. Tidal flooding played an important role in the interaction and exchange with the other villagers. Moreover, the governmental authorities seemed to be well aware of the flood exposure in the aquaculture and sugarcane areas. In the training classes and meetings with mass organisations and government authorities, tidal flooding was, however, in most cases not specifically addressed (see section 5.2.4). This can partly be explained by the fact that authorities perceived flooding to be an event which may have occurred regularly but which was not very noxious in the recent past (AI-C-KS-1103, AI-H-LS-0206, GD-AC-DX).

Individual risk experience and the interaction with other households accordingly seemed to be the most influential factor shaping knowledge about hazard and product characteristics in both flood and salinity affected areas because it appeared to be the only source of information about salinity and flooding in many cases. There was merely little or no information provided by training classes, awareness-raising programs or formal education (see section 5.2.4).

6.2 Competence appraisal

The subjective threat appraisal, as outlined above, seems to provide ample motivational energy to take action. Nevertheless, people can knowingly face an intolerable threat without intending to respond to it. A person who does not trust in his/her capacities to respond and who is not aware of the options to respond in a beneficial way, will either not be ready to take action or will decide upon avoidant maladaptation (see e.g.; Grothmann, Reusswig 2006: 107; Cervone 1989; Bandura 1982; Rogers 1975 in section 2.2.2). These variables are grasped by the so-called competence appraisal. It is defined as the "subjective evaluation of the own capability to respond to experienced hazardous events and anticipated threats in a beneficial way" (see definition in section 2.4; based on Krömker, Mosler 2002; Grothmann, Patt 2005; Grothmann, Reusswig 2006; Rogers 1975). In the socio-cognitive model presented in section 2.4.3, competence appraisal is the second of the two main variables which drive the intention to act. It encompasses the assessment of potential strategy options, self-efficacy and response efficacy. The description of the perceived self- and response efficacy also entails important insights for subjective judgements of strategies, i.e. they reflect capability- and outcome-oriented evaluation criteria. In the next sections, these three analytical components will be analysed in due consideration of cognitive determinants, social-ecological influences and the implications for forming an intention to respond.

6.2.1 Awareness of adaptation and coping options

The competence appraisal is first and foremost subject to the acknowledged adaptation and coping options. Only if a person is aware of a certain strategy option can he/she evaluate its quality and his/her own efficacy to implement it. Based on the conceptual reflections presented in section 2.4.2, the following analysis distinguishes between coping and adaptation options[108]. This categorisation implies not only statements about the timescale but also about the outcomes of actions (Schipper, Burton 2009; Birkmann 2011a) – two central aspects for the current analysis and evaluation of risk-related strategies. The following section will outline the perceived adaptation and coping options. These findings are predominantly based on the results of participatory household group discussions which exemplarily appraised relevant strategy options in four hamlets in the three production areas[109].

The awareness seemed to be lowest with regard to adaptation measures – most notably with regard to **flood/salinity-specific adaptation** options (see columns with red/blue shaded boxes in Table 6.1 and second group of bars in Figure 6.8). In the two flood-affected sugarcane hamlets protective measures such as the construction of embankments or drainage ditches around the fields and the inset of small gates were named to be the most important flood-specific adaptation strategies (GD-H-XR-1228, GD-H-BS-1230, and GD-H-TC-1227). In the aquaculture hamlet, these strategies were not named to be relevant options because they were perceived to be basic requirements for the production of shrimp, fish or crabs (GD-H-BS-1230). In the rice-producing hamlet, no protective measures which would make them better adapted to salinity occurrences in the future were acknowledged (GD-H-SV-1229). In this hamlet, also changing the crop as a reaction to increased

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[108] Adaptation represents deliberate medium- and long-term adjustments to experienced or expected hazards by changing the existing system; the strategies are based on livelihood assets and opportunities and aim to protect and improve the livelihood basis and the objects of value (IPCC 2012: 558; Korf 2002: 3; Birkmann 2011a). Coping is defined as the use of available livelihood assets and opportunities as a response to a hazard with the goal of fulfilling the basic needs and functioning in the short-term (IPCC 2012: 558; Korf 2002: 3; Birkmann 2011a; Turner et al. 2003).

[109] The in-depth interviews and pre-tests before the survey had shown that an appraisal of potential coping and adaptation options was not feasible and/or did not bring reliable results as part of the household survey. For this reason, the awareness of coping and adaptation options cannot be directly correlated with other socio-cognitive indicators on a quantitative level.

salinity/flood risk was not perceived to be an option; the same held true for the aquaculture producers (see section 6.2.4 for more details on why that was the case). Changing the crop only seemed to be an option in the sugarcane-producing hamlets where some people (also in the household survey) reported that they changed to corn (GD-H-TC-1227). In one of the sugarcane-producing hamlets, the group discussion participants said that changing to aquaculture was an effective way to adapt to flood risks (GD-H-XR-1228). In none of the discussions was the change to a more saline resistant variety perceived to be an option (GD-H-XR-1228, GD-H-BS-1230, GD-H-TC-1227, aGD-H-SV-1229).

The awareness of **general risk-related strategies** seemed to be higher than the awareness of flood/salinity-specific options (see column with purple shaded boxes in Table 6.1 and third and first group of bars in Figure 6.8). In three discussions, the participants in the group discussion reported that a change to livestock farming might be an option to respond to risks such as saline intrusion. In the discussion with aquaculture producers it was even named among the three most effective strategies in the context of flooding (GD-H-SV-1229, GD-H-XR-1228, GD-H-BS-1230). In all of these discussions, the change to livestock farming was only an option in its function as an additional and not as the only source of income (GD-H-BS-1230, GD-H-TC-1227, GD-H-SV-1229). Strategies related to finding another source of income which is not linked to agricultural production were perceived to be of relevance in all hamlets. Migration to large cities, e.g. to Ho Chi Minh City and Binh Duong, was of central importance in this context, most notably in the rice-producing hamlet where it was judged to be the second most important strategy in the context of flooding/salinity (GD-H-XR-1228, GD-H-BS-1230, GD-H-TC-1227, GD-H-SV-1229). Finding off-farm employment on site was less often perceived as a relevant option. Opening a small business such as a convenience store was only mentioned in the discussions with sugarcane farmers and aquaculture producers, not in the discussion with rice farmers, though (GD-H-SV-1229, GD-H-XR-1228, GD-H-BS-1230). Working for the large shoe factory My Phong was merely acknowledged in the discussion with aquaculture producers (GD-H-BS-1230).

The awareness of household-led **coping** options seemed to be higher than the awareness of adaptation options (see brown shaded boxes on the left margin of Table 6.1 and third and fourth groups of bars in Figure 6.8). In rice- and sugarcane-producing areas the participants of the group discussions said that they could increase inputs such as fertilisers to improve the soil quality. This was named as the most or second most effective strategy in the context of salinity/flooding. In aquaculture hamlets increasing inputs was not perceived as an option by the discussion participants. They said that they renewed the whole water in the pond anyway (just like after other seasons) and therefore also did not increase the inputs. Increasing the inputs went hand in hand with some other coping measures, i.e. buying more inputs on credit and/or taking an additional loan. These measures were most commonly perceived to be necessary because households needed, on the one hand, more inputs, but did not, on the other hand, generate any income to pay back the existing loans (GD-H-XR-1228, GD-H-TC-1227, GD-H-SV-1229). In the aquaculture hamlets, the reparation and maintenance of the embankment around the pond was named to be the most essential strategy option in the context of tidal flooding. In these hamlets, the embankments were often substantially damaged and without reparations there was no further production possible (GD-H-BS-1230). This was, according to the group discussions, not the case in the sugarcane- and rice-producing areas. In one of the discussions in sugarcane-producing hamlets, a short-term change in the cultivated product was additionally named as an option to improve the soil quality (GD-H-TC-1227). Producing again or re-filling the field/pond also was mainly relevant to sugarcane-producing households because they were able to start production all year round (GD-H-XR-1228, GD-H-TC-1227). In the discussion with rice producers, this was not perceived to be an option because farmers only had short periods in which they were able to start cultivation (GD-H-SV-1229). In the aquaculture areas, households sometimes restocked the pond with shrimp but they did not do so once the salinity or pollution was too high and the water had to be exchanged (GD-H-BS-1230).

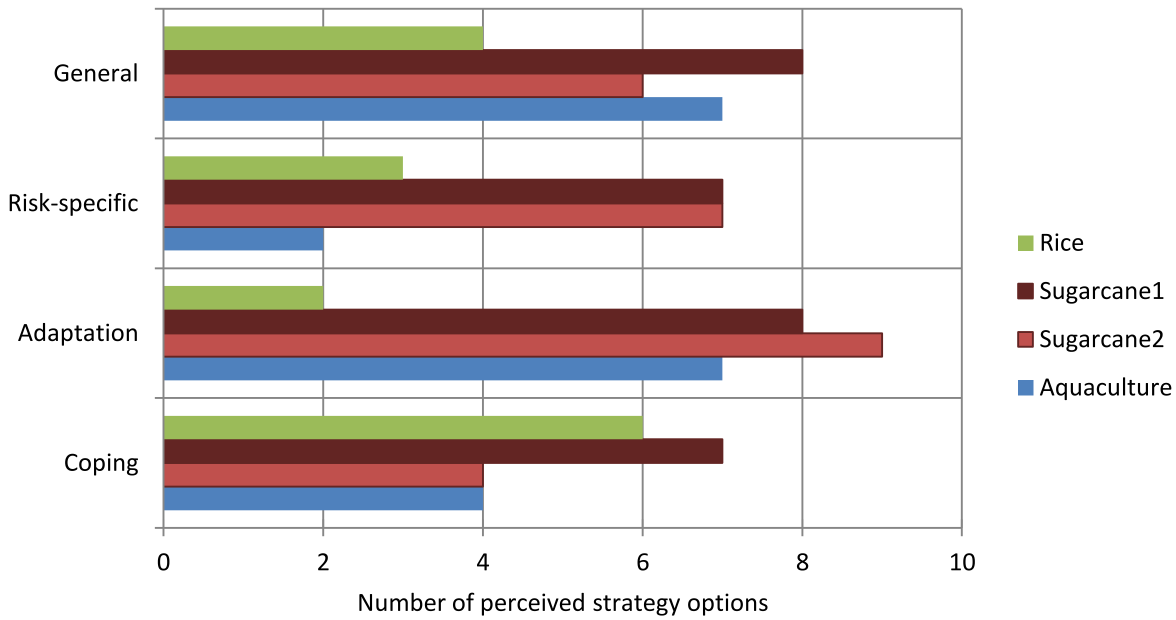
Table 6.1: Perceived household strategy options

C/A*	Risk-relatedness **			Household strategies***	*Place of group discussion: Prod. area and hamlet name (n=Number of participants)*			
					Rice area	Sugarcane area		Aquac. area
					Sa Van A hamlet *(n=15)*	Tra Cu C hamlet *(n=9)*	Xoai Rum hamlet *(n=13)*	Bau Sau hamlet *(n=31)*
C		F		Refill or produce again	o	x		
C		F		Repair the embankment				**(1)**
C	S			Pump water in/out of the field	**(3)**			
C	S	F		Increase fertiliser and pesticides	**(1)**	**(2)**	**(2)**	
C			G	Buy fertiliser/pesticides on credit	x	**(3)**		
C		F	G	Change product temporarily		x		
C/A		F	G	Storage of rainwater			x	
C/A			G	Take a loan	x	x	x	**(2)**
C/A			G	Sell land		x		x
C/A			G	Migrate to the large cities	**(2)**	x	x	x
A			G	Open a small business			x	x
A			G	Work for My Phong				x
A		F	G	Change to rice farming		o		o
A		F	G	Change to aquaculture			**(3)**	
A			G	Change to livestock	o	o		**(3)**
A	S	F	G	Change to other products		o	o	
A		F		Build an embankment		**(1)**	**(1)**	
A		F		Build a drainage ditches around the field			**(1)**	
A		F		Build a small gate to control the water			x	

Explanation: The households in the group discussions were asked which strategies had been and which others could be applied in the context of salinity/flooding. The applied strategies and the potential options were subsequently ranked according to their relevance in the context of flood/salinity risk management. The categorisation of the strategies is based on the definitions given in section 2.4 and the strategy-related information provided by the households in the group discussions.

*C/A Classification in ***coping*** (C), ***adaptation*** (A) and strategies which can be ***both*** depending on the circumstances (C/A)
S/F/G Classification in ***salinity-specific* (S), ***flood-specific*** (F), and ***general*** risk-related responses (G)
o Perceived options which were ***not applied*** in the hamlet in the past
x Perceived options which were ***applied*** in the hamlet
(n) ***Ranking*** of the strategy's importance in the context of salinity/flood risk

Source: Household group discussions, M. Schwab (2012)



Explanation: The axes depict the number of strategy options in the respective class of strategies as stated in the group discussions with households (see Table 6.1)

Figure 6.8: Illustration of the perceived strategy options in the context of salinity/flooding as stated in four group discussions (Source: author, based on household group discussions, M. Schwab 2012)

6.2.2 Perceived self-efficacy

Perceived self-efficacy is the second of the three main components which determine the competence appraisal of an agent. This component owes its relevance to the fact that one needs to judge one's own capabilities to perform the options which are perceived to be on hand before an intention to act can be formed (Grothmann, Patt 2005). These capabilities refer to the capacity of response which is driven by the wealth of livelihood capitals, i.e. by endowment with natural, physical, financial, human and social assets (see section 2.4). The empirical literature on socio-cognitive decision-making shows that most people are well aware of the more tangible of those assets; but as Bandura (2002: 94) argues, perceived self-efficacy is not primarily concerned with the endowment or the skill a person has "but with judgements of what one can do with whatever skills one possesses". It was therefore important to arrive at a more strategy-specific judgement of one's own capabilities. An evaluation of each coping and adaptation option based on process- and capability-oriented criteria seemed to be a viable option for identifying such strategy-specific capabilities[110]. The following section will therefore, first, introduce the most important criteria relevant to the analysis of perceived self-efficacy and, second, outline the general weight of each criterion and its strategy-specific implications to the different stakeholder groups.

Implementability and costs were identified as the most relevant quality **criteria** reflecting the perceived self-efficacy. Costs are clearly linked to the financial capital endowment of a household.

[110] Around one third of the interviewees (n=98) in the household survey were asked for an evaluation of a range of given strategy option. This evaluation section included a selection and ranking of the three most important advantages and disadvantages speaking for or against the application of a strategy. The interviewees could choose from six different quality criteria which also comprised three capability-oriented criteria, i.e. costs, implementability and implementation time (see Annex 12.3.3). Implementation time will not be addressed explicitly in the following pates because it seemed to be less important in the context of perceived self-efficacy.

Instead of asking how much money or income a household has, it has been shown to be more relevant to ask whether this capital endowment was enough to implement certain strategies or whether the strategies were (too) expensive to afford with the given capital stock. Accordingly, a household that thinks that low costs are a definite advantage in applying a given strategy assumes that it has the financial capability to implement it and vice versa. A similar argumentation applies to the criteria implementability and implementation time. Implementability relate to a broader set of livelihood assets, though. The semi-structured interviews and discussions with households showed that a judgement according to these criteria most commonly refers to assets such as know-how, physical health, natural resources or productive assets. To specify those criteria it was therefore necessary to draw on another source of information, i.e. the most important socio-economic risks perceived by the actors.

Costs seemed to be the most relevant capability-related criterion. They were named at least as the second most important criterion in the participatory criteria weighting of all group discussions (see Table 6.2); and in the household survey, it was the most commonly mentioned disadvantage of strategies (see Annex 12.11.1). Accordingly, a large number of households seemed to think that a lack of financial capital restrained them from putting many strategy options into action. Low output prices, high input prices and a high level of indebtedness may have been decisive drivers of these financial straits, according to the risk rankings of group discussions and the household survey (see Annex 12.11.1). The relevance of costs for the appraisal of self-efficacy was not the same for each stakeholder group, though. Disparities were, for instance, found between the different production areas. Costs seemed to be a more restraining factor in the aquaculture than in the crop-producing hamlets. In those areas, the interviewees mentioned it more often as *relevant*[111] and as the *most important* criterion inhibiting the implementation of a strategy than in the other areas (see Annex 12.11.1). This tendency was confirmed by the group discussions where households in the aquaculture hamlet ascribed far more importance to costs than the others, in particular compared with rice-producing households (see Table 6.2). Some more disparities were found between different socio-economic and cultural groups. It was observed that not-poor households and those with a larger land size were more often restrained by costs than near-poor and poor households with less land (see Figure 6.10). Moreover, a significant positive correlation between poverty classification and the average mentioning of cost as the *most important* disadvantage was found, yet only in salinity affected hamlets (C^{SR}= -.370; $p<0.05$)[112], i.e. households which were not poor mentioned costs more often than those that were near poor and near poor more than poor households. Reasons for this are higher total costs for inputs and more capital intensive production techniques for richer households with larger land.

[111] The adjectives “most important” and “relevant” refer to the ranking in the household survey. The interviewees were asked to name the most important advantage/disadvantage plus two other relevant advantages/disadvantages for each strategy.

[112] Due to the small sample size of only 89 cases, there were only few significant links found between the different comparison groups and the perceived self-efficacy/response-efficacy indicators. In the following sections, these few significant linkages will be mentioned. The correlations here refer to the average number of mentionings per household per strategy for the respective criterion. A comparison of means with t-test and one-way anova tests was not possible as the variables are not normally distributed. Therefore only a descriptive analysis was undertaken in terms of nominal variables.

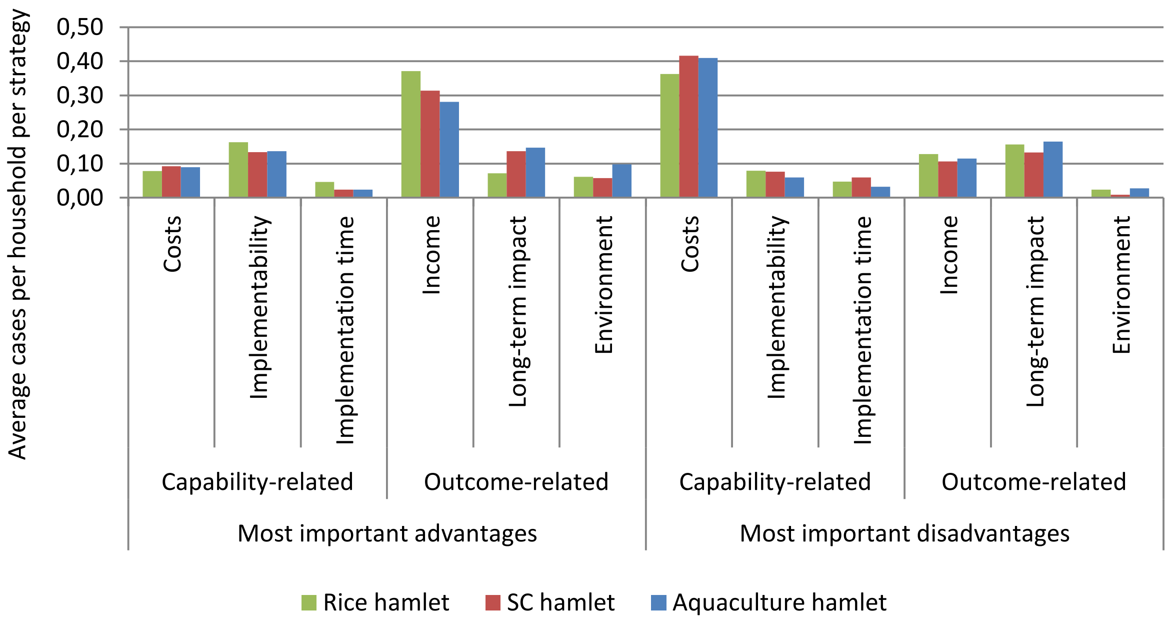
Table 6.2: Identification and scoring of relevant evaluation criteria in household decision-making

	Evaluation criteria for household strategies	*Scoring of relevant criteria for decision-making (total of 25 points)*			
		Average (all hh-discussions) *(n=61)*	**Rice** Sa Van A hamlet *(n=15)*	**Sugarcane** Xoai Rum hamlet *(n=13)*	**Aquaculture** Bau Sau hamlet *(n=31)*
Capability &process-oriented criteria	Costs	7	5	10	6
	Implementation time	1	2	1	0
	Autonomy/Implementability	1	2	0	1
	Climate Change proof	0	0	0	0
Outcome oriented criteria	Income	10	12	8	11
	Environment	1	4	0	0
	Long-term impact	2	0	0	5
	Flexibility	2	0	6	0
	Future risk	1	0	0	2
	Total of ascribed points	*25*	*25*	*25*	*25*

> 9 points ascribed to the criterion
7-9 points ascribed to the criterion
4-6 points ascribed to the criterion
1-3 points ascribed to the criterion

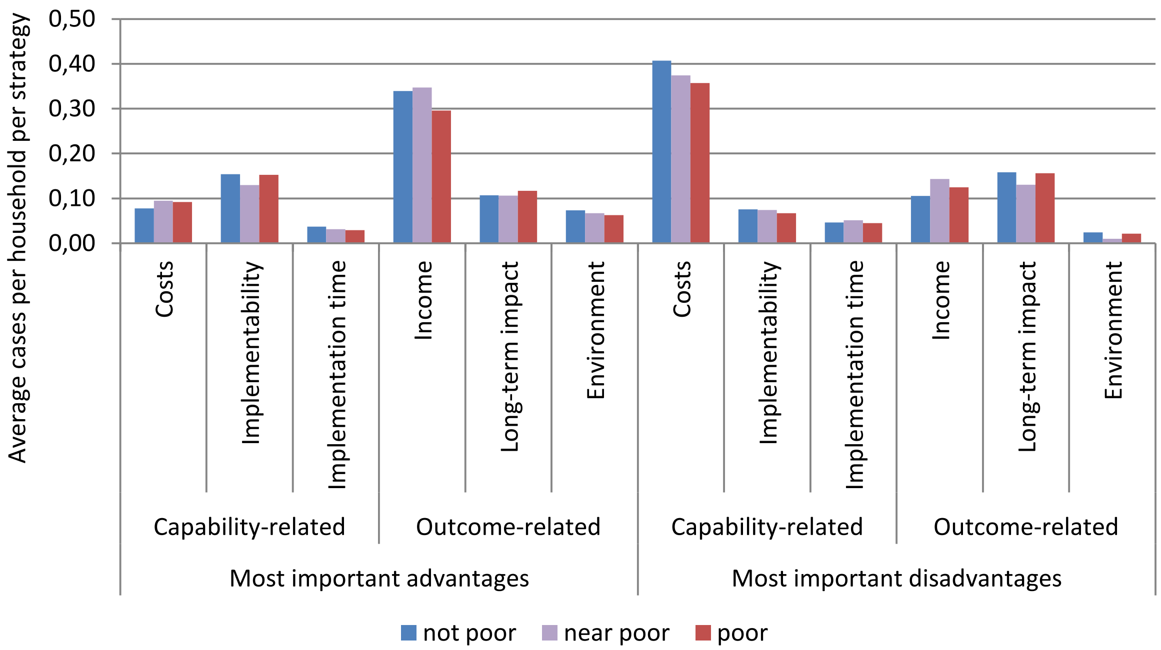
Explanation: The households in the group discussions were asked to name relevant criteria which speak in general for/against the application of strategies. When the households did not know of any more criteria, the moderator asked for the remaining criteria out of a list generated from a literature review. Subsequently, the households received a set of 25 pins which were distributed to the criteria on the list according to their relevance for decision-making. The distribution was decided commonly and consent-based by the participants.

Source: Group discussions and authority interviews, M. Schwab (2012)



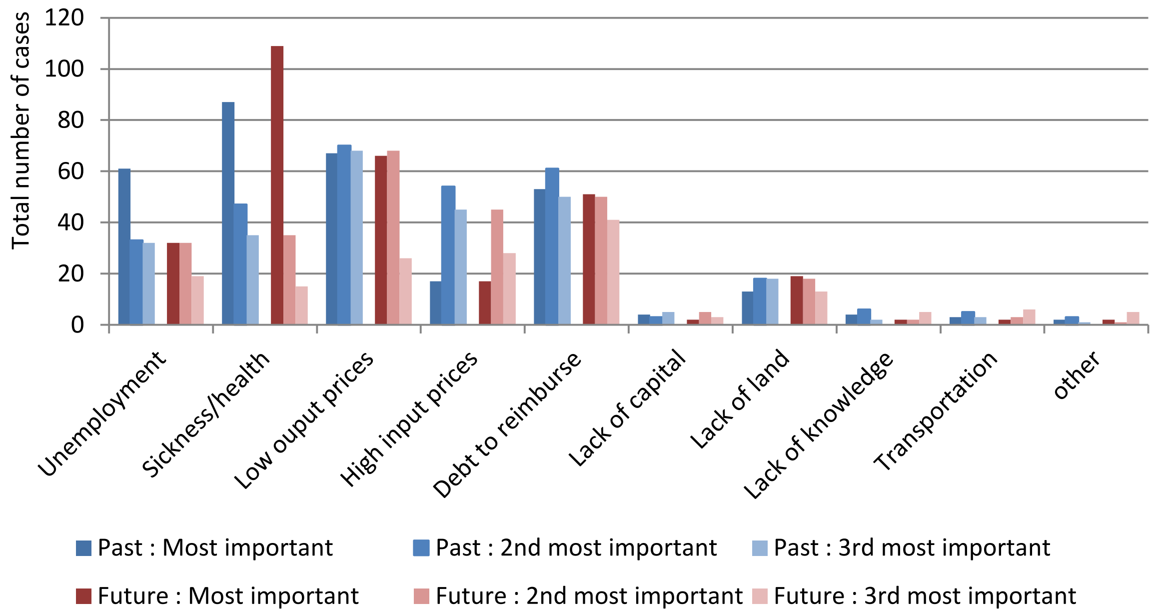
Explanation: The interviewees in the survey were asked to name the three most important advantages of each of the 20 strategies enquired of in the survey. These evaluation questions were only included in the long questionnaires and were only requested for strategies which were risk-related and relevant for the respective household. In the figure, only the most important advantages/disadvantages were considered. The y-axis depicts the average mentioning of the respective advantage/disadvantage per household per strategy. The total population is 98 (rice: 46, sugarcane: 28, aquaculture: 26).

Figure 6.9: Most important advantages and disadvantages of household strategies perceived by interviewees in the different production areas (Source: Household survey, M. Schwab 2012)



Explanation: The interviewees in the survey were asked to name the three most important advantages of each of the 20 strategies enquired of in the survey. These evaluation questions were only included in the long questionnaires and were only requested for strategies which were risk-related and relevant for the respective household. In the figure, only the most important advantages/disadvantages were considered. The y-axis depicts the average mentioning of the respective advantage/disadvantage per household per strategy. The total population is 98 (not poor: 55, near poor: 23, poor: 20). The classification is based on whether a household possesses a poor/near-poor certificate.

Figure 6.10: Most important advantages of selected strategies perceived by households classified as poor, near-poor and not-poor (Source: Household survey, M. Schwab 2012)



Explanation: The interviewees in the survey were asked “Which major socio-economic hazards did you experience in the last 10 years?“ and “Which socio-economic hazards will be of significant importance in the next 10 years?”. The interviewees were allowed to tick a maximum of three options. The selected hazards were subsequently ranked. The number on the y-axis represents the number of households who ticked the given options depicted in the legend. The total population is 312.

Figure 6.11: Ranking of past and future socio-economic risks (Source: Household survey, M. Schwab 2012)

Disparities not only occurred between different stakeholder groups but also between different strategies (see Annex 12.11.1 and 12.11.2). Some strategies, for instance, stood out from the others because their low costs spoke strongly for putting them into action. This was most notably the case for reducing fertiliser use, taking children out of school, and taking a loan from Agribank. In the case of reducing fertiliser use, more respondents with higher levels of education thought this way (no school education: 50%, primary school finished: 61%, secondary school finished: 80.5%). The low costs of taking a loan were more commonly named as *relevant* by households in aquaculture hamlets (58%) than by sugarcane and rice producers (43% respectively 41%). For all other strategies, costs were a factor speaking *against* rather than *for* the application of a strategy. Most often, it deterred the decision to buy land, introduce a third season of rice production and invest in livestock. For these strategies, more than 60 % of all respondents reported that costs were the most important reason that would deter them from translating an adaptation/coping intention into action. Interestingly, there were no major differences between households with a poor certificate and those without. The cost of buying land was more commonly perceived as a *relevant* disadvantage the more land the households possessed. The cost of investing in livestock were less often perceived as a *relevant* disadvantage among households in rice-producing (41%) than in sugarcane and aquaculture hamlets (61% vs. 63%).

Implementability was not named to be among the most relevant criteria in the group discussions (see Table 6.2) but it proved to be an essential criterion in the evaluation undertaken in the household survey (see e.g. Figure 6.9). In nearly twice as many cases it was named as an advantage than a disadvantage. It was more often mentioned as a *relevant* and the *most important* advantage/disadvantage by households in aquaculture and rice-producing hamlets than in the sugarcane-producing hamlets (see Figure 6.9). This was confirmed by the group discussions, where only aquaculture producers and rice producers ascribed value to this criterion (see Table 6.2). The judgement of implementability seemed to be strongly linked to the human capital available to the households. Human capital did not primarily refer to formal knowledge or the level of education; according to the risk ranking in the survey, hardly any household found it to be of major relevance. The relevant human capital seemed to be more to the practical skills and know-how needed for the implementation of certain strategies. The lack of salinity experience and knowledge among rice producers (see sections 5.2.4 and 6.1) suggests that those households possessed the smallest stock of practical risk-specific skills. Despite this apparent drawback, they seemed to be rather confident with regard to the implementability of most strategies. Physical health was another aspect restraining people from putting strategies into action. In the risk ranking of the household survey, it was named among the most important problems people had to face (see Figure 6.11). There were no major differences between the production areas or between the different socio-economic groups with regard to physical health. Limited endowment with physical and natural capital rarely seemed to inhibit the implementability of relevant coping and adaptation measures. A lack of land for productive purposes was, for instance, perceived to be of relatively low relevance for the interviewed households (see Figure 6.11).

The implementability of strategies was not judged equally across all strategies. There were some strategies which were commonly characterised as easily implementable whereas others were harder to implement for most of the interviewees. Among the more easily implementable response options were selling land, buying food and fertiliser/feed on credit and investing in livestock (see Annex 12.11.2). Buying food and inputs on credit were commonly applied by households, i.e. they seemed to be well acquainted with them. Particularly the purchase of fertilisers was a strategy applied by the majority of households every year and most of the people reported that they just had to go to the shop and ask to pay after the production season. Investing in livestock may not have been a commonly applied strategy but people seemed to know where and how to buy livestock (if they had the capital to do so). Alienating land was, in contrast, not common for the people but it was perceived as unproblematic by the households in the research area.

Textbox 6.1: **Perceived household self-efficacy from a governmental perspective**

Government authorities often perceived different barriers for local people to making use of their own capabilities. In contrast to households, many officials found formal education and know-how to be decisive factors inhibiting the application of adaptation and coping actions or productive activities in general (e.g. GD-A-DX-0114, GD-A-KS, AI-D-FA-01.11). "It is the low education level which is the main problem. The input prices are just an objective factor whereas education levels determine the whole way of managing production" (GD-A-KS). Several officials thought that it was particularly Khmer people who are lacking education (e.g. GD-A-DX-0114; AI-S-L24-03.05). This was not reflected in the households' perception of self-efficacy and there were no significant differences in the education level of Kinh and Khmer people observed in the survey. Moreover, a lack of know-how seemed to be perceived as a larger barrier in aquaculture and sugarcane-producing hamlets than in rice-producing ones. This was confirmed by both the interviews and the group discussions. In all discussions it was mentioned to be the 4th most important problem to the people. Physical health was, in contrast to most households' opinion, only perceived to be a problem by officials of OARD on district level and not by any of the other officials. Financial capital seemed to be perceived as a major barrier for the local population inhibiting the application of risk-related strategies, not only by households but also by government interviewees. Particularly on communal level, a lack of capital and high poverty rates were, for example, named among the most important problems in the researched hamlets in the group discussions. Some also found that "low education levels and poverty go hand in hand" (GD-A-KS), i.e. poor households often do not have the money to attain a higher education whereas in turn higher education is often a vital prerequisite to leave poverty. Higher level authorities, in contrast, did not say in the group discussions that it was a considerable risk for the people in Tra Cu. In terms of financial capital endowment, most government authorities found, as the risk rankings in the group discussions suggest, that high input and low output prices are a major problem.

Other strategies were perceived to be more difficult to implement. Taking a loan seemed one of those strategies (see Annex 12.11.1). The in-depth interviews showed that a lack of collaterals was a major reason keeping households from taking a loan. This was confirmed by the survey which revealed that households with only a small amount of land perceived implementability less often as an advantage than those with more land[113]. Changing the crop/species was another strategy which appeared to be difficult to implement for many households in the research area. In the survey, implementability was, after high costs, the most commonly mentioned factor deterring the households from changing the crop/variety (see Annex 12.11.1). The semi-structured and production-centred interviews revealed that this seemed to be due to the fact that especially rice producers anticipated that they can only change the crop if the other households also changed the crop. Moreover, many households in all hamlets thought that they did not have the know-how,

[113] Implementability perceived as a relevant advantage of taking a loan: households with less than 0.75 ha: 48%, with 0.76-1.5 ha: 67%, with more than 1.51ha: 52%).

infrastructure and machines to produce another crop. A further strategy which seemed to be hard to implement was migration (see Annex 12.11.1). Difficulties were strongly linked to the age of the interviewee and to a lack of physical health (see Figure 6.11). Older people often reported that "I really want to but I am simply too old to migrate" (HI-P-LS-P4-0208). This was not only an important factor inhibiting migration but also off-farm employment on site. Finding off-farm employment ranked among the strategies that were most commonly inhibited by difficulties in implementation. My Phong, the largest employer on site, only provided jobs to young women substantially restraining the access for older people and men.

6.2.3 Perceived household response efficacy

The individual competence appraisal comprises a third component, i.e. perceived household response efficacy. While the perceived self-efficacy describes people's judgements of their own capabilities, the response efficacy describes the outcome expectations or the "subjective valuation of whether a strategy option can produce beneficial outcomes or protect oneself or others effectively from being harmed by a hazard" (Rogers 1975). This component of competence appraisal is therefore linked to outcome-oriented evaluations (see section 2.3). Accordingly, it is a kind of counterpart to the previously described subjective process-/capability-oriented evaluation of coping and adaptation strategies and will be analysed along the lines of the previous self-efficacy appraisal. The subsequent section will therefore, as a first step, briefly outline the most relevant quality criteria for an assessment of the perceived response-efficacy and, secondly, describe the overall subjective weighting of each criterion and its strategy-specific implications to the different stakeholder groups.

Income effects, long-term impacts and environmental effects were shown to be the most relevant quality **criteria** in the present research context. In the group discussions and in semi-structure interviews with households, these criteria were named as relevant indicators describing the quality of a strategy on site (see Table 6.2). They were therefore also taken up in the evaluation section of the household survey[114]. Other outcome-oriented criteria such as impacts on food security, flexibility, or durability of the strategies were not mentioned as being of relevance to their decision-making (see section 2.3.2. for a list of outcome-oriented criteria).

I**ncome** effect is linked to the financial capital endowment of a household. The majority of households thought that a good strategy should bring a positive effect to their income or should at least not affect their income negatively. The participants in nearly all group discussions judged this criterion to be the most important variable in the decision for or against a strategy (see Table 6.2). This impression was confirmed by the household survey where no other criterion was judged to be the *most important* advantage of a strategy in so many cases (see e.g. Figure 6.9). This was most commonly the case in the rice-producing hamlets compared to the other production areas. As a *relevant* factor this criterion was, however, most often considered in aquaculture hamlets. A similar result was also obtained in the group discussions where participants in the rice and aquaculture hamlets ascribed higher importance to income than sugarcane producers (see Table 6.2). Furthermore, the importance of income significantly depended on the education level of the interviewees, i.e. the higher the education was, the more often was it named as the *most important* reason to apply a strategy (C^{SR}= .316; $p<0.01$)[115].

The perceived income effect was not the same across all strategies. As the *most important* advantage and as a *relevant* advantage, income was mentioned most commonly in the case of introducing a third season of rice (by rice-producing households only), migration, increasing the scope of work,

[114] Future risk was not taken up in the evaluation section because it was a criterion which did not apply to many of the enquired strategies and was difficult to grasp in a quantitative survey (see Annex 12.3 for more details).
[115] There were no significant relations found with regard to poverty and ethnicity.

increasing inputs and changing the crop (see Annex 12.11.2). Some other strategies were judged negatively due to their income effects. Many people, for example, did not expect a high enough increase in income when finding an additional off-farm job or feared that strategies such as reducing the inputs and selling land would decrease their income. For these reasons, many interviewees named the effect on income as the *most important* disadvantage (see Annex 12.11.1). There was only one major difference observed between the different socio-economic groups with regard to the judgement of these strategies. Reducing inputs to reduce costs in times of production-based losses was more often perceived as a *relevant* disadvantage by crop than by aquaculture-producing households (71% respectively 50% of all survey respondents). According to the semi-structured and production-centred interviews, households particularly seemed to fear a reduction in medicine and feed because they assumed that shrimps were highly sensitive to such changes.

Environmental effects were mainly related to the endowment with natural capital. Despite depending on natural resource-based livelihoods, environmental effects did not seem to be of major importance to the decision-making of households in the research area. In the group discussions, it was only mentioned once as of importance (in the discussion with rice producers). In the household survey, the interviewees mentioned environmental effects mainly in their function as a strategy's advantage, but hardly ever in their negative manifestation (see e.g. Figure 6.9). As an advantage it was seen to be the most decisive factor in only a few cases. There were some disparities observed between the different production areas with regard to the judgement according to this quality criterion. In aquaculture hamlets, the environment was more commonly named as a relevant criterion than in the other hamlets. The group discussions indicated, in contrast, that the environment was mentioned as a relevant criterion only by rice-producing households (see Table 6.2). This can be best explained by looking at the disparities between the judgements of different strategies.

Increasing inputs was the only strategy where a negative environmental effect was named as a *relevant* and the *most important* disadvantage by a considerable amount of people (see Annex 12.11.1). This was most notably the case among rice producers (it was named as a relevant disadvantage by 54% of rice and 21% of sugarcane producers). The households there seemed to think that a high amount of fertiliser was not good to the soil and water quality in the long-run, as was indicated in the semi-structured interviews. Households who did integrated rice-shrimp farming seemed to be even more aware of the negative effects of fertiliser use. In the semi-structured and production-centred interviews they reported that they did not use any fertiliser because of its negative effect on the water quality. Along the same line of argumentation, many crop producers saw that reducing fertiliser use had positive environmental effects (50% of crop producers) and even more aquaculture producers thought that reducing medicine use improved the environment (62% of aquaculture producers). On the other hand, many interviewees also anticipated the opposite, i.e. that increasing fertilisers/feed was good for the environment. In these cases the survey interviewees found that increasing fertiliser/medication was good for the crop/fish and therefore also good for the environment. However, the number of interviewees who thought so was, according to the survey, only half as large as the number of interviewees who stated that it was bad for the environment. Pumping fresh water and changing the crop/species or the crop calendar were also, albeit more rarely, mentioned as having positive effects for the environment (see Annex 12.11.2). Changing the crop or variety was perceived to be particularly positive for the environment by survey interviewees in aquaculture hamlets (75% of all respondents there) and less in rice- and sugarcane-producing hamlets (41% and 54%, respectively). Moreover, environmental effects were more commonly perceived as a relevant advantage of changing the calendar by aquaculture households (71% of all respondents there) than in crop-producing hamlets (53% of all respondents there). The aquaculture producers accordingly seemed to think that a rotational and more diverse system with regard to production is of benefit to the environment.

The **long-term impacts** of a strategy referred to various aspects of future livelihoods, most importantly they seemed to refer to the income situation in future. In the group discussions, this outcome-oriented quality criterion was only of minor importance, at least in two out of three discussions (see Table 6.2). In the household survey, in contrast, it was named as the *most important* or a *relevant* advantage/disadvantage in many cases (see e.g. Figure 6.9). The survey revealed that the ascribed importance of long-term effects varied most notably among the production types, i.e. rice-producing households named long-term effects less often as the *most important* advantage or as a *relevant* criterion in their decision-making than the other interviewees (see Figure 6.9). In the group discussions, it was only aquaculture hamlets that ascribed importance to this criterion (see Table 6.2). Moreover, a significant connection was found between the relevance of long-term effects and the education level of the interviewee. The higher the education level was, the more likely it was that long-term effects were mentioned as the *most important* advantage (C^{SR}= .303; p<0.01). Moreover, poor rice producers more often saw long-term effects as a relevant criterion than near-poor and not-poor rice producers (C^{SR}= .439; p<0.01).

These differences are reflected in the divergent evaluation of different strategies. Infrastructural measures such as building a small gate in aquaculture hamlets and building or repairing an embankment in sugarcane and aquaculture households were the strategies where long-term effects were most commonly mentioned as the *most important* advantage in favour of the application of the strategy (see Annex 12.11.2). These were strategy options only acknowledged by flood-affected households and not by rice producers. In these hamlets, they were often perceived to be the only long-term adaptation measures applicable for the households (see section 6.2.1). In the evaluation of investments, long-term benefits were most commonly mentioned to be an advantage of buying land and investing in agricultural machines and in livestock. These were strategies, which may be positive in the long-run but which were also perceived to be prohibitively high in costs for nearly all households (see section 6.2.2). They were accordingly already out of question before starting to assess the outcomes in more detail. As a disadvantage, long-term effects were mentioned by nearly all households (irrespective of ethnicity, poverty status or production type) in the context of taking children out of school (see Annex 12.11.1). This was mainly related to the negative implications for the children and not directly for the interviewee him/herself. One household, for instance, found that "We ourselves have a low education but we want our children to have a better education to improve the children's life in the future" (HI-S-Pretest-XT-0209) and many others also thought that "the children must study to get a job in the future" (HI-S-Pretest-LS-0208). Moreover, negative long-term effects were often perceived as the most important disadvantage of buying on credit and taking a loan (see Annex 12.11.1). This was more often the case for not-poor than for poor interviewees, and for rice producers more than for aquaculture and sugarcane producers[116].

6.2.4 Overall competence appraisal against the background of key findings and interpretation

The previous sections reveal that the perceived competence is a function of a multitude of factors. The households in the research area were aware of a wide range of risk-related strategies in the context of flooding and saline intrusion. Risk-specific adaptation options were rarely perceived, however. This was most notable in the rice-producing hamlets. The quality judgement with regard to the perceived options depended on both capability- and outcome-oriented criteria. On the side of capability, the majority of households judged financial costs as major restraint for implementing given strategies. Surprisingly, costs seemed to be more decisive for households who were comparatively

[116] Perceived long-term effects as a relevant disadvantage of *taking a loan*: poor: 42% / not-poor: 60%; rice: 54% / sugarcane: 36% / aquaculture: 67%.
Perceived long-term effects as a relevant disadvantage of *inputs on credit*: poor: 28% / not-poor: 40%; rice: 46% / sugarcane: 18% / aquaculture: 33%.
Perceived long-term effects as a relevant disadvantage of *food on credit*: poor: 33% / not-poor: 64%; rice: 63% / sugarcane: 21% / aquaculture: 58%.

well equipped with financial capital and not by the poorer households. Implementability could compensate for some of the cost-related disadvantages, particularly with regard to general risk-related strategies which were commonly applied. With regard to outcome expectations, income was rated as most decisive criterion. However, a judgement across different strategies revealed that long-term effects often seemed a lot more influential in the decision for or against strategies.

Overall, **people judged most of the strategy options positively**. The survey questions about whether a strategy is rather a *good* or *bad* one in the context of flood/salinity risk was answered by substantially more people and for more strategies as *good*. This was particularly the case for building and repairing protective infrastructure (97-99%), for investments in assets (98%), and livestock (98%). This was partly confirmed by a pairwise comparison between a set of long-term oriented strategies. It indicated that the majority of households would decide to invest in an individual dike if they had the choice between this and a range of other strategies (see Table 6.4). The most positively judged strategies were all strategies which were perceived to be difficult to implement due to financial constraints but which stood out positively with regard to their perceived long-term impacts. Income-wise, these strategies were rarely perceived to have a decisive effect. Introducing a third season of rice was also among the strategies which were most commonly judged to be positive (93%). In contrast to the previously mentioned strategies, this seems to be a strategy which was judged positively mainly due to its positive income effects and not due to long-term effects. Considering that most of the rice-producing households introduced a third season within only one year, implementability and costs did not seem to restrain people too much from implementing this strategy. A pairwise comparison of a set of coping strategies revealed that taking a loan was most often preferred over the other coping strategies (see Table 6.3). Despite the expected negative long-term effects (see Annex 12.11.1), it seemed to be judged positively. This might be mainly related to its short-term financial effect and the low costs of taking a loan (see Annex 12.11.2).

Some other strategies were judged more negatively. The good-or-bad question at the end of each evaluation section in the survey showed that coping strategies were mostly judged negatively. The strategies which were most commonly seen as *bad* strategies were taking children out of school (92%) and selling assets (81%). Like the strategies which were perceived to be the most beneficial, this judgement was mainly based on long-term considerations; i.e. negative long-term impacts were the most common factors restraining households from applying these strategies (see Annex 12.11.1). Buying on credit and reducing inputs were also found to be *bad* strategies by more than half the interviewees. Buying on credit may have been perceived as easily implementable but was at the same time expected to have negative impacts in the long run – which seemed to predominate in the end. Reducing inputs was judged negatively in so many cases because households seemed to be afraid of high income losses. Migration was one of the few long-term oriented strategies which were judged to be *bad* strategies by the majority of households. This was confirmed by the pairwise comparison which revealed that all other strategies were preferred over short-term and long-term migration by the majority of households (see Table 6.4). Despite promising gains in income, which were in most cases perceived to be higher than the costs of migration, households seemed to judge only a few other strategies as bad as this one. The migration-centred interviews showed that any of the above mentioned criteria made it a bad strategy, whether income, costs or implementability. The main reason why it was judged to be a *bad* strategy was related to the fact that the migrants had to leave their families and homeland if they wanted to migrate.

Table 6.3: Pairwise comparison of selected household-led coping options

	Reproduce	Increase non-farm labour	Short-term migration	Take a loan
Reproduce				
Increase non-farm labour	**225** 87			
Short-term migration	**267** 45	**281** 29		
Take a loan	129 **182**	125 **187**	53 **259**	

Explanation: The interviewees in the survey were asked "Which [out of the given two] options would you prefer when salinity/tidal flooding destroys the harvest?". The numbers in the cells depict the total number of households who decided upon the respective strategy. The bold and underlined numbers represent the preferred option. The total population is 312.

Source: Household survey (n=312), M. Schwab 2012

Table 6.4: Pairwise comparison of selected household-led long-term oriented strategy options

	Invest in ind. embankment	Long-term migration	Change production calendar	Change species/crops
Invest in individual embankment				
Long-term migration	**291** 20			
Change production calendar	**214** 97	26 **285**		
Change species/crops	**244** 68	38 **273**	**214** 97	

Explanation: The interviewees in the survey were asked "Which [out of the given two] option would you choose to be more adapted to changing salinity intrusion in the next 15 years?". The numbers in the cells depict the total number of households who decided upon the respective strategy. The total population is 312.

Source: Household survey (n=312), M. Schwab 2012

There were only minor **differences** with regard to the overall judgement between the different **socio-economic and ethnic groups**. The smallest differences were observed between Kinh and Khmer households. No major ethnicity-related disparities could be found in any of the capability- and outcome-oriented judgements. There were some differences found between the production areas. Most notably production-specific strategies were judged differently. Increasing inputs was, for instance, more often perceived to be a negative strategy in the aquaculture (23%) than in the rice and sugarcane areas (16% respectively 10%). This might be related to the fact that rice and sugarcane producers more often expected a positive income effect of increasing inputs; whereas aquaculture producers more often seemed to judge high costs as a restraining factor than the other households. Producing again or refilling was judged more positively in sugarcane hamlets than in the rice-producing hamlets. This may be owed to the fact that rice producers often thought that they could not reproduce due to the strict crop calendar requirements. The overall judgement of buying on credit and taking a loan also varied between different stakeholder groups. It was more often judged to be a *bad* strategy in the rice-producing hamlets and among wealthier households. This seemed to be strongly linked to the perception of the negative long-term effects of taking a loan and buying on credit. These were most commonly perceived as decisive disadvantages by rice producers and by better-off households. Migration was most often preferred over other strategies in the rice-producing hamlets. In these hamlets, the positive income effects seemed to be more critical than in the other hamlets.

The perceived competence was influenced by a range of **socio-cognitive variables**. In the current research context, the most decisive determinants seemed to be the actual capacity of response, individuals' risk experiences and information about potential adaptation and coping options provided by training classes and by interactions with other villagers and local authorities (see section 5.2.4 for more details). In the rice-producing villages, farmers possessed only little risk experience and potential adaptation and coping options were rarely addressed in interactions with other villagers and local authorities (see section 6.1. for more details). In addition, awareness and know-how with regard to potential salinity/flood-related strategies were, if at all, merely implicitly conveyed in training classes – this was the case in all production areas. As a consequence, the awareness of adaptation and coping options was generally low in the research area; particularly in the rice-producing hamlets (see Table 6.1). The lack of salinity experience and knowledge among rice producers (see sections 5.2.4 and 6.1) suggests that those households possessed the smallest stock of practical risk-specific skills. Despite this apparent drawback, they seemed to be rather confident with regard to the implementability of most strategies, however. This can be partly explained by the fact that the interviewees in these hamlets talked mainly about general risk-related strategies and not about salinity-specific strategies. These were adaptation and coping options they were well acquainted with.

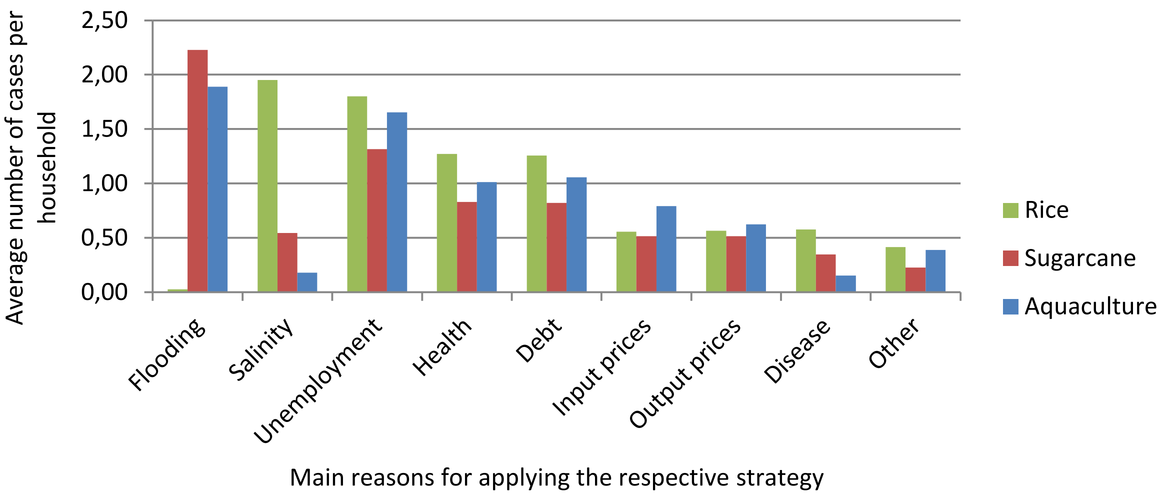
Moreover, the empirical findings reveal that a subjective evaluation extends way beyond commonly used outcome- and capability-related criteria or a mere rating of good and bad. The case of migration depicts well that judgements cannot always be pigeon-holed into given criteria, are often context-specific, and resemble in many cases more intuitions than structured evaluations. This study therefore attempted to arrive at a structured evaluation by at the same time acknowledging for the qualitative side of value judgements.

6.3 Adaptation and coping intention against the background of key findings and preliminary conclusions from threat and competence appraisal

The previous chapters were all about explaining the social, environmental and cognitive drivers of forming an intention to adapt/cope. A decision-making model which takes a social-psychology perspective on social-ecological systems has provided the basis for this analysis. The individual appraisal of threats and competences were defined as the two main determinants of the intention to respond to given hazards. The threat appraisal, i.e. the perceived hazard exposure and susceptibility, drives the individuals' motivation to act. A high enough motivation leads to an adaptation and/or coping intention when it coincides with a high enough perceived competence. This competence is defined as comprising, firstly, the acknowledged response options, secondly, the perceived self-efficacy and, thirdly, the perceived response efficacy (see section 2.4.3 for more details). These analytical components were analysed in the previous sections 6.1 and 6.2. The following paragraphs will now outline which coping/adaptation intentions were formed based on the perceived threats and competences.

The perceived threat of salinity and flooding seemed to provide ample motivation to respond. In combination with a seemingly high enough perceived competence, this translated into an intention to adapt or cope in many cases. The household survey revealed that there was no other risk-related reason for taking actions which was named so frequently – not only among the salinity-/flood-specific but also among the more general risk-related strategies[117]. Besides these threats, unemployment, health and indebtedness were also hazards to which people commonly responded (see Figure 6.12).

The relevance of each hazard in individual decision-making seemed to **vary between different stakeholder groups**. The flooding/salinity-related intention to act was higher in the flood-affected areas than in the salinity-affected hamlets. This seemed to be due to a more distinct feeling of threat in the flood affected areas (see section 6.1). A further disparity was observed between households of different socio-economic status. Poor households with small amounts of land[118] less often judged salinity/flooding as being the most decisive reason for applying risk-related strategies than better-off households. The salinity-/flood-related threats for poor households may have been as high as those for the other households; nevertheless, poor households felt more often threatened by hazards such as unemployment, health and indebtedness. These were perceived threats which they were motivated to respond to in addition to the salinity/flood-related hazards. The disparities in the intention to act between groups of differing ethnicity were only minor, as was already shown for the perceived threats and competences.



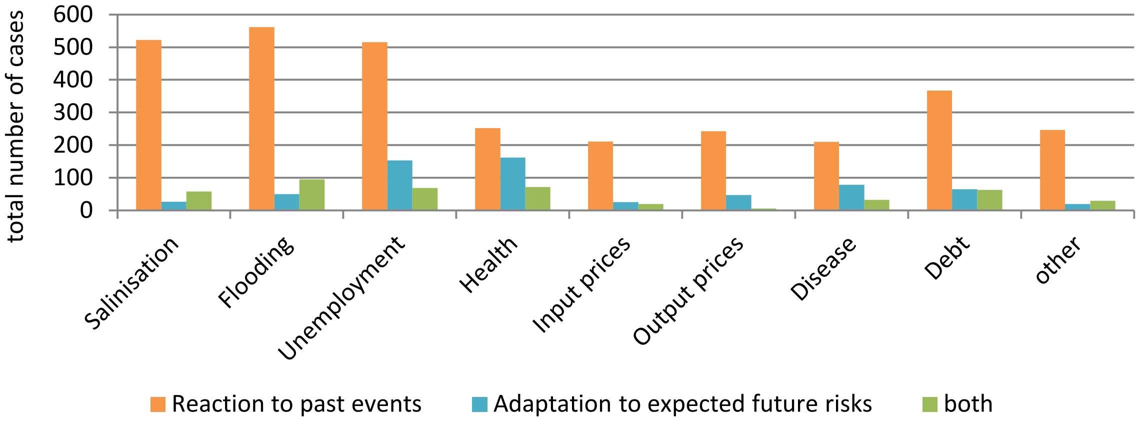
Explanation: The households were asked "Did you do it to better cope with following problems?" for each of the strategies. They were allowed to tick a maximum of three options from those depicted on the x-axis. The number of cases on the y-axis represents the average mentioning of the respective option per household for 11 general risk-related strategies. The salinity-/flood-specific strategies were not included because this would have biased the results towards salinity-/flood-risks. The total population is 312 (rice: 140, sugarcane: 101, aquaculture: 71).

Figure 6.12: Main reasons for applying *general* risk-related measures in the different production areas (Source: Household survey, M. Schwab 2012)

Most of the risk-related strategies were undertaken as a **reaction to past events** and were not applied in order **to be better adapted in the future**. While it was stated more than 500 times that a measure was undertaken as a reaction to salinity, it was in only around 80 times that adaptation to future hazards was named as the main reason (see Figure 6.13). This strongly contradicts the perception of an increase in salinity and flood-related threats in the next 30 years (see section 6.1). Considering that the large majority of interviewees listed the same future risks as those which were

[117] In the household survey, the interviewees were asked for the risk-related reason of each of the applied strategies. The households could hereby chose between eight different socio-economic and natural hazards. Flooding and saline intrusion were also included among these hazards.
[118] A significant correlation between land size and the number of salinity-related strategies per households ($p<0.01$, $C^{SR}=0.254$) was observed.

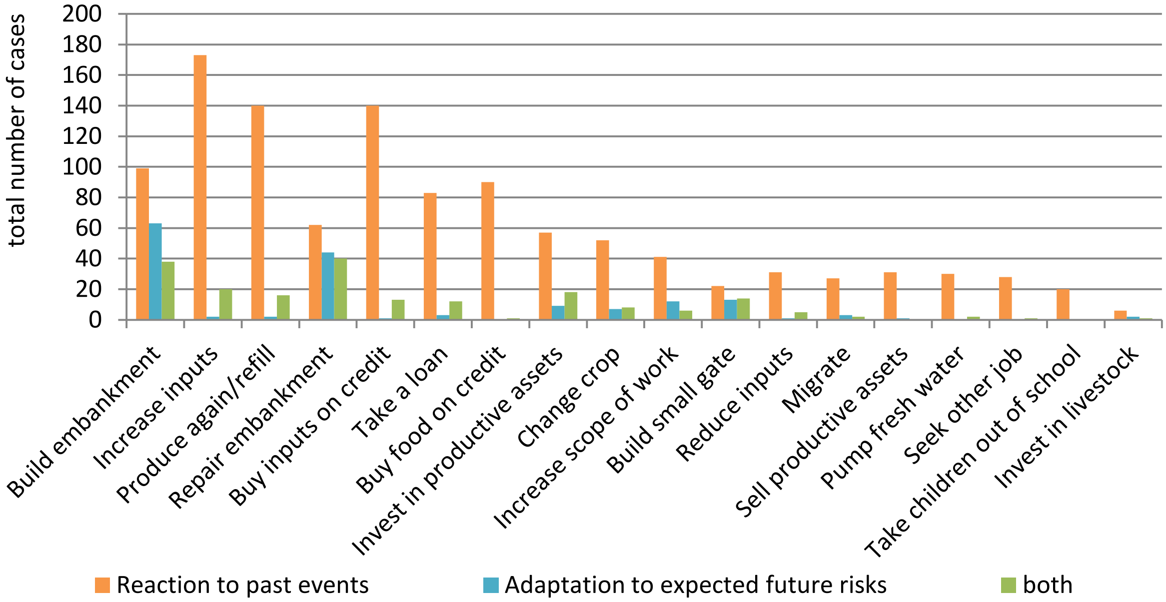
experienced in the past, raises the assumption that households did not adapt to risks which have never been experienced before. Only health-related risks were expected to occur in future although they did not have to deal with them in the past (mainly related to larger health problems of elderly people). Natural hazards like taifuns were not listed in the rankings of past and future risks in the group discussions and interviews. For these reasons, it can be assumed that adaptation to taifuns or other newly emerging risks did not take place in the research area. Overall, also the high threat perception with regard to flooding and salinisation did not seem to provide enough motivational energy to take action. A decisive reason for this may be found in the individual appraisal of competence. Firstly, only a few adaptation options were perceived in the research area. Secondly, the adaptation options which were perceived were often inhibited by the perception of low response-efficacy, particularly with regard to financial capital endowment (see section 6.2). These reasons seemed to outweigh not only a seemingly high perception of threats but also the more positive judgement of long-term oriented adaptation strategies in comparison with short-term-oriented strategies.



<u>Explanation:</u> The households were asked "Did you do it to better cope with following problems?" for each of the given strategies. They were allowed to tick a maximum of three options from those depicted on the x-axis. The cases were grouped into answers from respondents who told that it was a reaction to past events, an adaptation to expected future events, or both a reaction to past events and an adaptation to future events. The y-axis represents the total number of cases for the 20 given strategies. The total population is 312.

Figure 6.13: Reasons for applying strategies as a reaction to past events or adaptation to expected future risks (Source: Household survey, M. Schwab 2012)

The intention to respond to future and past hazards seemed to **vary between different groups of actors and different strategies**. Adaptation to future risks was mainly undertaken in sugarcane and aquaculture hamlets where people built small gates and repaired embankments to better withstand future flood events (see Figure 6.14). This mainly seemed to relate to a higher awareness of potential adaptation options in the flood-affected hamlets compared with the salinity-affected hamlets (see section 6.2). Some other strategies were perceived to be both a reaction to past events and an adaptation to expected future risks. Among these were reproduction, increasing inputs, buying on credit and investing in productive assets. All other strategies were nearly only undertaken as a reaction to past events. Accordingly, a more positive judgement of the outcomes of long-term oriented strategies, most notably the judgement of investments in livestock and productive assets, seemed to be outweighed by far by their seemingly prohibitive financial costs (see section 6.2). Other strategies appeared to be applied despite their perceived negative impacts. In the case of these strategies, people felt the need to react to current threats and thought that only those strategies were implementable for them. This was most notably the case for buying on credit.



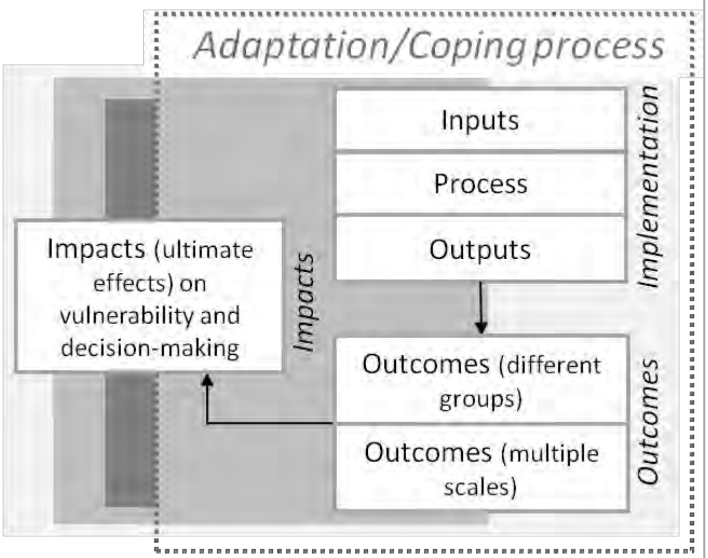
Explanation: The households were asked whether they applied the strategy in reaction to past events, as an adaptation to expected future events, or as both a reaction to past events and an adaptation to future events. The y-axis represents the total number of cases for the 20 given strategies. The strategies are ordered according to the number of cases. The total population is 312.

Figure 6.14: Reasons for applying selected strategies as a reaction to past events or an adaptation to expected future risks (Source: Household survey, M. Schwab 2012)

In **conclusion**, an analysis of the decision-making processes made it easier to answer some of the most central research questions. A social-psychology perspective motivated and guided by a social-ecological vulnerability concept conveyed an understanding of how decisions were made and how strategies were evaluated by different stakeholders in the research area. The analysis of perceived hazard exposure and susceptibility explained why households felt threatened and were motivated to take action, i.e. it represents a measure for the perceived relevance of taking action. An assessment of the perceived strategy options and self-efficacy outlined whether households thought they were capable of translating the motivation into response mechanisms. The comprehension of whether those strategies were beneficial with regard to their outcomes constituted, in consequence, the last component of understanding why an intention to respond was formed. In addition to being an important component for understanding individual decision-making, the analysis of perceived threats, self-efficacy and response-efficacy provides a pertinent basis for comparing the results of common evaluation approaches with the subjective evaluation of local stakeholders. To arrive at this comparison and to identify whether the intention to respond was put into action, the following section will assess the implemented strategies based on a theory of change- led evaluation concept.

7 Evaluating coping and adaptation - empirical results depicting the implementation and outcomes of strategies

The analysis of risk-related response mechanisms in light of their implementation and outcomes provides the third cornerstone needed for an understanding of "how and why rural stakeholders in the Vietnamese Mekong Delta cope with and adapt to changing water-related risks in a beneficial way" (the central research question introduced in the first chapter). The first cornerstone, i.e. the assessment of social-ecological risks, facilitated a comprehension of the context in which decisions are taken and response mechanisms take place (see chapter 5). In the words of the "anatomy of adaptation", the section described "who" responds "to what" (see section 2.4). The second cornerstone, i.e. the analysis of decision-making processes, explained why an intention to respond to water-related hazards was formed and which of those response mechanisms were subjectively perceived to be beneficial in their outcome and implementability (see chapter 6). The following section builds on these analyses and aims to complement the bigger picture. It addresses two of the remaining components in the anatomy of adaptation and coping, i.e. "what does the response look like?" and "how good is the response?". In order to answer these questions, this chapter will, firstly, identify which intentions to act were translated into actions and, secondly, will take a closer look at those strategies guided by so-called 'theories of change' (see section 2.4.4). These two analyses will be undertaken for both household-led strategies (see section 7.1) and formal governmental response mechanisms (see section 7.2). This chapter will, accordingly, address some of the key research questions of this thesis (see Figure 7.1).



Research questions addressed in this section:

RQ1: How are coping and adaptation processes on site interrelated with differential vulnerabilities to water-related hazards?

→ What are the effects of local coping and adaptation processes on current and future vulnerabilities?

RQ2: How can different strategies be evaluated?

→ How can coping and adaptation options be characterised by different evaluation approaches?
→ [...] how do [different stakeholders] evaluate [...] government strategies?
→ Which evaluation-based mismatches arise?

Figure 7.1: Conceptual basis for analysing the implementation and outcomes of risk-related responses and for answering the related research questions (Source: author, the conceptualisation is based on GEF Evaluation Office 2007: 9; UNFCCC 2010: 5; UNDP Evaluation Office 2002: 6; Jacob, Mehiriz 2012)

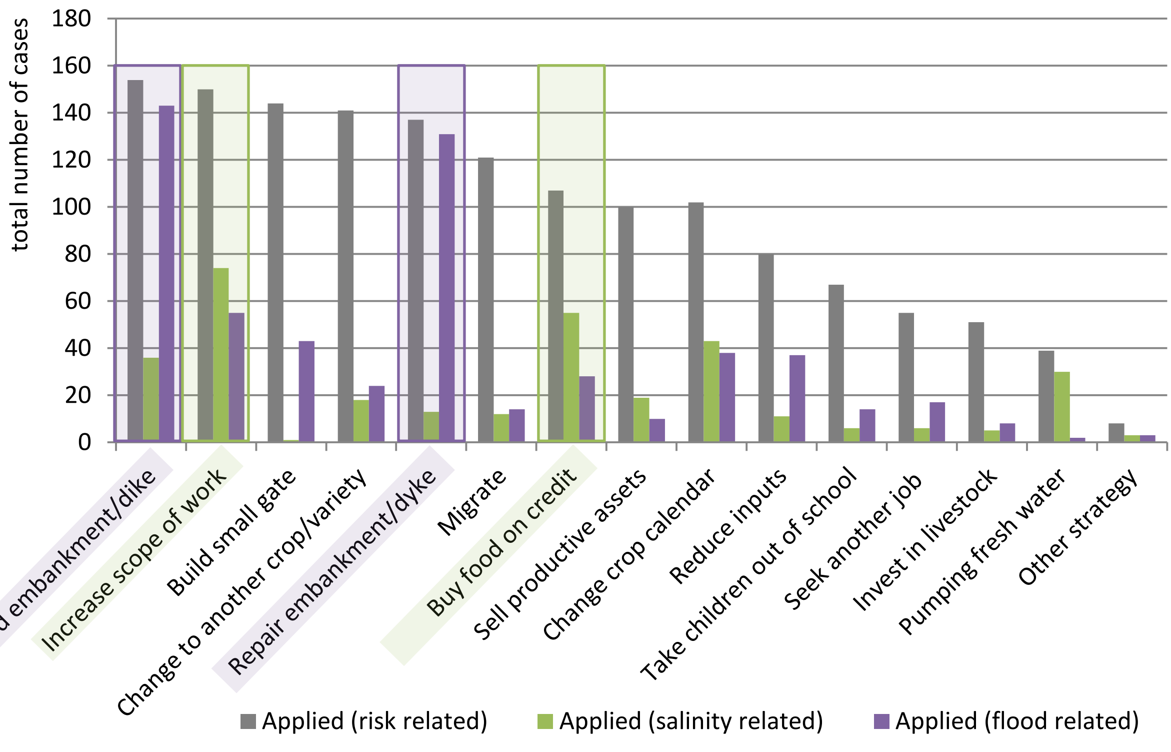
7.1 Household strategies

The first section of this sub-chapter is concerned with household-led coping and adaptation processes. Firstly, it will assess which of the previously described intentions to act were translated into action and, secondly, will assess the inputs, processes, outputs, outcomes and vulnerability-related impacts of those strategies.

7.1.1 Realised coping and adaptation strategies

At the household level, coping strategies were particularly applied in reaction to salinity and flooding (see Figure 6.14 in the previous section 6.3). Most commonly inputs were increased and food and inputs were bought on credit more than normally. In flood-affected households, reproduction was also prevalently applied. Anticipatory adaptation was rarely undertaken in the contexts of salinity and flooding. If at all, it was the building and repairing of an embankment (in flood-affected hamlets only) and an increase in the workload which were applied to be better adapted in future.

Among the applied strategies, several **risk-specific** measures were undertaken. These strategies were more commonly applied in the context of tidal flooding than in the context of salinity. Building and repairing an embankment as well as reproduction were the most frequently applied responses to flooding. Reproduction was more common in sugarcane hamlets. In the aquaculture hamlets, the implementation of a small gate was also a common measure in reaction to tidal flooding. In the rice-producing hamlets, several households pumped freshwater in response to saline intrusion. This was a strategy which had not been applied in the flood-affected hamlets. Increasing the inputs also seemed to have despair relevance in the different production areas, i.e. it was more frequently applied in crop producing than in aquaculture areas (see Figure 7.2)[119].

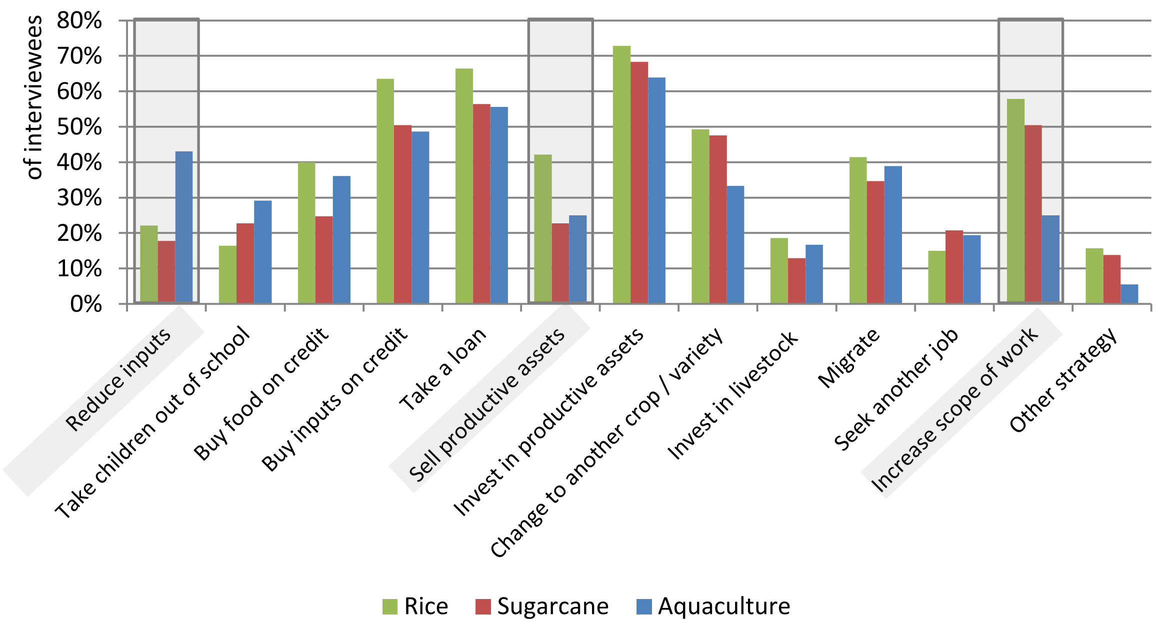


Explanation: The households were asked “Did you do it to better cope with following problems?” for each of the strategies depicted on x-axis. The interviewees were allowed to tick a maximum of three options. The y-axis represents the total number of cases where households ticked that it was generally risk-related (sum of all reasons), salinity-related or flood-related. The strategies are ordered according to the total number of mentioning. The total population is 312. The groups of bars with a violet framing represent the most commonly applied flood-related strategies and the groups of bars with a green framing represent the most commonly applied salinity-related strategies.

Figure 7.2: Applied salinity and flood-related household strategies in comparison with all risk-related strategies (Source: Household survey, M. Schwab 2012)

[119] Significant links between the application of a strategy and the production systems existed for: building embankment ($p<0.01$), repair embankment ($p<0.01$), reproduce ($p<0.01$), increase inputs ($p<0.01$), pumping fresh water ($p<0.01$). All the following statistical significance tests are either based on an exact Fisher test for 2x2 tables or are described by the Spearman rho coefficient.

Among the applied strategies, some measures were not only frequently applied in the context of flooding/salinity but were also common reactions to other socio-economic or natural risks. The most prevalent examples for these **general risk-related strategies** were investments in productive assets and taking a loan (see Figure 7.2). Among these measures, several disparities were observed between the different production types. Those disparities were smaller than the differences with regard to the more risk-specific strategies, however. Overall, general risk-related measures were more commonly applied in rice-producing areas. This was most apparent for selling productive assets and buying more inputs on credit. Taking children out of school and reducing inputs was, in contrast, more commonly applied in aquaculture than in the other hamlets. A further difference was identified for increasing the scope of work and changing the product or variety. These strategies were more frequently applied among crop-producing households than among aquaculture producers (see Figure 7.3)[120].



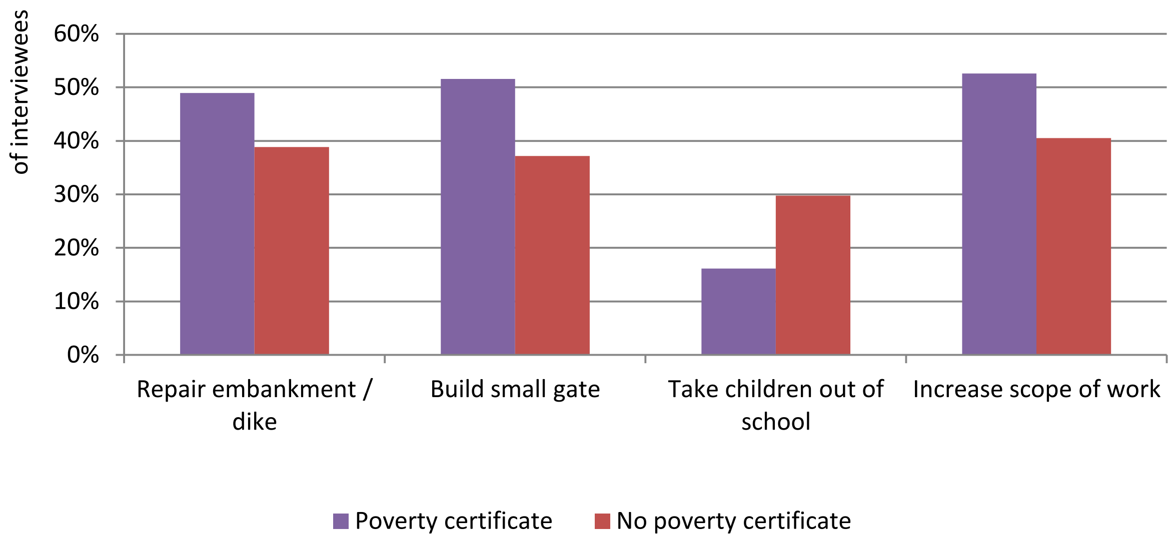
Explanation: The figure depicts the share of households who reported that they applied the respective strategy in the context of a risk. In this figure, only strategies which were not specific to flooding or salinity intrusion were considered. The total population is 312 (rice: 140, sugarcane: 101, aquaculture: 71). The groups of bars with a grey framing represent some of the most notable disparities.

Figure 7.3: General risk-related household strategies applied in the different production areas (Source: Household survey, M. Schwab 2012)

Further disparities seemed to exist between **poor and not-poor households**. In sugarcane-producing hamlets, building a small gate was, for instance, undertaken significantly more often by poor than by not-poor households; taking children out of school was more commonly done by not-poor households in rice and sugarcane-producing hamlets than by poor households in those hamlets. Moreover, not-poor households more often seemed to have access to loans and credits than the others. In rice and aquaculture-producing hamlets, not-poor families bought significantly more food on credit and more often took loans than poor households. Not-poor households also seemed to be more capable of finding an off-farm job than poor households (this link was at a significant level only among rice producers). Increasing the scope of work, in contrast, was applied significantly more often

[120] Significant connections between the applied strategies and the production systems existed for: buy inputs on credit ($p<0.01$) reduce inputs ($p<0.01$), changing the product/variety ($p<0.01$), invest in livestock ($p<0.01$), increase scope of work ($p<0.01$), sell productive assets ($p<0.01$), take a loan ($p<0.05$), take children out of school ($p<0.05$).

by poor than by not-poor rice-producing households[121] (see Figure 7.4).



Explanation: The figure depicts the share of households who reported that they applied the respective strategy in the context of a risk. The answers are group into households who did not hold a poor certificate and households who held a poor certificate (includes both near-poor and poor certificate). The graph shows the strategies with the most notable differences between poor and not poor households. The total population is 312 (no poverty certificate: 191, poverty certificate: 121).

Figure 7.4: Selected risk-related household strategies of poor and not-poor households (Source: Household survey, M. Schwab 2012)

The least disparities were found between **Kinh and Khmer** households. Only two significant differences were observed between the applied strategies and the ethnicity of the interviewee, i.e. pumping fresh water and increasing inputs were more common among Khmer than among Kinh households. These disparities seemed to be due to the different production systems rather than the ethnicity. In an analysis of the ethnicity-related differences in each of the three production areas, no significant link was found between the applied strategies and the ethnicity of the household[122]. The disparities between households with **different education levels** were also comparatively small. Only two significant differences between the average education level of a household and the applied strategies were found. The strategies of buying food on credit and increasing the working scope were more frequently applied, the lower the average education level. In a separate analysis for the different production hamlets, this link only existed at a significant level in the sugarcane-producing hamlets[123].

[121] Significant connections between the applied strategies and the poverty level existed for: building small gate ($p<0.01$), buy food on credit ($p<0.01$; among rice and aquaculture producers), seeking alternative job ($p<0.01$; among rice producers), taking a loan ($p<0.05$; among rice and aquaculture producers), taking children out of school ($p<0.01$; among rice and sugarcane producers).

[122] Significant connections between the applied strategies and ethnicity existed for: pumping freshwater ($p<0.05$) and increasing inputs ($p<0.01$).

[123] Significant connections between the applied strategies and the education level existed for: Buying food on credit ($p<0.01$); Increasing scope of work ($p<0.05$).

7.1.2 Household strategies in relation to asset exchange, outcomes and vulnerability impacts

The household strategies described above were not only subject to current vulnerabilities and individuals' decision-making but also produced and altered vulnerability patterns and decision-making processes on site. Putting an intention to respond into action basically requires the transformation and exchange of livelihood assets in a given risk context. Once those actions are implemented, they have short-term effects on the capital endowment of a household and can produce change and transformation in the social-ecological setting. A so-called *theory of change* links the "inputs, activities, and outputs causally and looks strategically at how they result in outcomes and how they impact on the social-ecological system and individual agents" (see definitions in section 2.4). Accordingly, theories of change can provide a pertinent basis for this evaluation study which aims to understand the interrelationship between vulnerability and local response mechanisms (see central research questions in section 1.2). In the following section, the implemented strategies most relevant to the given research context are therefore evaluated with regard to the required asset exchanges and against the background of caused changes in the vulnerability patterns.

Asset exchange against the background of exposure changes

Overall, only a few households applied strategies that intended to change their exposure to tidal flooding/saline intrusion. **Selling land** which is affected by salinity or flooding acted as a relevant exposure-reducing strategy in this respect. Despite being highly threatened by water-related hazards and despite having a large market demand for land, only 36 of the 312 interviewed households reported that they had sold land in the last five years. In most of these cases, they alienated land in order to increase their short-term capacity to cope with current problems. This was more often related to high debts or healthcare costs which exceeded their financial capacity than to tidal flooding/salinity, though. Adaptation to future salinity/flood risk was the rarest. Only one of the interviewees decided to sell the field because he did not want to be affected by salinity in the future. The low number of households that alienated land seemed to be due to the fact that it was perceived to have detrimental consequences in the long-run (see section 6.2.3). It decreased the income from agriculture and reduced the financial capacities to better adapt to and cope with water-related threats in the future. If households had to sell all their land they would completely lose their main source of livelihood. This was, however, not the case for any of the interviewed households. On average, there were more interviewees who alienated land among poor households than among not-poor households. This was related to the fact that poorer households had less savings to draw on or assets to alienate in the event of a crisis and were therefore more likely to sell land. It was also observed that the share of households who sold land was largest in the sugarcane-producing areas. This appeared to be related to quickly rising land prices in combination with socio-economic threats rather than to salinity-/flood-related threats.

In the rice-producing and aquaculture hamlets in Don Xuan commune, a similar constellation was expected to arise in the near **future**. Many people in these hamlets lived in the area of the planned industrial zone and expected to or will have to sell their land and move to another place (see section 5.2). Similarly, households in Xoai Rum that live in the area where CAWACO plans to build an oil depot will most likely sell their land. In the same hamlet resettlements are planned in the vein of the plans to build a sea dike along the Hau River. In both communes households that are highly exposed to tidal flooding today will not be living there any more in the future. Nevertheless, the implications for exposure patterns after having sold the land are not clear yet as there is no information available on where people will move or where the government opens up potential resettlement sites. However, what could be shown in the last years was that households who sold their land at an earlier stage received less money per ha of land than households who sold their land later on. One woman in Don Xuan, for example, said "In the past [when we sold our land] we got only 11 million VND (around 430

Euro[124]) per cong [0.1 ha]; now we would receive 30 million (around 1,200 Euro) per cong. People start calculating the land prices in m^2 and not in cong anymore because prices have been raised so much" (HI-ID-BS-0307). The same held true for land prices in Xoai Rum. Here 19 of the 20 households sold their land to Tram Be (a famous businessman from Ho Chi Minh City who is originally from Tra Cu) at a low price some years ago. Tram Be knew about the plans to build an oil depot before the local population and could therefore get the land at a cheap price. CAWACO would pay a much higher price for land to the households at present but most people had already sold their land to Tram Be before (GD-H-XR-1228, AI-H-7).

Accordingly, only few households changed their exposure today but many will change it in future by selling land. The households who already sold land did not increase their capacity of response substantially despite the high demand for land and comparatively high land prices. Whether the people can make use of rising land prices in future remains to be seen.

Asset exchange against the background of intended susceptibility changes

There were several more strategies that aimed to change the susceptibility patterns, i.e. the production of winter-spring rice, changing to a more saline resistant crop/variety, the maintenance and repairing of the individual embankment, increasing inputs, pumping fresh water in the field, and re-producing after crop failures (see section 5.2.3 for more details about why these strategies are relevant for susceptibility reduction).

In the salinity affected areas, the type of **crops cultivated in the winter-spring season** was of particular importance. While nearly all the interviewed households produced rice in this season in 2011, there were only around 5-10 % of all households producing winter-spring rice in 2012, according to local officials. Among these households most produced rice only on a small portion of their land. The other households either decided not to grow anything in that year or changed to more saline resistant crops such as corn or vegetables (AI-H-27, AI-H-28, AI-H-32, AI-H-33, and AI-H-20). Overall, most households were therefore less susceptible to salinisation in 2012 than in the previous year[125]. The cost-benefit calculations undertaken in the production-centred household interviews showed that growing winter-spring rice required more time and effort than the other seasons but needed less fertiliser than the summer-autumn season. Moreover, it was easier to implement in terms of know-how than growing vegetables and corn. Households were acquainted with rice production but had little or no experience in the cultivation of other products. In addition to comparatively low input requirements, the expected outcomes were high at times. In years with no salinity problems, such as 2012, an increase in income seemed to compensate for the higher efforts and risks. This was the case for the households who produced winter-spring rice in 2012. Water availability was good in that year and returns were high. Accordingly, the increase in financial capital could also raise the capacity of response. The success of those households seemed to have raised the perceived efficacy of winter-spring rice production by so much that nearly 90 % of all interviewees stated that they would introduce a third season of rice production again in the next year.

The susceptibility reduction in consequence of stopping winter-spring rice production therefore seemed to be more of a short-term than a long-term change. The effects on the individual response capacity mainly depended on whether salinity affected production.

Also **changes to other less sensitive crops or varieties** were of importance for susceptibility reduction. It was applied by nearly half of all interviewed households, not primarily in the context of salinity/flooding, though. Changing the crop was more common in response to diseases or low

[124] At an average exchange rate of 2012.
[125] The household survey did not show any significant differences between ethnic or socio-economic background of the people.

output prices. Moreover, it seemed to be motivated by the actions of other households. The majority of interviewees who did not change the crop or variety in the past said that they would change to a more saline-resistant crop if the others did so. In the sugarcane-producing areas, only 10 % of all households changed the crop and only half of those 10% did so because of flooding. In total, four households changed from rice to sugarcane as a response to salinity-related threats. The change of variety was more common for the sugarcane producers. Nearly 40 % of all households changed their variety, of which 10% did so because of flooding. In the rice-producing hamlets, more than 50% of all households changed the crop/variety. Only 20 % of these households altered the crop. They mainly changed to corn or vegetables, i.e. to less saline-sensitive crops. The other households altered the variety. Most of these changes were, however, not related to the threat of salinity. In the aquaculture hamlets, only two households changed from freshwater to saltwater aquaculture. The change in variety was more common. In total, 20 households changed the variety whereas only 7 did so because of flooding. The reluctance to change the product/variety may be due to a lack of trust in having the know-how to change to another crop (see section 6.2). The asset requirements for changing the crop seemed to be reasonable as most of the potential options did not require large sunk or fixed costs, according to the costs-benefit analyses (CBA). Nevertheless, a change from rice to sugarcane was in most cases not possible without the other households altering the crop. A shift from crop production to aquaculture was, in contrast, accompanied by high up-front investments as well as by large variable and fixed costs. The economic returns generated with another product/variety also depended on the production type (in addition to the general agro-ecological characteristics). The cost-benefit analyses showed, for instance, that rice brought low returns compared with sugarcane. Aquaculture production seemed to bring high returns in some years but also high losses in others (see section 5.2.4 for more details about the costs and benefits from different production systems[126]).

In conclusion, several households may have increased their response capacity by changing the crop/variety but only a few families reduced their susceptibility to flooding/salinity.

The **construction, maintenance and reparation of the embankments** around the ponds and fields influenced the chances of future levee failures in sugarcane and aquaculture hamlets (see section 5.2.3). The quality of this work therefore substantially affected susceptibility. These strategies were applied by the large majority of households in response to flooding (see Figure 7.2). Building and maintaining a levee and its reparation after being damaged mainly required the materials for construction or refilling (in the case of breaches), a machine to reinforce the construction/fill-in material and manpower to put those processes into action. The building/fill-in material (mainly soil, coconut shells and mud) was freely available. The investments in the machine rent could be substantial, though. The costs for hiring a machine were as high as 500,000 VND (around 19 Euro[127]) per hour; for repairing the embankment several aquaculture producers needed it for around 10 to 15 hours (HI-HS-BS-L39, AI-H-LS-0308, GD-H-BS-1230). Repairing the embankment did not take much less time than building the embankment; one household even explained that it took longer to repair the levee than to build it (HS-HS-BS-L39). In the sugarcane hamlets, maintenance of the embankment did not necessarily require a machine. In the few cases when it was required, the machine was not needed for as long time as in the aquaculture hamlets. In most cases, manpower and construction material was enough. Instead of renting a machine those households hired labourers if they were not able to build or repair the embankments by themselves. The costs of labour were 100,000 VND (around four Euros[128]) per person per day. One of the households reported that they needed six to ten workers for one day so that the costs added up to at least 600,000 VND (around 24 Euro[129]; HI-CB-

[126] An assessment of the costs and benefits of cultivating another variety was not feasible in the scope of this study.
[127] At an average exchange rate of March 2012.
[128] At an average exchange rate of March 2012.
[129] At an average exchange rate of March 2012.

XR-S192), i.e. still less than the machine rent. In addition to the costs for the machine, the materials and the labour needed for maintenance, most of the households needed to check more regularly whether flooding destroyed or damaged parts of the embankment. In that way, they were better able to react quickly to flood impacts and assure the quality of the dike during critical flooding periods (e.g. HI-S-BS-L39). Households in aquaculture hamlets seemed to do this more often than sugarcane producers. In consequence, the high input requirements for building and repairing an embankment in the aquaculture hamlets sometimes ate up a large share (e.g. HI-CB-BN-S259, HI-CB-LS-S116) or even all of the overall turnover gained from production (e.g. HI-CB-BN-TVB)[130]. This reduced the capacity of response, particularly in the short-run.

Overall, the input requirements for these strategies were comparatively low in the sugarcane hamlets so that the short-term effects on response capacities were only minor. In the aquaculture hamlets, solid construction, regular maintenance and thorough filling-in had substantial implications for short-term and long-term capacities of response, in contrast. The short-term and long-term susceptibility reductions by were also more notable in the aquaculture hamlets than in the sugarcane areas.

Other coping options, most notably increasing inputs, pumping fresh water, and reproducing after a loss of harvest, aimed to reduce the extent of production losses. Accordingly, those strategies were intended to reduce susceptibility in the short-run. These strategies did not always achieve a decrease in susceptibility, however. This was most apparent in the rice-producing areas where most farmers lost all their production in 2011, despite attempts to preserve some of the crops by pumping fresh water and increasing fertiliser and pesticide use. The cost-benefit analyses showed that several households applied up to three times more fertiliser and sprayed up to three times more pesticides than normal (HI-CB-RB-S60, HI-CB-BGA-S181, HI-CB-BGA-S169). These households spent between 290,000 and 410,000 VND (10 to 15 Euro[131]) per cong[132] on the additional inputs, i.e. around 1/5 of the average production costs per season. In consequence, the attempt to decrease susceptibility failed and came at high costs. In the sugarcane areas, reproduction was the most commonly applied coping measure to reduce susceptibility. The reproduction of sugarcane costed between 500,000 and 1.5 million VND (around 57 Euro[133]) per cong (HI-CB-XR-S201, HI-CB-XR-S183, HI-CB-XR-X2, HI-CB-XR-X4), depending on how much of the sugarcane had to be reproduced. In contrast to rice production, the coping strategies seemed to be more effective in reducing the loss of production at the end of the season (in the year 2011/2012). In 2011/2012, no interviewed sugarcane producer revealed a deficit in the contribution margin calculations whereas all interviewed rice producers showed a loss. In addition to the higher costs, increasing inputs and reproduction required an increase in the scope of work. In the aquaculture hamlets, reproduction, increasing the inputs and pumping fresh water were only rarely applied to cope with the effects of tidal flooding.

Overall, the input requirements for these coping strategies were comparatively high in both sugarcane and rice production and they could only reduce the short-term susceptibility in the sugarcane-producing area.

Finding an additional source of income was another way of reducing susceptibility to flooding/saline intrusion by increasing diversity of income sources. This included investing in livestock, job-related migration to urban areas, working for companies on site and opening an own business. Except for investing in livestock, these strategies were predominantly meant to improve financial capacity and

[130] Only three interviewees in the cost-benefit analyses mentioned the costs for repairing the embankment. For that reason, the given numbers are only exemplary and are not representative for all households in the hamlets. The numbers roughly coincided with what was mentioned in the group discussions, though.
[131] At an average exchange rate of March 2012.
[132] Cong is the prevalent unit of land size. There are small (0.1 ha) and large cong (0.15 ha) units. In this analysis a cong is an equivalent to 0.1 ha.
[133] At an average exchange rate of March 2012.

not to reduce susceptibility. Job-related migration, finding non-farm employment on site, and opening one's own business will therefore be addressed in the following section which is concerned with strategies which are intended to bring about a change in the capacity of response. Investing in livestock was, in contrast, not meant to increase income but create assets which a household can draw on in times of crisis, i.e. with investments in livestock the households intended to reduce susceptibility. This often served as a kind of *savings account* (e.g. HI-CB-XR-KK, HI-CB-XR-KR, HI-CB-RB-LNK). One farmer reported, for instance, that "raising pigs can give me more security. Whenever I lose production I can sell a pig" (HI-P-BGA-0209). Despite the potential susceptibility reduction, only relatively few people invested in livestock (see Figure 7.2). Moreover, those interviewees rarely did it as a response to salinity or flooding. The most commonly mentioned investments were in pigs. The cost-benefit analyses showed that the costs of buying young pigs and raising them were comparatively low (HI-CB-RB-S60, HI-CB-XR-S185, HI-CB-XR-X1). For raising one pig, households spent roughly as much as for one cong of rice production in the same period of time (around 2.5 Mio VND; around 100 Euro[134]). After 5-6 months, the interviewed households were able to sell the pigs. The turnover was low compared with costs so that the contribution margin for raising one pig was smaller than most of the contribution margins for one cong of sugarcane production (on average 2.6 Mio VND per year compared with 5.8 Mio VND per year). The fixed costs mainly comprised the cage for the animals. A cage for 10 pigs amounted to around five million VND (around 190 Euro[135]).[136].

In conclusion, finding additional sources of income could decrease susceptibility substantially but it came at a sometimes high financial cost (particularly livestock production).

Asset exchange against the background of intended changes in the capacity of response

Many of the strategies applied in the research area were meant to increase the capacity of response, i.e. wealth in terms of capital endowment. Some strategies directly aimed to increase the capital stock whereas others only indirectly followed this goal. The previously discussed strategies may have been first applied for a reduction of susceptibility or exposure reduction but they were in one way or another also applied for an increase in the capacity of response. For instance, increasing the amount of fertiliser was intended to reduce the production losses in the first place but a reduction in the losses in the end also aimed to prevent a reduction in the financial capital endowment, i.e. part of the capacity of response. In the following section, those strategies will not be considered; only the measures which focus, in the first place, on changing the capacity of response will be outlined. The most relevant response mechanisms were strategies which (1) raise the short-term availability of financial capital (i.e. taking a loan and buying food and inputs on credit), (2) reduce the asset requirements (i.e. reducing inputs and taking children out of school), and (3) increase the income (i.e. job-related migration and off-farm employment).

The most common ways to access financial means in times of exceptional income loss and/or high costs were **taking a loan and buying food and inputs on credit**. The risk-related loans and credits on goods were rarely meant to adapt to future risks. They mostly served short-term oriented coping purposes. However, those short-term financial reliefs could also markedly reduce the capacity of response in the long-run. Firstly, being highly indebted meant that a substantial share of the income had to be spent on paying the instalments (including the interest rates). For this reason, households often had only a little left to pay for other expenses (e.g. GD-H-BS-1230, GD-A-DX-0114). Secondly, increasing indebtedness reduced the chances of obtaining another loan in times of crisis and/or increased the interest rates (e.g. GD-H-BS-1230). These aspects took on even greater importance in the light of increasing indebtedness. This was most notably the case in the aquaculture hamlets

[134] At an average exchange rate of March 2012.
[135] At an average exchange rate of March 2012.
[136] Only three cost-benefit analyses were undertaken for raising pigs which is why the given numbers are only exemplary and not representative for all pig raising households in the hamlets.

where households had to take the highest loans and seemed to be subject to the largest income risks (see section 5.2.4). Interest rates varied depending on the lending institution. For a loan from the Agricultural Bank, the households had to pay interest rates of around 2 % per month; a loan from the Vietnam Bank for Social Policies had an interest rate of 0.7 % per month (GD-H-SV-1229; see section 5.2.4 for more details). According to the household survey, the median interest rate for loans from the Women's Union lay at 0.6 % (n=11), the median interest rate from family and friends by 3 % (n=23), and the median of loans from private lenders at 5 % (n=20). The interest rates for loans from governmental programs ranged between 0 and 1 % (n=9). Input factors and food were mainly given on credit by shop owners or market sellers. The interest rates ranged for inputs between 0 and 30 % with an average of 4.2 % (n=125) and for food between 0 and 15 % with an average of 3 % (n=66), according to the survey. The more in-depth interviews revealed that the difference in terms of interest rates was often dependent on social ties to the trader. Larger sums were given in the form of secured loans where the lender pledged land as collateral (e.g. HI-HS-RB-L24-0305, GD-H-SV-1229, AI-S-H-LS-L59; see section 5.2.4 for more details with regard to the access and amount of loans).

In conclusion, loans and credits on goods enabled people to cope with the situation today but rarely increased the capacity to respond to future risks.

Other strategies were meant to **reduce the cost of production and/or living**. Reducing inputs and taking children out of school are relevant examples in the current research context. These strategies aimed to help households to better cope with income-related losses or exceptional costs in the short-run. According to the household survey, only a few households took their children out of school in response to a flooding/salinity threat (see Figure 7.2). When applied, it could not reduce the daily costs notably but it increased the labour force in the family. These gains in capital substantially reduced the human capital of the next generation, however. A lack of formal education reportedly reduced the chances of getting into certain jobs, particularly in the non-agricultural sector (e.g. HI-P-BXD-0206, HI-P-LS-0208, HI-S-L131-BN-0330). Reducing input factors (mainly fertiliser, pesticides and medicine) was more commonly applied, particularly in the context of flooding (see Figure 7.2). The production cost-benefit calculations showed that input factors amounted to a large sum, particularly for sugarcane production and the industrial production of shrimp[137]. Many households in the in-depth interviews indicated, however, that they were hesitant to reduce inputs because they thought it was "simply not possible to reduce inputs" (HI-P-BS-0208). When reducing pesticides people were afraid that they were the only ones not to use it so that diseases and bugs would all come to their field (HI-P-TCC-0207). In the case of reducing fertilisers, people were afraid that the soil quality would decrease day by day (HI-S-RB-L24-0503) and others feared losing a large share of production due to this. One farmer, for instance, reported that "I applied it only twice instead of three times. But the result was that I had 50% less yield and the seeds were smaller" (HI-S-SVA-S45-0303). Several people, however, reported that they could reduce inputs if they were taught a certain technique for doing this (e.g. HI-S-L36-BC-0306, HI-S-BGA-S163-0310, HI-P-BXD-0206).

Accordingly, the reduction of costs could increase the capacity of response in the short-run (particularly a decrease of inputs) but it did not raise the capacity of response in the long-run. On the contrary, many people feared that it would reduce the financial capital.

The third group of strategies aimed to change the response capacity by **increasing income**. **Migration** was a very relevant strategy in the current research context. The migration-centred interviews showed that people who found jobs in cities like Ho Chi Minh City or Binh Duong sometimes earned a multiple of what a household could generate with agriculture (see 5.2.4). The interviewed

[137] The effect of a reduced input usage on the overall output is difficult to estimate and cannot be analysed based on the cost-benefit calculations undertaken in this study. In none of the production-centred interviews did households report the reduction of inputs.

households said that they earned between 36 and 84 Mio VND per year (around 1250-2900 Euro[138]) as low-qualified workers. The interviewed rice– and sugarcane producing households, in comparison, had an average contribution margin of only 31 respectively 35 Mio VND per year[139]. However, migrants had often essentially higher living expenses, i.e. accommodation and food. According to the migration-centred interviews, migrants spent between 230,000 and 500,000 VND per month on accommodation (n=6) and between 900,000 and 2,000,000 VND per month on food (n=6). Some companies provided board and room to their employees. This was the case for four out of ten interviewees. On average, the income after subtraction of the essential living costs was still between 1.2 and 4.5 Mio VND per month. Of this net income, migrants sent remittances to their families in 11 out of 12 cases. These were all between one and two million VND per month, i.e. the remittances were sometimes as high as half of the average income from agriculture and aquaculture (see 5.2.4). For households in a productive age, finding a job often required more social than human capital. Due to the large demand for unskilled labour, households often did not need any specific education to receive a job. Social networks were, in contrast, highly important. Most interviewees said that they needed and got help from other migrants before or when they migrated. One interviewee said "People who migrated before told us how to get there, how to apply for this job, what the work is like, etc." (HI-M-XR-KT). The importance of networks also became apparent when taking account of the variety of jobs and destinations. The hamlet leader in Ba Giam A, for instance, reported that many people in his hamlet migrated to work in an aluminium factory in Ho Chi Minh City (AI-H-BGA-0405). The number of people seemed to be high enough for the company to send a whole bus to pick up the people from Ba Giam A before and after the Khmer New Year. Off-farm jobs in the region were mainly provided by the shoe-producing factory My Phong. As with migration, it promised an often higher income than from agriculture, i.e. 12 to 18 Mio VND per year per person. This was less than migrants earned but most of the women who worked for My Phong could stay with their families and therefore had lower living expenses (see section 5.2.4 for more details).

Consequently, job-related migration and finding off-farm employment seemed to be easily implementable and thereby substantially increased the capacity of response, particularly through remittances.

7.1.3 Evaluating household-led strategies – key findings and interpretation

Only a few households changed their exposure to flooding. Selling exposed land was identified as the most relevant strategy in this context but it has so far rarely been applied in order to reduce the exposure to flooding/salinity and the chance of making use of high land prices was rarely grabbed. Also strategies which were intended as susceptibility changes played only a minor role. Except for the construction and maintenance of dikes and the changes of crops, these strategies were either rarely applied or had merely a short-term impact, if any, on susceptibility. Strategies like increasing fertiliser to prevent losses did often not have any positive effect but came at high costs (particularly among rice producers). Most of the prevalent strategies were applied as part of a deliberate change in the response capacity. Strategies that aimed to reduce the expenses for living and for production played only a minor role in this regard– even though particularly a reduction in inputs could bring about a notable decrease in production costs. The most commonly applied strategies focused on raising the short-term availability of financial capital by taking a loan or buying on credit. Nevertheless, these strategies reduced rather than increased the long-term capacity of response, above all the increasing indebtedness in the aquaculture hamlets. Measures that aimed to improve the capital endowment may have come at relatively high costs in terms of financial, social and human capital but seemed to have enhanced, in most cases, the capacity of response in the short- and sometimes also in the long-run. Migration to urban areas was, in this context, the most profitable strategy.

[138] At an average exchange rate of 2011.

[139] For rice production, the winter-spring season is not included here because nearly all households lost their production. Moreover, most households only produced two seasons before 2011 anyway.

7.2 Formal government-led adaption and coping strategies

This research is not only concerned with household-led response mechanisms but also with the governmental side of coping and adaptation. These actions are part and parcel of the transforming structures – as the livelihood approach calls it (see section 2.1.3). Transforming here refers to their capability of influencing a household's access to capitals (and thereby also the vulnerability), the terms of trade between the capitals, and the consequences of private household-led strategies. This indicates why it is so central not only to consider household and government strategies in isolation from each other (or in two different studies) but also to approach them in a more integrative way. The second section of this sub-chapter will therefore outline the most important *formal* coping and adaptation processes and their implication for household-led strategies and livelihoods. Firstly, the decisive actor groups will be identified against the background of their relevance to flood/salinity vulnerability. Secondly, the study will assess which government-led coping and adaptation strategies were put in place in the recent past. Thirdly, each of these strategies will be evaluated along the lines of theories of change; i.e. the inputs, processes, outputs, outcomes and vulnerability-related impacts on rural livelihoods, private decision-making processes and household-led strategies will be analysed (see section 2.4.4). In a fourth phase, the government-led measures will be examined from a subjective household-specific evaluation perspective with a mult-criteria-based approach.

7.2.1 Transforming structures and their relevance in dealing with risks

The "government" is not just a single actor that runs the state and is thereby concerned with reducing risks for the population. These tasks are undertaken as part of a diverse hierarchically organised network where each institution has its responsibilities and follows its own goals. These are established and stipulated in formal regulations, ordinances and laws from the national level but are, in most cases, interpreted and implemented at more local levels. This locally specific interpretation and implementation may comply more or less with the legal requirements from a higher level (see section 3.3). The following section aims to convey an understanding of the complex and locally adapted network of formal institutions and their relevance in dealing with flood and salinity risk. It will therefore, on the one hand, provide an overview of the most relevant official institutions and will, on the other hand, review their responsibilities and interconnectivities from a local stakeholder perspective. This is an essential prerequisite for evaluating and understanding governmental measures in response to water-related risks. The institutional analysis will focus on governmental institutions at the district, commune and hamlet level, address inter-linkages between the different levels, and outline each institution's relevance in relation to other institutions at the respective level. The national and provincial levels are discussed in more detail in section 3.3.

Authority and expert interviews as well as governmental reports at the different administrative levels show that the institutional setting was dominated by the **different arms of the government**. The People's Committee (PC) at the province, district, commune and hamlet level took on a coordinating role and promulgated policies coming from the respective higher level. Among the different government arms, the Ministry for Agriculture and Rural Development (MARD) was the most decisive actor in the context of rural flood and salinity management. At the province level, it was represented by the Department for Agriculture and Rural Development (DARD), at the district level by the Office for Agriculture and Rural Development (OARD). The OARD organised agricultural training classes for local farmers in all the researched hamlets, mainly on the dominant production types, i.e. rice, sugarcane and aquaculture. Moreover, the OARD issued the cropping calendar for rice production and promoted crop changes. At the communal level, agricultural extension officers represented the MARD. They collected household and production information from the hamlet level, were involved in or coordinated relevant meetings, and passed regulations and policy measures down to the hamlet level. The agricultural extension officers also disseminated early warning alerts received from the district level to the hamlet leaders and to the farmers. Within the DARD and the OARD, the Irrigation

Department Tra Vinh and the Irrigation Station Tra Cu, respectively, held an important position in public risk management. They were responsible for the construction and management of dikes, sluice gates, and canals. The construction budget came from the national, provincial or district level, depending on the size of the investment. Similarly, management responsibilities for the sluice gate operation also depended on the size of the infrastructure. On the governmental side, the Ministry/Department of Labour, War Invalids and Social Affairs (MOLISA/DOLISA) was also an important entity to be considered. At the district level it was represented, among other offices, by the Office of Vocational Training in Tra Cu which organised training classes in many of the researched hamlets. Of particular importance for disaster risk management in the Vietnamese context was the Committee for Flood and Storm Control. It is a committee of representatives from different departments and mass organisations and forms in times of flood- and storm-related crisis (see section 3.3. for more details about the national and provincial authorities, Table 7.1 for a list of the provincial, district, communal and hamlet level institutions and their responsibilities, and section 7.2.3 for more details about the processes and responsibilities attached to each institution).

Table 7.1: Institutions in the research area and their role in salinity and flood risk management

Institution type	Level		Role in salinity and flood risk management
Public entities	Hamlet	PC/ Party	- solves conflicts - takes political decisions - arranges meetings
		Hamlet leader	- intermediates between community and communal government - decides allocation of poverty certificates and other support schemes - solves conflicts (together with police) - gathers information about people - collects fees - holds meetings - consults households in production-related issues
	Commune	PC	- informs hamlet leaders about the decisions taken - steers extension services - dredges canals (3. and 4. level) and builds gates - provides seeds, larvae and livestock - communicates communal needs to the district level - provides official documents to households (for loans, applications, etc.)
		CFSC	- gets only together in case of a flood- or storm-related disasters - evacuates people in case of a storm
	District	PC	- promulgates policies - provides housing support and insurances - communicates district needs to the province level - informs communes about the decisions taken
		OARD	- provides training classes - provides seeds - promotes new varieties and crops - issues seasonal calendars
		CFSC	- gets only together in case of a flood- or storm-related disasters - evacuates people in case of a storm
	Province	PC/DARD	- construction of dikes, sluice gates, bridges, roads, etc. - regional planning
		CC committee	(planned but not implemented at that time)
Governmentally funded organisations	Hamlet/ Commune	School support	- provides financial support for tuition fee
		School	- provides education for children
		VBSP	- provides loans
Mass and professional organisations	Commune	Women's Union	- provides production capital - issues loan guarantees for the farmers - provides loans to its members - informs hamlet leader about local ideas and needs
		Farmers Assoc.	- identifies training needs and communicates them to OARD (district) - provides guidelines of good production practices to the community - promotes new varieties and crops

		Fatherlands Front	- collects fees and donations for the pagoda - intermediates between local government and the pagoda - coordinates the activities of mass organisations
		Red Cross	- consults and financially supports households with health-related issues - hands out medicine
Religious / cultural organ.	Community	Pagoda	- provides public education - collects donations - provides spiritual support
Private sector entities	District	Agribank	- provides loans (also for people who are not members of a mass organ.)
		My Phong	- provides jobs
		Sugarcane company	- provides training classes - buys products and sets prices
		Fertiliser company	- provides training classes
		Corn company	- supplies seeds, fertilisers and pesticides - provides training classes
	National	CAWACO	- buys land from farmers (Xoai Rum) - plans oil depot (Xoai Rum)
International NGOs	Inter-national	IMPP	- provides training classes - provides loans - supports the building of dikes
Other actors/ organisations	Community	Cooperatives	- provide common production support
		Gate operators	- control sluice gates in the community
	District/ Province	Sluice gate operators	- control sluice gates of the large dikes
	Private	Tram Be	- provides financial support for housing and land - financially supports the pagoda - bought land from farmers in Xoai Rum

Source: based on Venn Diagrams and interviews with local authorities, M. Schwab (2011-2012)

Households' perception of the responsibilities, relevance and accessibility of these institutions was often different from what the official system stipulated. Venn diagrams that were prepared in participatory group discussions with households have illustrated this picture (see Figure 7.5 for an example of a Venn diagram, Annex 12.8 for the other two Venn diagrams, and Annex 12.3.3 for more details on the methodology). The Venn diagrams show that the local population attached great importance to the government in the context of flood and salinity management. Households perceived, for instance, often more adaptation options on the side of the local government than at the household level. This did not mean that they necessarily relied on a beneficial implementation of those options but indicated that they knew of the potential relevance of the government.

The discussions with households also revealed that governmental institutions at the province and district level were not considered to be of major relevance to local salinity and flood management. In addition, they were perceived to be distant to the community meaning that there were only few or no possibilities to interact with the institutions at a higher level and that it was difficult to influence decisions made at this level. The communal level was also perceived to be barely addressable by the community. It was judged to be among the most important and influential institutions, however. By far the most crucial governmental actor for the local population was the hamlet leader. He was mostly considered to be close to the community. Many of the interviewees, not only in the group discussions, said that they could approach him with their problems and opinions in everyday life and that he was the main advocate of community concerns. He was also known as the one who decided on the allocation of public supports. This seemed to endow him with notable authority. However, ascribing copious power to a single person could also foster the granting of unjustified advantages to some people. This was described as a major problem in the group discussion in the aquaculture hamlet Lo Soi A. As a consequence, the others (in this case, the participants were part of "the others") felt excluded and more distant to the hamlet leader.

Explanation: Venn diagrams, such as this example from Rach Bot hamlet, were prepared in participatory discussions with farmers. Here, firstly, the institutions on different levels were identified (pieces of colour paper; green: community, pink: institutions on hamlet level, blue: institutions on a commune/district/province level, yellow: private sector and pagoda). Secondly, their risk-related tasks and institutional interconnectivities were illustrated (labelled arrows describe the kind of task and its directedness). Thirdly, the participants ascribed importance to each institution (size of the paper represents the importance) and judged the degree to which these institutions were accessible and open to the community (distance to the green community paper) (see section Annex 12.3.3 for more details and Annex 12.8 for the Venn diagram from two other villages).

Interpretation: This figure shows that the pagoda ("chua") and institutions at the hamlet level were by far the most important institutions for the people. At the governmental level, particularly the hamlet leader ("truong ap") was of central relevance. Moreover, the communal government is judged to be highly important ("UBND Xa"). Institutions at the commune, district and province level as well as private actors were perceived to be difficult to influence and were relatively distant to the community.

Figure 7.5: Venn diagram for Rach Bot hamlet in Ngoc Bien commune (Source: Group discussion with key informants in Rach Bot hamlet, Ngoc Bien commune, M. Schwab 2012)

Mass and professional organisations also took their role in the management of water-related risks (see section 3.3.2 for more details about mass organisations). The most relevant institutions in the current research context were the Women's Union, the Farmers' Association and the Fatherland's Front. In the group discussions, mass organisations were perceived to be closely interlinked with the local government. They advocated the needs and ideas of their members in front of the communal government and disseminated information and policies from the governmental level to the local population. The mass organisations also granted access to loans. When it came to local risk management, they were not considered to be of decisive relevance according to the household group discussions. Households reported that the loans which were granted were rarely given in response to a hazardous event or in order to be better adapted to water-related risks in the future. The mass organisations were often perceived as being close to the community given that so many people were members, knew the heads of the unions personally, and interacted with them on a regular basis (see section 5.2.4). The support provided through the organisations was, however, only accessible for members of the association. For this reason, those who were not members of a mass organisation seemed to feel less connected to them and did not acknowledge their relevance (GD-ID-LS). This seemed to hold true particularly for some of the hamlets in Don Xuan and Ngoc Bien communes where fewer households were members of mass organisations (see section 5.2.4).

The **banking sector** was another relevant agent in the context of salinity/flood management. The banks provided loans for adaptation and, in a few cases, to better cope with cases of hardship. Two banks were particularly relevant for the researched communities: the Vietnam Bank for Social Policies (VBSP) and the Vietnam Bank for Agriculture and Rural Development (Agribank). Both banks were government owned and therefore strongly linked to state entities and mass organisations. The VBSP provided loans at low interest rates to the poorer population (see section 5.2.4). It granted loans in the context of public policies such as support for houses or livestock. There was a close link between the VBSP and the mass organisations. The Women's Union and Farmers' Associations formed loan groups which could jointly apply for a loan from the VBSP. Loans were also provided by the Vietnam Bank for Agriculture and Rural Development. These loans were given irrespective of membership of a mass organisation or a governmental program (AI-C-NB-0419, AI-C-KS-0420). Overall, the group discussions showed that those banks took on a relatively small role in risk management and were perceived to be distant from the community.

At both the district and the communal level, a **Committee for Flood and Storm Control (CFSC)** was in place, as stipulated in national regulations (see section 3.3.2 for more details about the CFSC). Representatives from the different departments and mass organisations were part of this committee. The CFSC was supposed to be convoked when a major flood or storm event occurred – including tidal flood-related events. Interviews at the communal level, however, showed that these committees merely existed on paper. There were no meetings, no reports and no actions taken in the last years. A government officer in Ngoc Bien who was part of the CFSC explained it as followed: "[…] from the past until now there were no bigger disasters which is why we [the CFSC] have never taken any action in this regard" (AI-C-NB-0419-TQH). The interviewed member of the CFSCs in the flood-affected communes Kim Son and Don Xuan explained the inaction of the CFSC in the same way (AI-C-KS-1103, AI-C-DX-0418-MN). In the household group discussions people were either not aware of this institution at all or did not attach any importance to it.

In the research hamlets, the majority of the population was Khmer. **Buddhist institutions** therefore seemed to play a central role in the lives of most Khmer - also when it came to risk management. The pagoda, i.e. a public place of worship, seemed to be seen as an institution in itself and not as a mere location. Together with the Fatherlands Front, the pagoda collected donations which were then allocated to households in need. This also applied for households who were or would be severely affected by tidal flooding or saline intrusion. Moreover, the pagodas provided free education to the communities and organised festivals. The most significant value that the pagodas provided for the local population was reportedly spiritual support in times of hardship. The pagoda was seen as a place where people could go and seek for support at any time. In the group discussions, every participant acknowledged its proximity to the community and merited its substantial contributions to be better able to deal with salinity and flooding.

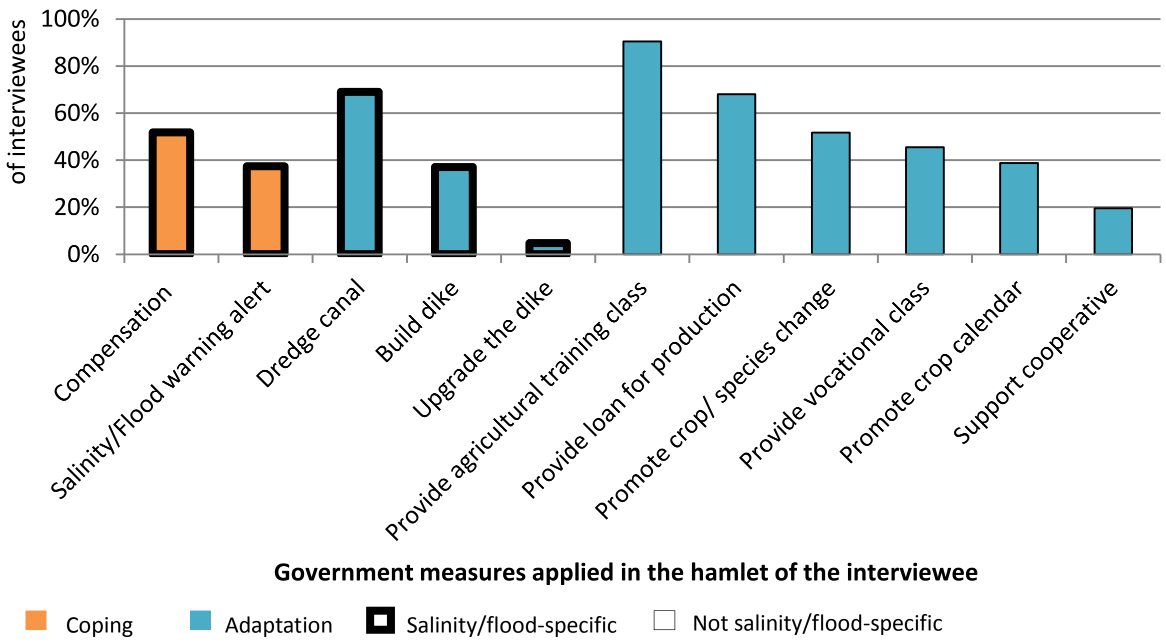
Private entities were also active in the research area and were relevant to the communities. My Phong, a shoe producing company in Tra Cu district, provided employment to many of the younger women in the research area (see section 7.1.2 for more details). In Xoai Rum, another industrial player, namely CAWACO, planned an oil depot in the hamlet. As a big buyer of land, CAWACO therefore provided valuable opportunities to alienate land at high prices (also in the case of hardship or as an adaptation measure). This opportunity did not materialise for the local households, though. Tram Be, a businessman originally from Tra Cu, bought a large amount of land before the local households knew that CAWACO wanted to invest there. In this way, Tram Be, and not the local farmers, was the one to profit most from the high land prices offered by CAWACO. Tram Be was also involved in other ways in the research area. In Ngoc Bien commune, he bought houses for poor and landless families and in Don Xuan he financially supported the pagoda. In Don Xuan commune, also the plan for building a large industrial zone had a substantial influence on the research area (see section 5.2 for more details). However, most of the interviewed farmers were not aware of the implications that these plans would have (see section 6). This seemed to be the reason why the industrial zone management board was not mentioned as being of significance in the group discussion in Don Xuan. The same held true for CAWACO and Tram Be in Kim Son commune. They were not acknowledged as being of any relevance to the management of flooding and salinity risks in the group discussions. My Phong, in contrast, was perceived to be of importance. This was due to its role as the largest off-farm employer in the region. The households in the group discussions thought that My Phong was, despite its relevance, distant to the community. Most of the participants explained this distance by the fact that My Phong merely dictated their terms of employment without the people having any say in it.

From the **international arena of development cooperation**, the German International Cooperation (GIZ) and the International Fund for Agricultural Development (IFAD) were present in Tra Vinh province. In the research area, GIZ and IFAD provided, under the “Programme for Improving Market Participation of the Poor” (IMPP), training classes and microcredits to the local population (IFAD 2012b). IMPP therefore closely interacted with the district government offices of OARD and OLISA which were responsible for agricultural and vocational training classes, respectively. In the group discussions, this program was, however, not acknowledged to be of relevance in the context of flood and salinity risk management.

7.2.2 Government-led coping and adaptation strategies implemented

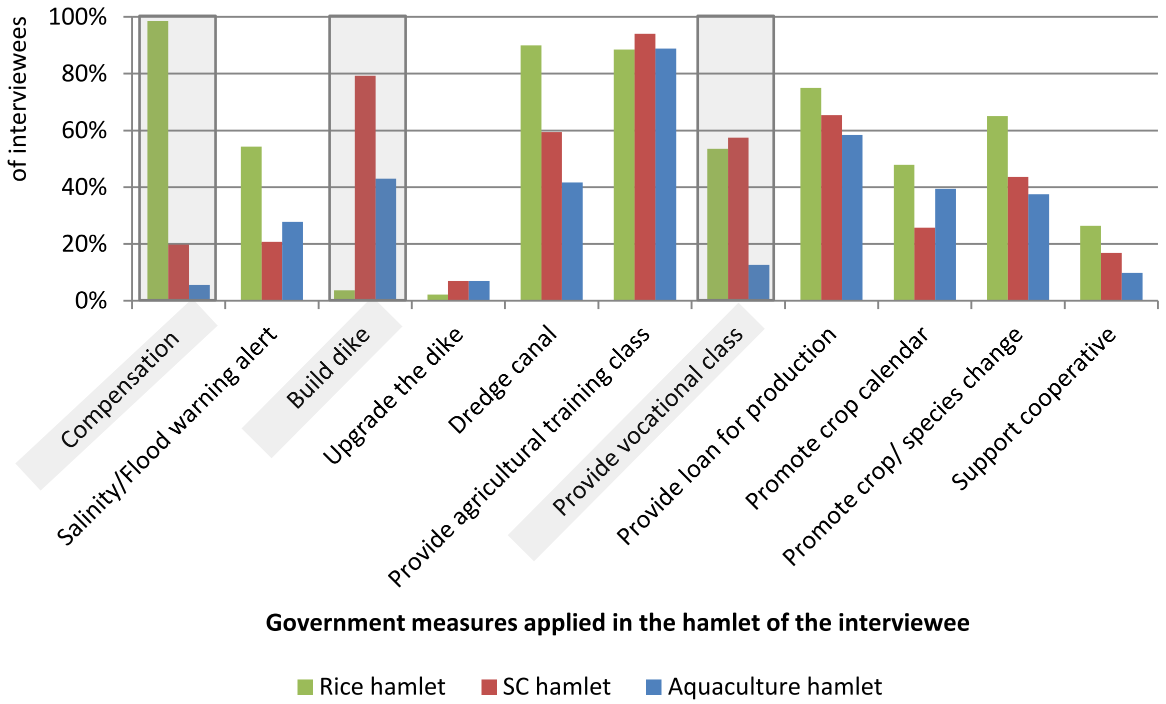
The previously depicted state entities put a wide range of risk-related measures in place (see Figure 7.6 and Table 7.2). Among these strategies, only a few acted as a direct near-term response to flooding and salinity, i.e. immediate payments to compensate for parts of the production losses and salinity and flood warning alerts. The other government-led strategies were long-term oriented adaptation measures, such as dredging the canal or providing a loan. Some adaptation measures were specific responses to tidal flooding and salinity risks (e.g. building a dike to protect households from salinity and flooding) whereas others addressed more general problems of socio-economic development and other natural hazards (e.g. promoting new crops to advance production structures or vocational training classes to improve non-agricultural employment opportunities).

These strategies were not implemented identically in the different administrative entities (see Figure 7.8, and Table 7.2). The largest disparities were observed between flood/salinity-specific strategies. The large majority of survey interviewees in the rice-producing hamlets stated, for instance, that the government paid compensation, issued warning alerts and dredged the canal. The interviewees in the other hamlets only rarely reported that these measures came into effect in their villages (see Figure 7.7). A dike, in contrast, was only mentioned as being built in the discussion with authorities in Kim Son and Don Xuan communes and not in the rice-producing commune Ngoc Bien (see Table 7.2). Disparities between the hamlets and communes were also revealed in the context of more general risk-related strategies. Vocational training classes were, for instance, only offered in Kim Son and Ngoc Bien but not in Don Xuan commune, according to government authorities (see Table 7.2). This was confirmed by the household survey where only a few households in Don Xuan reported that vocational training classes were offered in their village (see Figure 7.8). Moreover, cooperatives seemed to be more often supported by the local government in Ngoc Bien than in the other two communes. Similarly, promoting the crop calendar and promoting a new crop were mentioned more often as being put in place in Ngoc Bien than in Don Xuan and Kim Son (see Figure 7.8).



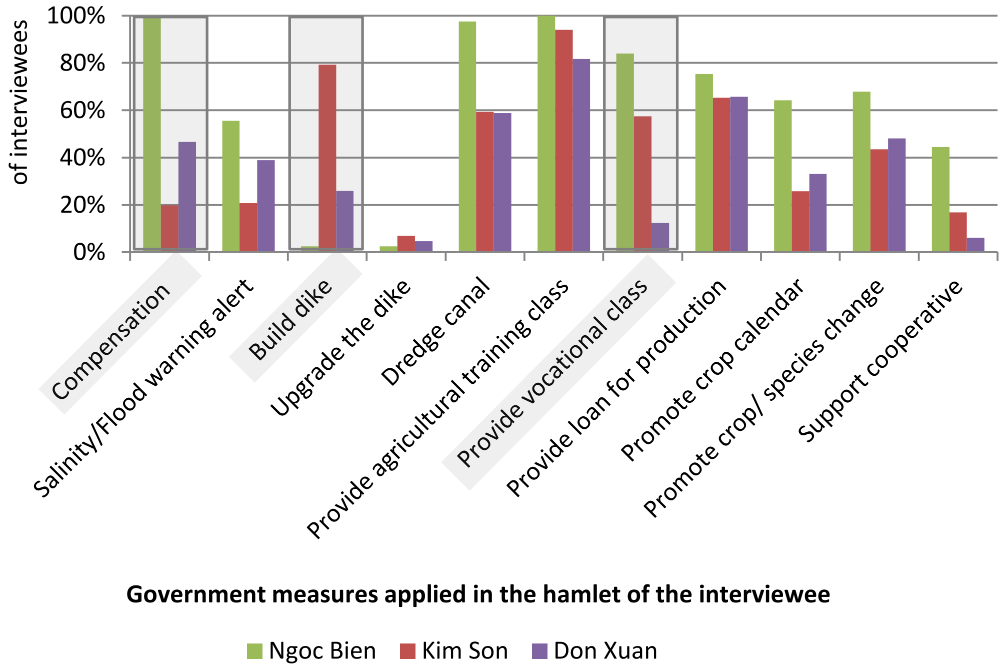
Explanation: The figure depicts theAp share of interviewees who reported that the respective strategy was implemented in his/her hamlet. The strategies are grouped according to the definitions given in section 2.4 and the information received from interviews and group discussions. The total population is 312.

Figure 7.6: Risk-specific and general coping and adaptation strategies implemented by the government in the research area (Source: Household survey, M. Schwab 2012)



Explanation: The figure depicts the share of interviewees in the respective production area who reported that the respective strategy was implemented in his/her hamlet. The total population is 312. The groups of bars with a grey framing represent some of the most notable disparities.

Figure 7.7: Risk-related government strategies as perceived by households in the different production areas (Source: Household survey, M. Schwab 2012)



Explanation: The figure depicts the share of interviewees in the respective commune who reported that the respective strategy was implemented in his/her hamlet. The total population is 312. The groups of bars with a grey framing represent some of the most notable disparities.

Figure 7.8: Risk-related government strategies as perceived by households in the different communes (Source: Household survey, M. Schwab 2012)

Some other strategies were only mentioned at the province and district level (see Table 7.2). In general, flood risk was of only minor importance to the authorities at these administrative levels. The interviewees in the district and province authorities always focused on salinity-related measures first and addressed flood aspects (if at all) only as a secondary concern. Climate change-related measures were also reported as being implemented. These measures included the implementation of a provincial committee on climate change, climate change-related training classes, awareness-raising programs, and an expansion of climate change research activities. The acknowledgement of climate change at the province and district level was reportedly also due to increased attention to climate change nationally and internationally in recent years (AI-P- DONRE-1101, AI-P-HMI-0417, AI-D-OARD-0111). This awareness has not trickled down to the commune or hamlet level yet.

An apparently strong link between some officials at the district and province level to research institutions in Can Tho and Ho Chi Minh City seemed to increase the acknowledgement of research. These authorities reported that further development of new agricultural technologies and crop varieties was of central relevance to flood-/salinity-risk management. DARD officials at the provincial level also reported that mangroves were planted near the research area. However, none of the interviewees at the hamlet, commune or district level reported that mangroves were being promoted - although Kim Son commune was located directly on the Hau River close to the coast.

Table 7.2: Government strategy options and their relevance to authorities at the different administrative levels

C/A *	Government strategies	Commune level**				District level***		Province level***	
		Sugar-cane	Rice		Aqua-cult.	Rice		Rice/ sugarc.	Rice
		Kim Son	Ngoc Bien	Don Xuan		OARD	Farmer Assoc.	DARD	DONRE
	(n=Number of participants/ interviewees)	*(n=10)*	*(n=10)*	*(n=11)*		*(n=1)*	*(n=2)*	*(n=2)*	*(n=3)*
C	Compensation payments	x	x	x		x			
C	Salinity/flood warning alerts			x	x		x		
C	Repair the dike	x							
A	Agricultural training classes	x(2)	x(3)	x(2)	x	x	x (2)	x	
A	Build a dike	x(1)	o (1)	x		x o	o	x o	x o
A	Capital support for production	o		x	x	x	o (1)		
A	Dredge/widen the canal	x	x o	x		x			
A	Expand research activities					x	o	x	x
A	Promote crop calendar	x				x	x		
A	Provide access to loans	x			x		x		
A	Discourage winter-spring rice		x	x		x			
A	Upgrade the dike	o				x		x	
A	Agricultural extension		x				x		
C/A	Operation of the sluice gates		o				o (3)		
A	Build more sluice gates					o		o	
A	Promote cooperatives				o		o		
A	Promote other crops			x(3)					
A	Provide fertiliser and seeds	x							
A	CC awareness-raising					x			
A	Plant mangroves							x	
A	Training on climate change, dike and storm protection							x	
A	Vocational training classes	x							
A	Discourage rice outside of dike								x
A	Increase monitoring stations							x	
A	Create sample field for farmers			o(1)					
A	Build a processing factory		o (2)						
A	Build more canals							o	
A	Define agric. planning areas				o				
A	Promote saline-resistant crops		o						
A	Promote high quality species				o				
A	Promote indiv. embankment				o				
A	Implement Committee for CC and Salinity Prevention								o

Explanation: The authorities were asked in interviews and group discussions which strategies have been and which others could be applied in the context of salinity/flooding. The applied strategies and the potential options were subsequently ranked according to their relevance in the context of flood/salinity risk management. The categorisation of the strategies is based on the definitions given in section 2.4 and strategy-related information provided in group discussions and interviews.

C/A* Classification in coping (C), adaptation (A) or both depending on the circumstances (C/A)
** Results of group discussions with relevant members of government and mass organisations
*** Results of semi-structured interviews with two to three government officials
o Perceived options which have not been applied so far
x Perceived options which are applied in the hamlet
(n) Ranking of relevance in the context of salinity/flood risk
Strategy Strategy option which was mentioned only once
Strategy Strategy option which was mentioned more than three times

Source: Group discussions and authority interviews, M. Schwab 2012

7.2.3 The inputs, processes and outputs of government-led response mechanisms and their impacts on household vulnerability

The previous sections depict the formal actors, their responsibilities, and the measures which were implemented by them. This provides the basis for assessing "what the responses look like", i.e. a central component on the way towards a quality judgement of risk-related strategies in the research area. To arrive at an answer to this question, the following section will assess the previously introduced strategies along the lines of "theories of change" (see section 2.4.4), i.e. by analysing how inputs, processes and outputs are linked causally and how the outcomes have an impact on local vulnerabilities. This analysis thus reveals underlying goals, outlines costs as well as benefits in both the short- and the long-run, shows consequences for other groups in addition to implications for the target group, and considers both process- and outcome-oriented criteria in the assessment.

Strategies aiming at exposure reduction

Exposure-reducing measures seemed to be highly prominent strategies in the context of flooding and salinisation risks. Large infrastructural changes like the construction of dike systems and sluice gates were the most formative measures in this context (see Table 7.3 for an exemplary logic framework assessment of dike systems).

Dikes were built and planned to be built in Kim Son and in Don Xuan communes (see section 5.2.2 and Figure 7.8). These were, however, according to communal level authorities and most interviewed households, not upgraded in the past ten years. Only officials at the province and district level reported that the dikes in the researched communes were regularly upgraded and maintained. According to the DONRE at the province level, an assessment of the state of the dikes was undertaken every five years so that they had up-to-date knowledge of where upgrading was required (AI-P-DONRE-1101). At the lower levels, none of the interviewed officials reported such an assessment, however. The capital for the large dike systems came from the central government, according to the interviewed provincial and district authorities. The South Mang Thit dike was supported by a large World Bank project (see section 3.1.2). In Kim Son commune, local authorities stated that further capital for building dikes came from IMPP. The costs of building a dike amounted, in the case of the currently constructed dike in Kim Son commune, to 500 million VND (around 20,000 Euro[140]) per km, according to the officer in charge (AI-C-KS-T-0420) - a sum which was by far larger than the expenses for other governmental programs. He said that the commune managed to build around 2 km per year. From this budget, compensation was also paid to farmers who provided land. According to some households who had to give land, the amounts varied between seven million VND (275 Euro[141]) per cong (HI-S-XR-S197) and 40 million VND (around 1,600 Euro[142]) per cong (GD-H-TC-1227). According to communal officials in Don Xuan and Kim Son, the local population is involved in the decision-making. The officers said that, "farmers decide in a meeting whether they want the dike" (AI-C-DX-N-0418); "the meetings take place at the hamlet level with the PC staff. We will invite all farmers who are affected by building a dike" (AI-C-KS-T-0420). The DONRE in Tra Vinh, moreover, said that an environmental impact assessment (EIA) was required before a large infrastructure investment was put in place. An EIA report was, however, not accessible to the researcher (AI-P-DONRE-0417). Moreover, communal and district authorities were not aware of such assessments. The cost calculation and the management were undertaken by the commune, whereby the farmers had to let the communal PC know if any kind of problem, such as a breach, occurred. The district level seemed to consult, monitor and control these activities regularly (AI-C-DX-N-0418).

[140] At an average exchange rate of 2012.
[141] At an average exchange rate of 2012.
[142] At an average exchange rate of 2012.

Table 7.3: Logic framework assessment at the example of dike systems

Rationale and objectives	→Reduce exposure to flooding and saline intrusion, in particular →Increase rice production →Improve economic development
Inputs	→Budget from central government, World Bank (South Mang Thit dike), Bai Ngan Project, IMPP →In Kim Son commune, for instance, 500 million VND per km were spent →Compensation for private land was paid in addition to the construction costs (for gov. dikes only; 7-40 million VND/cong)
Activities	→Meeting with all farmers who would be affected by building a dike →Environmental impact assessment *(local authorities were not aware of this activity)* →Cost calculation by the communes →Dikes were built and new ones were planned in Kim Son and in Don Xuan communes (2km/year in Kim Son) →Management by communes →Assessment of the state of the dikes was undertaken every five years *(local authorities were not aware of this activity)* →Farmers timely and regularly reported damages →Regular upgrading and repairing based on the assessments (*local authorities did not report this)* →The district level consulted, monitored and controlled these activities regularly
Outputs	→Areas with a higher freshwater availability and lower frequency and intensity of tidal flooding inside the dike →Areas with a higher frequency and intensity of tidal flooding outside the dike →Improved transportation
Outcomes	→Up to three rice seasons could be produced →Flood damages inside the dike were reduced →Higher losses due to flooding in the sugarcane areas →Improved transportation →Some people lost land
Vulnerability impacts	→Exposure of households inside the dike decreased →Income from rice production could improve the capacity of response (*but: income from other production types was often higher*) →Increased losses in sugarcane areas reduced the capacity of response there →Rice production in the dry season increased susceptibility to salinisation
Impacts on decision-making	→Reliance on being protected by the dike weakens the feeling of being threatened and reduced the individuals' motivation to adapt

Source: author, based on interviews, group discussions and governmental reports, M. Schwab (2011-2012)

The **operation of the sluice gates** has been shown to be an influential strategy in the context of flooding and salinity risks. From a short-term perspective, the timely closing of the sluice gates in the dike systems was a decisive coping measure in times of high salinity levels in the canals. From a more long-term perspective, the responsibilities and timing of the operation needed to be reliable and adapted to future needs and goals. Sluice gates were formally operated by OARD's irrigation department at the district level (AI-P-DONRE-0417, GD-A-NB-0113, AI-D-FA-0111). They were supposed to measure salinity levels in the dry season between January and May and were responsible for closing the gates when the levels were too high (GD-A-DX-0114). However, in the case of the Can Chong gate in Tieu Can district, i.e. one of the most influential sluice gates for the research area, it was reportedly opened and closed flexibly by private actors before 2012. Several authorities and households said that sugarcane producers in Tieu Can opened the gate whenever they needed/wanted to transport their product the shortest way to the ocean (HI-P-TCC-L1-0228, AI-D-FA-0111, AI-C-PC-NB-1103, AI-H-RB-0305). Furthermore, aquaculture producers seemed to be able to operate the gates. They opened it for disposing polluted water from their production (AI-P-DARD-1101, AI-D-OARD-1102). In 2011, this led to high salinity levels in the canals of Don Xuan and Ngoc Bien communes. As a consequence, 926 households in Ngoc Bien lost more than 70% of their production on more than 1000 ha; in Don Xuan, 542 households lost more than 70% of their rice harvest on nearly 500 ha (OARD Tra Cu 2011b; DARD Tra Vinh 2011). At an average return of 5.3 Mio VND per cong per season (according to the CBAs; n=14), the losses would therefore amount up to at least 37 billion VND (around 1.3 million Euro) respectively 19 billion (around 0.7 million Euro)[143]. Provincial authorities and district authorities in Tieu Can and Tra Cu responded to those crop failures with new institutionalisation. However, the commune authorities, mass organisations and hamlet leaders were not included in the meetings. According to the new regulation, all eight gates should be closed when salinity levels are higher than 2 g/l and two gates should be closed when the salinity levels are between 1 and 2 g/l (AI-D-OARD-1102, AI-D-OARD-0111). In contrast to the situation before, authorities reported that a clear distribution of responsibilities, regular controls, and sanction mechanisms were also implemented. However, many households and hamlet-level officials did not seem to be aware of the assigned responsibilities and regulations either before or after 2012 (AI-C-DX-0418, AI-C-NB-0419). Several households and authorities, for instance, reported that broken sluice gates were responsible for high salinity levels in 2011 and not a failure in the operation of the gates (HI-HS-BGA-S163-0310, HI-HS-XT-S143-0309, AI-H-XT-0309). Other larger sluice gates, such as Tra Cu gate, were reportedly closed throughout the whole dry season and therefore seem to be better able to protect the rice farmers from saline intrusion (AI-H-XT-0401). The smaller sluice gates were operated by locally appointed gatekeepers (AI-D-OARD-0111, GD-A-NB-0113, GD-ID-LS). There were no major impacts reported due to the operation of these sluice gates.

Overall, the exposure-reducing measures had diverse outputs, outcomes and vulnerability-related impacts (see Table 7.3). The construction of the dikes had improved the transportation infrastructure for the whole region and had created areas with higher freshwater availability and less flooding (HI-S-RB-L24). The reduced exposure therefore decreased harvest losses due to tidal flooding and saline intrusion (HI-S-SV-S45, AI-P-DARD-0110). In the areas where new dikes were built, nearly all survey interviewees who said that a dike was built stated that they benefited from it (see Figure 7.9)[144]. In the rice producing areas, the dike system allowed for the production of rice in up to three seasons per year (HI-S-SV-S45, AI-P-DARD-0110). However, the production-centered interviews showed that sugarcane production in 2011 led in most cases to a higher contribution margin than rice production (see sections 5.2.4 and 7.1.2)[145]. A general increase in income and response capacity compared with the other production types can therefore not be assumed. Moreover, flood and salinity exposure was not totally eliminated. Salinity and flooding could still reach the fields in the case of infrastructure or management failures. The previously described operation of the sluice gates led to substantial losses

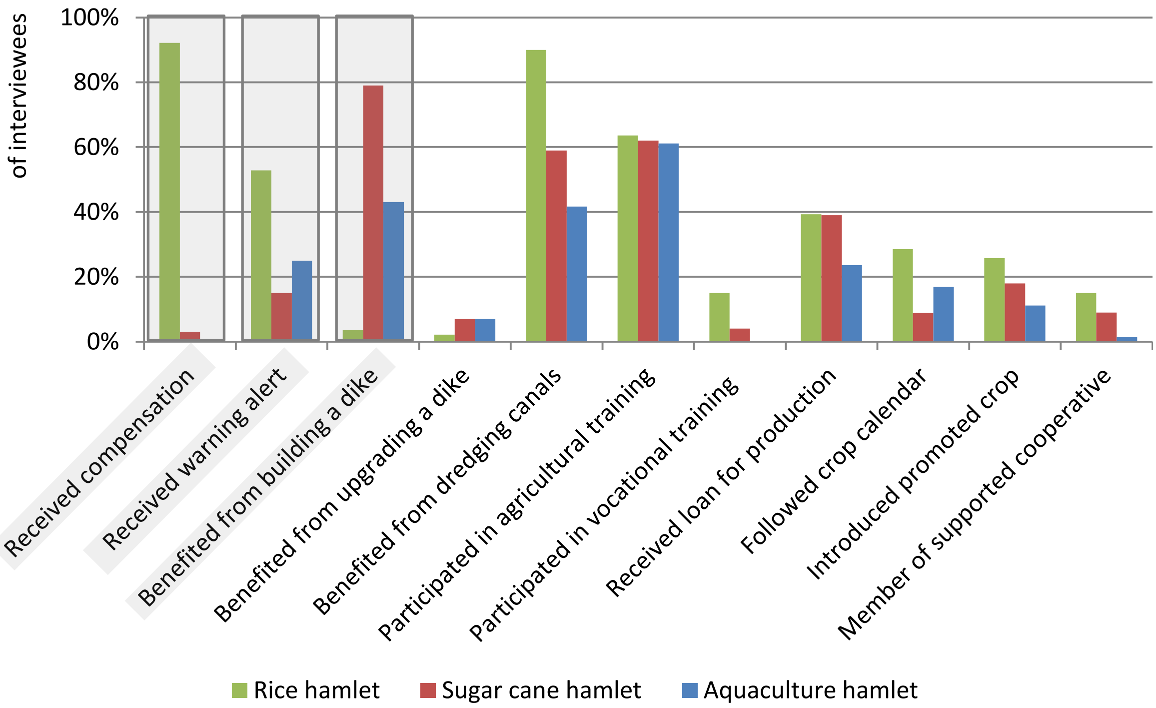
[143] At an average exchange rate of 2012; assuming a loss of 70% of the production.

[144] In the rice producing areas no dikes were built in the last 10 years, which is why there were also very few people who said that they benefited from it.

[145] This calculation is based on three seasons of rice production in which the winter-spring season did not bring any returns due to salinity related harvest loss. Also when only considering the costs and benefits of the other two seasons, the contribution margin was in most cases lower than for sugarcane. It has to be considered, however, that the income from crop production is also dependent on factors such as commodity prices or crop diseases and can therefore not be generalized based on the CBAs undertaken for the year 2011 only.

in the rice production area in 2011. The subsequent decline in net income was therefore also responsible for a loss of response capacity – at least in the short-run. In consequence, people stopped producing rice in the winter-spring season which reduced their susceptibility. The institutionalisation which took place in 2012 had further distinct vulnerability implications. The reliance on a better sluice gate operation reduced the threat perception in the rice producing areas (see section 6.1) and led to a reintroduction of a third crop (see section 7.1), i.e. their susceptibility rose again. In the areas outside the dike, people lost their power to determine the sluice gate operation which considerably reduced their capacity of response, including in the long-run. Moreover, the interviews revealed that the impacts of tidal flooding could become more adverse than before in cases of infrastructure failure. If a dike was breached, flooding would not only occur suddenly but with much higher water pressure (AI-P-HMI-0417). Furthermore, the protection of one area seemed to increase the exposure of other areas. Several people who lived outside the dike said that flooding started to occur only after the dike was built (e.g. HI-S-XR-S198) or that the flood levels increased significantly as a consequence of the dike (e.g. HI-S-XR-S197). Authorities reported, in contrast, that tidal flooding in the areas outside the dike would only increase insignificantly or not at all (AI-C-T-0420).

In summary, the cost-intensive construction of dikes and sluice gates had reduced the exposure to flooding and saline intrusion substantially – if maintained and operated adequately. In case of management failures, it could lead to a substantial loss of financial capital in the short-run which could also affect the capacity of response of households in the long-run. The feeling of being protected raised the susceptibility of many rice producers (the ones who introduced winter-spring rice) and was the main reason for being affected by saline intrusion in 2011.



Explanation: The figure depicts the share of interviewees who reported that they benefited from/were affected by the respective strategy. The total population is 312 (rice: 140, sugarcane 101, aquaculture: 71). The groups of bars with a grey framing represent some of the most notable disparities.

Figure 7.9: Interviewees who benefited from risk-related government strategies in the different production areas (Source: Household survey, M. Schwab 2012)

Strategies in relation to susceptibility reduction

In addition to the exposure-reducing strategies, the government also put several measures into place which aimed to reduce susceptibility to flooding/salinity. The strategies most relevant to this research context were dredging the canal, promoting the crop calendar, and encouraging the production of another crop/variety/species.

The **canals** seemed to be dredged regularly in order to improve the freshwater availability. The majority of all interviewees said that the nearest canal to their field was dredged at least once in recent years (see Figure 7.9). In the group discussions and interviews with authorities it was a strategy frequently mentioned in all communes (see Table 7.2). The officials in charge reported that the canals were dredged yearly or at least every couple of years (AI-C-PC-NB-1103, GD-A-D; XAI-C-DX-N-0418, AI-C-KS-T-0420). In terms of the responsibilities, different opinions prevailed among the commune officers in charge. The official in Ngoc Bien said that primary and secondary canals are the responsibility of the irrigation office at the district level (AI-C-NB-TQ-0419); whereas the officer in Don Xuan commune reported that the responsibility for primary canals lay at the national level and for secondary canals at the provincial level (AI-C-DX-N-0418). In Kim Son commune, the respective officer in charge stated that he did not know about the distribution of responsibilities for the construction and maintenance of primary and secondary canals (AI-C-KS-T-0420). Nevertheless, all officers in charge were aware about the responsibility for tertiary canals, i.e. that the communal staff had to maintain them. They reported that there was a meeting with the affected farmers at the forefront of dredging a canal in which all participants had to agree to the dredging plans (AI-C-DX-N-0418, AI-C-NB-TQ-0419, AI-C-KS-T-0420). For secondary canals a meeting seemed to be held between the communal and district authorities only (AI-C-NB-TQ-0419). An assessment of costs or a feasibility study before implementation was, according to the commune authorities, not undertaken. Reports about the incurred costs were compiled after implementation, though. In Ngoc Bien commune, the costs of dredging a canal were on average 11,000 VND per m^3 in 2011. In this year, a total of 6,500 m^3 of canal was dredged so that the total costs added up to 72 Mio VND (around 2,500 Euro)(PC Ngoc Bien 2011c). The budget for secondary and tertiary canals came from district level whereas smaller canals were maintained and paid by local farmers (AI-C-DX-N-0418, AI-C-KS-T-0420, AI-C-NB-TQ-0419). Moreover, the building and dredging of canals often required land from farmers. One farmer in Ngoc Bien reported that he got 1.6 million VND (around 63 Euro[146]) per cong (HI-S-XR-S198), whereas government officials in all communes asserted that no compensation was paid to the farmers (AI-C-NB-TQ-0419, AI-C-KS-T-0420, AI-C-DX-N-0418). The actual dredging took only a few days for several hundreds of meters, according to officials in charge in Ngoc Bien (AI-C-NB-TQ-0419). The vulnerability-related outcomes of regular canal dredging included a better water supply (AI-C-T-0420, AI-D-OARD-1102) and improved drainage. In this way, the extent of production losses and also the susceptibility to flooding could be decreased accordingly (AI-C-T-0420). There were no reports of major negative vulnerability-related implications of dredging the canals.

Promoting a **crop calendar** was another commonly applied strategy. Even though this measure primarily aimed to coordinate production and harvest times, it often targeted a reduction in susceptibility to tidal flooding and saline intrusion too. In the group discussions and interviews, only authorities in the sugarcane-producing commune Kim Son, officers from OARD and staff from the Farmers' Association at the district level reported having promoted crop calendars (see Table 7.2). The survey revealed, in contrast, that the percentage of households who reported that a crop calendar was promoted in their hamlet was higher in rice and aquaculture areas than in the sugarcane-producing areas (see Figure 7.7). The crop calendar was issued by the district level, disseminated by agricultural extension staff, and announced as a public notification at the hamlet house. The costs of this measure therefore mainly comprised staff salaries and were comparatively low. A large share of the population, however, did not implement the promoted crop calendars (see

[146] At an average exchange rate of 2012.

section 6.2 for details on the reasons for this reluctance). In the flood-affected areas, only 9 % of all interviewed sugarcane producers and 17 % of aquaculture producers stated that they followed the calendar. In the rice-producing hamlets, in contrast, more than 65 % of interviewees confirmed that they applied the suggested calendar. In the rice-producing areas, government officials also reported that they discouraged households from growing winter-spring rice before and particularly after the severe salinity event in 2011 in order to keep susceptibility to salinisation low (see Table 7.2; AI-C-PC-NB-1103). Despite this recommendation, most of the households in the rice-producing areas introduced winter-spring rice in 2010 and planned to reintroduce it in 2012. The government initiative to reduce susceptibility was accordingly not very effective.

Promoting a change of crops is a measure which can considerably reduce susceptibility. The household survey revealed that such initiatives were commonly put into action, particularly in the rice-producing hamlets (see Figure 7.7 in the previous section). The officers in charge at various administrative levels reported encouragement for starting to grow vegetables (AI-C-KS-T-0420, AI-H-XT-1221, AI-H-BGA-0206, GD-A-DX-0114, GD-A-NB-0113), rice (GD-A-KS-0112, HI-HS-BS-L39-0307), sugarcane (AI-H-XR-1228), corn (AI-C-KS-T-0420), peanuts (AI-H-RB-1221, HI-HS-BGA-S163-0310) and aquaculture (AI-D-OARD-1102). New crops and species were either promoted by information distribution (AI-H-BGA-0405) or by the provision of seeds (AI-C-PC-NB-0419, AI-H-BGA-0405), loans and special contracts with agricultural companies (AI-C-DX-0529, HI-HS-XR-S197-0312, HI-HS-BGA-S163-0310). These initiatives were often based on regulations from the central level such as decisions 457 QD-TT-CLT 05/11/2010 and 198 QD-TT-CLT 18/06/2009 which argue for a change to a different rice variety. The majority of households who changed products in response to these promotions introduced more saline-resistant crops (sugarcane, corn and peanuts). There was no one in the survey who introduced rice. The susceptibility of households who followed the promoted changes therefore seemed to be reduced. Nevertheless, the amount of people who did so was small. In total, only eight people altered their crop in response to these governmental initiatives. Moreover, changes to more saline-resistant varieties or to less sensitive aquaculture species were encouraged, according to officials in all communes (e.g. AI-C-KS-T-0420, GD-A-NB-0113, AI-H-BS-0401). The interviewed households seemed to follow these initiatives more often than the encouragements for changing crops. In the sugarcane and aquaculture hamlets, all households who reported that a new variety was promoted introduced this new variety. Nevertheless, in total only 40 out of 312 households changed the variety in response to government initiatives.

In conclusion, the data revealed that dredging the canal was the most commonly applied and reliable strategy which reduced susceptibility. The promotion of crop calendars and crop/variety changes was also a commonly applied, yet, less expensive strategy which was, due to the administrative structures on site, easily implementable. Nevertheless, only a few households followed the government recommendations so that a reduction in susceptibility was rarely observed.

Strategies in relation to an increase in capacity of response

The majority of risk-related government strategies directly or indirectly aimed to increase the response capacity of households in the research area. They included two immediate short-term response mechanisms (i.e. immediate payments to compensate for some of the production losses, and salinity and flood warning alerts) and a comparatively large number of long-term oriented strategies. The most relevant long-term oriented measures seemed to be agricultural and vocational training classes, loan schemes, promotion of cooperatives, encouragement of improved production techniques, and poverty reduction measures.

The most prominent coping strategy in reaction to water-related hazards was the payment of **compensation** for the exceptional production losses due to saline intrusion in 2011. This measure was intended to strengthen the coping capacity of households, i.e. their short-term capability to make a living despite the detrimental effects of saline intrusion. Based on decision 142/2009/QD-TTG of the central government compensation payments were provided in order to improve agricultural production in the event of adverse impacts caused by natural hazards, livestock diseases and aquaculture diseases (GoV December 2009). Every household received 100,000 VND (around 3.5 Euro[147]) per cong if production was destroyed by more than 70%; if households lost between 30 and 70 % of their production, they received 50,000 VND (around 1.7 Euro) per cong (AI-D-OARD-1102; GoV December 2009). Considering that the interviewed households made an average turnover of 5.3 Mio VND per cong per season (around 180 Euro[148]; according to the CBAs, n=14), this is a comparatively small compensation. The budget for compensations came from both the provincial and national levels. Households and local authorities stated that farmers reported their losses to the hamlet leader who then gave a list to the communal level; from the communal level, agricultural extension staff came and did spot checks on whether the reported damage was correct (e.g. AI-H-RB-0403, AI-H-XR-0312, and AI-C-DX-N-0418). Two households reported that extension staff came to their house and asked them how much they had lost and how much money they needed to compensate for the loss (HI-P-BC-0209, HI-S-RB-L24). These opinions were not considered when deciding the actual amount of compensation being paid. This amount had been predetermined by the central government in the decision 142/2009/QD-TTG. In total, compensation payments of around seven billion VND (around 243,000 Euro[149]) were paid to the salinity-affected households in Tra Cu district in 2011. In Ngoc Bien commune, 926 households received a total of around one billion VND (around 35,000 Euro[150]); in Don Xuan commune, 542 households received about 500 million VND (around 17,000 Euro[151]). In both communes, the full compensation for a loss of more than 70 % was paid to every affected household (OARD Tra Cu 2011b; DARD Tra Vinh 2011). Among the survey interviewees, more than 90% of all salinity-affected households received compensation (see Figure 7.9). The authorities stated that this compensation payment would not be paid again if people lost their production in the following winter-spring season (AI-H-RB-0403, AI-H-XR-0312, and AI-C-DX-N-0418). In Don Xuan commune, the compensation was also paid in 2010. In that year, it was a reaction to the severe impacts of a drought. According to the vice head of the commune, 542 households and 474 ha were affected at that point. The loss was in most cases between 30-70 % (AI-C-DX-N-0418). In the flood-affected areas, only a few households and some authorities in the group discussion in Kim Son commune reported that such compensations were paid in response to natural hazards (GD-A-KS-0112). The household survey revealed, in this regard, that around 20 % of all households in the sugarcane-producing areas and around 6 % of households in aquaculture hamlets received compensation in the past.

Overall, it seemed to be a strategy which was implemented relatively promptly and from which many people could benefit (given that the government decided to allocate compensation payments). However, the sum of money received by each household compensated for only a small share of the income loss and was not enough to implement any adaptation strategies. Nevertheless, it eased getting by right after the households experienced the adverse impacts. The payments therefore appeared to have at least an effect on the immediate capacity to cope.

The dissemination of **salinity and flood warning alerts** was the other immediate and short-term oriented government response to salinity and tidal flooding. Hydro-meteorological information on flooding and salinity had been regularly received by communal and hamlet authorities (AI-P-TCC-0207, AI-HS-BN-L131-0330, AI-HS-TCC-L105-0313, AI-HS-XR-S197-0312). The communal authorities received daily information on salinity levels during the dry season from OARD at the district level (AI-C-NB-TQ-0419) which itself received the information from the Hydro-meteorological Station in Tra Vinh (AI-P-HMI-0417). The communal authorities acquainted the hamlet leaders who distributed the

[147] At an average exchange rate of 2011.
[148] At an average exchange rate of 2011.
[149] At an average exchange rate of 2011.
[150] At an average exchange rate of 2011.
[151] At an average exchange rate of 2011.

information mouth-to-mouth, in meetings and/or in the form of a notification paper at the hamlet house (AI-C-NB-TQH-0419, AI-H-BGA-0310, AI-H-LS-0803, AI-H-BC-0603h). Moreover, information on tidal flooding, salinity levels and the operation of sluice gates seemed to be announced on the television during periods of frequent hazard occurrences (AI-P-HMI-0417, HI-P-TCC-0702, HI-P-BXD-0206). The survey revealed that around 37 % of the interviewed households reported that a warning was issued in their hamlet. Most of those were located in Ngoc Bien commune (see Figure 7.8). Authorities there stated that they informed the population about the latest salinity levels and suggested coping strategies such as the usage of ground water instead of canal water and increased fertiliser application so that crops could better withstand saline intrusion (AI-C-NB-TQH-0419). Considering that the majority of households lost their entire production in 2011, the warning alerts and coping recommendations did not show much effect. In the flood-affected areas only comparatively few households said that there was a warning in their hamlet, particularly in the sugarcane hamlets where only 20% of households reported that an alert was disseminated (see Figure 7.7). The officers in charge reported that information about flood levels was distributed and that coping measures were suggested such as early harvesting, a reinforcement of the embankments and an immediate and joint filling-in of breached levees (e.g. GD-A-DX-0114, AI-H-XR-0312, AI-D-FA-011).

Overall, a system of salinity and flood warning seemed to be in place and could lead to a timely acknowledgment of the hazard. However, only a few households seemed to receive these alerts and the dissemination of information rarely strengthened the know-how to cope. The short-term implications for the coping capacity were therefore, despite the high potential, only small.

The institution responsible for the coordination of short-term responses, i.e. the Committee for Flood and Storm Control (**CFSC**), did not take any action in the researched hamlets. Nevertheless, CFSC structures were in place and the respective authorities seemed to be aware of these. A member of the CFSC in Ngoc Bien commune said, for instance, that: “Whenever there is a disaster the CFSC comes into action. In that case, there will be a document sent to us from higher level authorities; this notification determines what action we will have to take […]. When we receive this document we will have a meeting and we will pass the document on to the hamlet level. This document describes how to reduce the risks and harmful effects of disasters for the people […]” (AI-C-NB-19.4.). However, none of the households and authorities, neither in group discussions nor in the interviews, said that the CFSC was active in recent years. The officers in charge said that this was mainly related to the fact that there were no major natural disasters. Hazards such as previous tidal flood events were not perceived to be the responsibility of the CFSC, according to the commune officers in charge (see section 7.2.1).

Vulnerability implications would therefore only arise in the context of rare life-threatening or more damaging storm or flood events – respectively when officials define a hazard to be threatening. Hazards which threaten production and income losses did not seem to be the perceived responsibility of the CFSC, however.

The officials in the group discussion in Kim Son commune reported a further coping option, i.e. **financial support to repair breached or damaged embankments** (see Table 7.2; GD-A-KS-0112). However, none of the interviewed households in Kim Son commune confirmed that this support scheme existed in the hamlet.

Long-term oriented strategies were more commonly applied in the current risk context than immediate short-term oriented measures. **Agricultural training classes** seemed to be a highly influential strategy for strengthening the capacity of response. According to local officers in charge (GD-H-XR-1228, GD-AI-KS, GD-H-XR-1228, AI-C-KS-0529), training classes were offered by the OARD, the IFAD program IMPP (not in Don Xuan commune), and private sugarcane and fertiliser companies (in Kim Son commune only). The governmentally implemented training was organised by OARD Tra

Cu and was financed from the national budget. Communal officials said that the costs of renting a room were between 50,000 and 100,000 VND (around two to four Euro[152]) per day and each of the participants received between 10,000 and 30,000 VND (0.4 to 1.2 Euro[153]) per person per day (AI-C-KS-L-0529, AI-C-DX-D-0418). The officers did not know about the amount of other expenditure. The training classes were most often held on one day per week for several months (GD-H-SV-1229, GD-H-XR-1228, AI-C-KS-L-0529, AI-C-DX-D-0418, and AI-H-BC-0306). For some of these classes, the content was reportedly determined by national-level programs such as the "3 up- 3 down" program (see section 3.1.4). Moreover, officials from DARD Tra Vinh said that they cooperated with universities and that farmer needs, experiences and know-how were included in the planning (AI-P-DARD-0417). The training classes mainly focused on improving the production techniques of the dominant production type economically and environmentally. Some other classes promoted new production options such as mushrooms in Tra Cu C (AI-H-TCC-0416), corn in Ba Giam A hamlet (AI-H-BGA-0405) or peanuts in Sa Van A (AI-H-SVA-0401). Tidal flooding and salinity risks did not seem to be explicitly addressed in those classes, however. The interviews and group discussions showed that salinity and flooding were either not very prominently addressed (AI-C-KS-0529-MN) or not addressed at all (GD-AI-KS, HI-S-S45-SVA, AI-C-0420-KS). Some of the training seemed to include the promotion of more saline-resistant varieties (AI-P-DARD-1101, AI-C-NB-TQ-0420, GD-A-KS-0112, AI-C-0529-DX) or crops which were more adapted to future land and soil conditions (AI-C-0529-KS). The local need for training classes was reportedly assessed by a farmer survey conducted by the mass organisations or by a consultation with the extension officers (AI-H-LS-0308, HI-P-BC-0209, AI-C-KS-L-0529, GD-A-KS-0112). The selection of the participants was done by the mass organisations in coordination with the hamlet leader. The selection was reportedly only based on whether the main activities of the household matched the content of the class (AI-H-RB-0305, AI-C-KS-T-0420). Around 60% of the survey interviewees participated in agricultural training (see Figure 7.9). Ngoc Bien commune revealed the highest percentage of training class participants. On average, the members of the interviewed household participated in five training classes throughout the last five years (median of three classes per household). Households with a higher average education level seemed to participate more frequently in training classes than those with a lower formal education; and Kinh participated on average more often than Khmer. There were no major differences in terms of the poverty level. In all production areas nearly 90 % of the interviewees said that they changed their production in response to the training class. The households most commonly changed the variety and the amount and kind of chemicals.

Agricultural training classes can reduce vulnerability in various ways. Firstly, training classes serve as a platform to raise awareness of existing and potential future risks. Secondly, farmers can learn about their options to better deal with these risks. For instance, they can learn how saline water can be recognised so that farmers do not pump it onto their fields, how ponds and embankments can be better prepared so they do not break, or whether, how and what kind of fertiliser has to be used once saline water intrudes in the field. In terms of adaptation, training classes can also provide the necessary knowledge, for instance, to change to more saline-resistant crops or varieties or change the overall production technique. In the research area, merely the aspect of changing to another more saline-resistant crop seemed to be addressed (in Kim Son and Ngoc Bien only). Coping options did not seem to play a role. Therefore, the training apparently only rarely led to a major increase in the knowledge-related coping capacity. Thirdly, training classes can generally provide more know-how of production techniques and therefore increase productivity, reduce costs and consequently raise the overall net-income of a household. This in turn increases the financial capital and has, as stated earlier (see section 5.2.4), important implications for the capacity to adapt and cope with water-related hazards. An increase in overall productivity was the focus of most training classes in the research area. For this reason, changes in the capacity of response were mainly related to an improved financial capital endowment. In addition, training classes seemed to have raised the

[152] At an average exchange rate of 2012.
[153] At an average exchange rate of 2012.

environmental component of the capacity of response to some extent by more environmentally-friendly production techniques (e.g. AI-C-29.5.-DX, AI-C-29.5.-KS, AI-P-DARD-0111).

Vocational training classes were also offered in the research area. They mainly aimed to improve opportunities for finding an alternative or additional off-farm source of income. In the research area, vocational training classes were conducted by OOLISA and OARD Tra Cu, IMPP and Women's Union (e.g. GD-H-XR-1228; household survey; see also section 7.2.1). Vocational training classes took place over a period of several months, but more frequently per week than agricultural training classes (AI-C-KS-L-0529, AI-C-DX-D-0418). The costs of the room and the payment each participant received were reportedly slightly lower than for agricultural training classes (AI-C-KS-L-0529, AI-C-DX-D-0418). Overall, only 25 households said that a family member had participated in these classes in the last five years (see Figure 7.9). Most training classes took place in Ngoc Bien commune, and the least in Don Xuan commune. In the aquaculture hamlets in Don Xuan, no interviewed household participated in a vocational training[154]. The training classes were offered in the field of mechanics, producing handicrafts, sewing and construction, according to the commune authorities in charge and the hamlet leaders. The sewing classes were conducted to improve access to jobs in the shoe factory My Phong (AI-P-DPI-0110, AI-H-RB-1221; see section 7.2.1). Mechanical and handicraft classes were intended to support finding an additional source of income on site whereas construction training aimed to improve the chances of finding a job not only in Tra Cu but particularly in urban areas. Nevertheless, only 15 people indicated that they started another job after or because of the training, of which 11 were from the rice-producing hamlets in Ngoc Bien commune.

Accordingly, vocational training reached considerably fewer people than agricultural training classes and led to an improved income situation for only a comparatively small share of participants. The know-how-related impact on the capacity of response therefore seemed to be limited.

Providing access to **loans** was another influential strategy in the current research context. The governmental loan schemes were issued by the Vietnam Bank for Social Policy (VBSP) and were most commonly provided to poor households who did not have enough collateral to receive a loan from the Agribank or from other lending sources. The loan application procedures were reportedly less complicated than for other loan schemes (GD-H-BS-1230-1230) and the interest rates were lower than the rates of the Agribank and private lenders (see section 5.2.4 for more details). The interest rates for loans from governmental programs were between 0 and 1 %, according to interviewees in the household survey. Commune authorities in Ngoc Bien reported that interest rates differed from program to program. The loans provided as part of program 167 had, for instance, an interest rate of 0.3 % per month whereas a loan scheme for poor ethnic minorities gave 5 million VND (around 200 Euro[155]) without any interest rate (AI-C-NB-0419-MT). Households who held a poor certificate seemed to be able to obtain program-independent loans at a lower interest rate, i.e. only 0.65 % whereas other households had to pay 0.9 % per month. Another loan scheme existed as part of program 74 which provided 3 million VND (around 120 Euro[156]) plus a loan of 10 million VND (around 400 Euro[157]) to improve the productive activities of ethnic minorities, i.e. Khmer people (GD-H-XR-1228, AI-C-KS-PC-0420). Loans were also given to students to improve the education and employment opportunities of young people (AI-H-XT-1221, HI-XR-S197-0312). Livestock farming, shrimp production and house construction were also supported with special loan schemes (HI-S-LS-S131, HI-S-BN-L131).

In total, around 70 % of all households reported that there was a governmental loan scheme in their

[154] There are no significant differences in terms of the education level, between poor and not-poor, and between Kinh and Khmer households. This mainly relates to the small total number of participants.
[155] At an average exchange rate of 2012.
[156] At an average exchange rate of 2012.
[157] At an average exchange rate of 2012.

hamlet (see section 5.2.4) and more than 35 % of all interviewed households said that they received a loan from such a program. These loans most commonly seemed to be received by crop-producing households, particularly in Ngoc Bien commune (see Figure 7.9). In the survey, there were on average more poor (41 %) than not-poor households (35 %) receiving loans from governmental programs. There was no major difference between Kinh and Khmer households, though. By far the largest loans were given to aquaculture producers (average of 58 million VND – around 2,300 Euro; sugarcane producers received only 12 million VND – around 470 Euro; and rice producers only 14 million VND – around 550 Euro[158]). Most of the households used the loan to buy fertiliser and other chemicals for production, particularly in the sugarcane-producing areas. In these hamlets, many of the loans were also used for reproduction. Moreover, livestock was bought comparatively often with the borrowed money, especially in the aquaculture and rice-producing hamlets. Only a few invested in land, healthcare or living expenses. The amount of loans given to households did not increase much due to the losses caused by the most recent flood and salinity events, however, according to several authorities (AI-C-NB-0419-MT, AI-C-KS-0420-MN, AI-D-FA-0111).

Overall, access to loans was good and interest rates were comparatively low. For this reason, the governmental loan schemes increased the financial capacity to adapt to water-related hazards for a large number of households in the research area. The capacity to cope could, in comparison, be increased for only a few households (mainly sugarcane producers) as most of the loans were bound to specific investments and were not provided in the case of emergency.

In addition to the previously introduced strategies, several other long-term oriented measures were put into action. However, these strategies were rarely applied and were only indirectly related to flood and salinity risk reduction. The support of cooperatives was among these strategies. In the household survey, around 20% of all interviewees said that the government **supported cooperatives** in the hamlet. This was most commonly the case in Ngoc Bien commune where more than 40% of all households reported that this measure was in place (see Figure 7.8). In this commune, the share of interviewees who were part of a cooperative was also the highest (see Figure 7.9). The support mechanisms were not based on an official regulation of higher level authorities, according to the hamlet leaders in Ngoc Bien commune (AI-H-BC—0210, AI-H-RB-0403, GD-H-SV-1229). The hamlet leader in Ba Cum hamlet, for instance, supported the cooperative informally by arguing for the advantages of cooperatives and distributing information to local farmers. The cooperatives that existed did not focus on joint marketing but targeted common production decisions such as the timing of seeding, the rice variety and the time of harvest. Cooperatives can also strengthen the bargaining power of farmers to raise output prices and obtain higher returns. Given that none of the existing cooperatives focused on joint marketing, these opportunities did not materialise. The common production decisions promoted by the cooperatives in the research area were reportedly meant to reduce the chances of diseases and ease harvesting and seeding.

A reduction in crop failures and production costs due to coordinated production in cooperatives would consequently improve the financial capacity to respond to flooding and salinisation[159].

In Ba Cum, the hamlet leader also reported on plans to build a sample field for high quality rice production on more than 100 ha. There was no further information available at that point in time (AI-H-BC-0210), though. Improved know-how and better technologies could increase productive income and lead to better adapted production. Moreover, the hamlet leader in Ba Cum encouraged rich farmers to support poorer people by making some of their fallow land available to land-poor households for vegetable production (AI-H-BC-0210). In addition, several more formalised poverty

[158] At an average exchange rate of 2012.

[159] The current study did not assess whether the cooperatives achieved a reduction in crop failures and costs. To assess these impacts, a longer-term study which included a higher number of cooperative members would be necessary. This was not possible within the scope of this study.

reduction measures were taken as part of program 167 which supported the construction of houses for poor people, program 268 which aimed to reduce electricity costs for poor households, and program 102 which provided ad hoc food and financial support to poor people (AI-C-NB-PC-0419). Moreover, ethnic minorities, i.e. Khmer people, as well as poor people received free health insurance (AI-C-NB-PC-0419, AI-H-RB-0403).

All these poverty reduction measures aimed to either reduce expenses or increase income, which had a positive effect on the response capacity of the poorest households in the research area.

Government measures in relation to their vulnerability implications – key findings and interpretation

The evaluation along the lines of "theories of change" indicated that household vulnerability was shaped decisively by government-led coping and adaptation processes on site. **Exposure** reducing strategies seemed to be the most formative and prominent strategies in the context of salinity and flood risks. A system of large dikes and sluice gates created areas of higher freshwater availability and lower exposure to flooding and saline intrusion in the long-run. This exposure reduction was, however, partly achieved at the expense of households living outside the dike and was accompanied by an increase in susceptibility and an apparent reduction in response capacity for the people inside the dike.

Susceptibility reduction seemed to have received less attention than exposure reduction. The most effective among these strategies appeared to be the regular dredging of canals. The promotion of crop changes and crop calendars revealed a potential for susceptibility reduction but seemed to have a rather weak impact on local vulnerability patterns.

The majority of government-led strategies aimed to increase the **response capacity** of local households. Only two of the strategies were immediate short-term oriented strategies. The compensation payments received by the salinity affected households achieved an effect on the immediate capacity to cope, even though this effect was only limited in its extent. The immediate knowledge-related effects of flood and salinity warnings had an effect on only few households, in contrast. In terms of more long-term oriented strategies, agricultural training and the provision of loan schemes were the most formative measures in the research area. They reached a large number of households and increased their financial capacity to respond to salinisation and flooding. Vocational training and the support of cooperatives, in contrast, seemed to have reached comparatively few households and had only a limited impact on the financial and knowledge-related response capacity of these households. The poverty reduction measures may have addressed salinity and flood risks only indirectly but they seemed to have a positive impact on the response capacity of the poorest households in the research area and can therefore contribute to more distributional justice.

7.2.4 Perceptions about the efficacy of governmental responses

The previous analysis of inputs, processes, outputs and vulnerability-related impacts revealed "what the responses looked like" but could not indicate how those strategies were subjectively judged by different stakeholders. A more subjective evaluation assessed by a multi-criteria analysis can, however, provide the basis for understanding individuals' goals, priorities and preferences for or against certain strategies. Accordingly, such an evaluation makes it easier to assess the stakeholder-specific acceptance of strategies and enables the identification of potential goal conflicts. Despite the relevance of these aspects in a more comprehensive evaluation of risk-related strategies, a subjective perspective is widely neglected in evaluation research and practice (see section 2.3). The fourth section in the analysis of government-led measures will therefore examine the given response measures from a subjective stakeholder-specific evaluation perspective. Firstly, the most decisive evaluation criteria will be outlined against the background of their relevance for different actor groups. Secondly, the most prevalent government strategies will be depicted according to their perceived quality with regard to each of the evaluation criteria. Thirdly, the individuals' preferences will be analysed in a comparison of the strategies.

Evaluation criteria against the background of their actor-specific relevance

This section will depart with an actor-oriented **identification and weighting of evaluation criteria**. This imparts an understanding of overarching goals and priorities and provides the basis for a subjective multi-criteria analysis. In addition, an analysis of the compatibility and mismatch of goals reveals potential points of cooperation or conflict among different stakeholder groups and can indicate their perception-based origin.

In the research area, some criteria were judged to be decisive across all actor groups and strategies whereas others were rarely mentioned (see Table 7.4 and Figure 7.11). The group discussions and interviews showed that **outcome-oriented criteria** in particular seemed to be decisive for stakeholders. The potential increase in income for households in the research area (sometimes referred to as agricultural productivity[160]) was perceived to be the most crucial outcome-oriented criterion. Besides the income effect, the number of beneficiaries, i.e. the proportion of households who are able to benefit from the implementation of a strategy, was judged to be a key criterion for most of the interviewees. Other outcome-oriented criteria such as food security, environmental impact and better adaptedness to climate change seemed to be of less relevance to the interviewees.

Process-oriented criteria were judged to be of less importance than outcome-oriented ones (see Table 7.4 and Figure 7.11). Among the process-oriented criteria, the participation of the population, farmer implementability and implementation time seemed to be the most relevant criteria to the majority of interviewees. Participation referred to the extent to which the local population was involved in the planning, implementation and evaluation of government-led measures; farmer implementability referred to the ability of farmers to put suggested measures into action or to utilise support in a way which provides long-term benefits to them. The competence, reliability and costs of governmental activities were rarely mentioned and were rated comparatively low if they were mentioned. Competence referred to the planning and implementation of a government measure. Reliability meant that a household could rely on support when needed and/or when certain criteria were fulfilled.

[160] Increase in income and agricultural productivity were often named hand in hand because most people in the research area gain their income from agricultural production which is why an increase in productivity in their opinion also implies an increase in income and vice versa.

Table 7.4: Identification and weighting of evaluation criteria by different stakeholder groups

Research area		All communes (average)		Kim Son commune		Don Xuan commune		Ngoc Bien commune		Tra Cu district		Tra Vinh
Production type				Sugarcane		Aquaculture		Rice		Rice/ Sugarcane		Rice
Stakeholder group		**Hh**	**Gov.**	**Hh**	**Gov.**	**Hh**	**Gov.**	**Hh**	**Gov.**	**OARD**	**FA***	**DARD ****
Evaluation criteria		*Scoring of relevant criteria for decision-making (total of 25 points)*								*Ranking*		
Outcome-oriented	Effect on Hh-Income/ productivity	**8.3**	**6.2**	**9**	**8.8**	**11**	**4**	**5**	**7**	**7.5**	*6*	***2***
	No. of beneficiaries	4.0	4.8	**6**	**7.5**	3	3	3	4	3.8	*5*	***3***
	Food security	0	0	0	0	0	0	0	2	0	0	0
	Environment	0	2.1	0	1.3	0	2	0	3	1.3	*7*	0
	CC-proof	0	0.4	0	1.3	0	0	0	0	0	0	0
Process-oriented	Costs	2.0	2.0	0	0	**6**	4	0	2	**5**	***2***	***1***
	Reliability	1.3	0	1	0	0	0	3	0	0	**1**	0
	Participation	1.0	3.9	0	3.8	0	6	3	2	1.3	**3**	0
	Farmer Implement.	2.3	2.2	7	2.5	0	3	0	1	1.3	*8*	0
	Competence	1.7	0.3	0	0.0	0	0	5	1	0	0	0
	Implementation time	4.3	2.0	2	0	**5**	3	**6**	3	3.8	*4*	0
	Total of given points	25	25	25	25***	25	25	25	25	25***	*Rank*	*Rank*
	Nr of participants	61	31	13	10	33	11	15	10	1	*2*	*2*

Explanation: The table depicts the results from group discussions with households and commune authorities. In three communes (Kim Son, Don Xuan and Ngoc Bien), both stakeholder groups were asked in separate discussions first to list the evaluation criteria which were relevant in their decision-making and secondly to distribute a total of 25 points among these criteria. Bold numbers represent the criteria with the highest scores. * FA= Farmers' Association; ** Irrigation Department of DARD Tra Vinh; *** in these discussions 100 points instead of 25 were distributed which is why 25 points represents 100/4 points

Source: Group discussions with commune authorities and households, authority interviews, M. Schwab (2012)

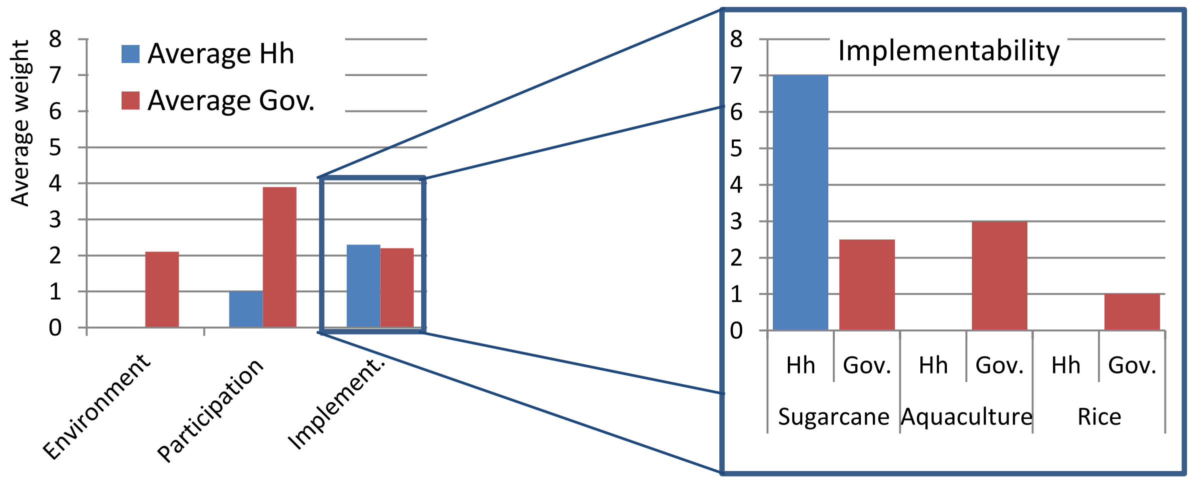
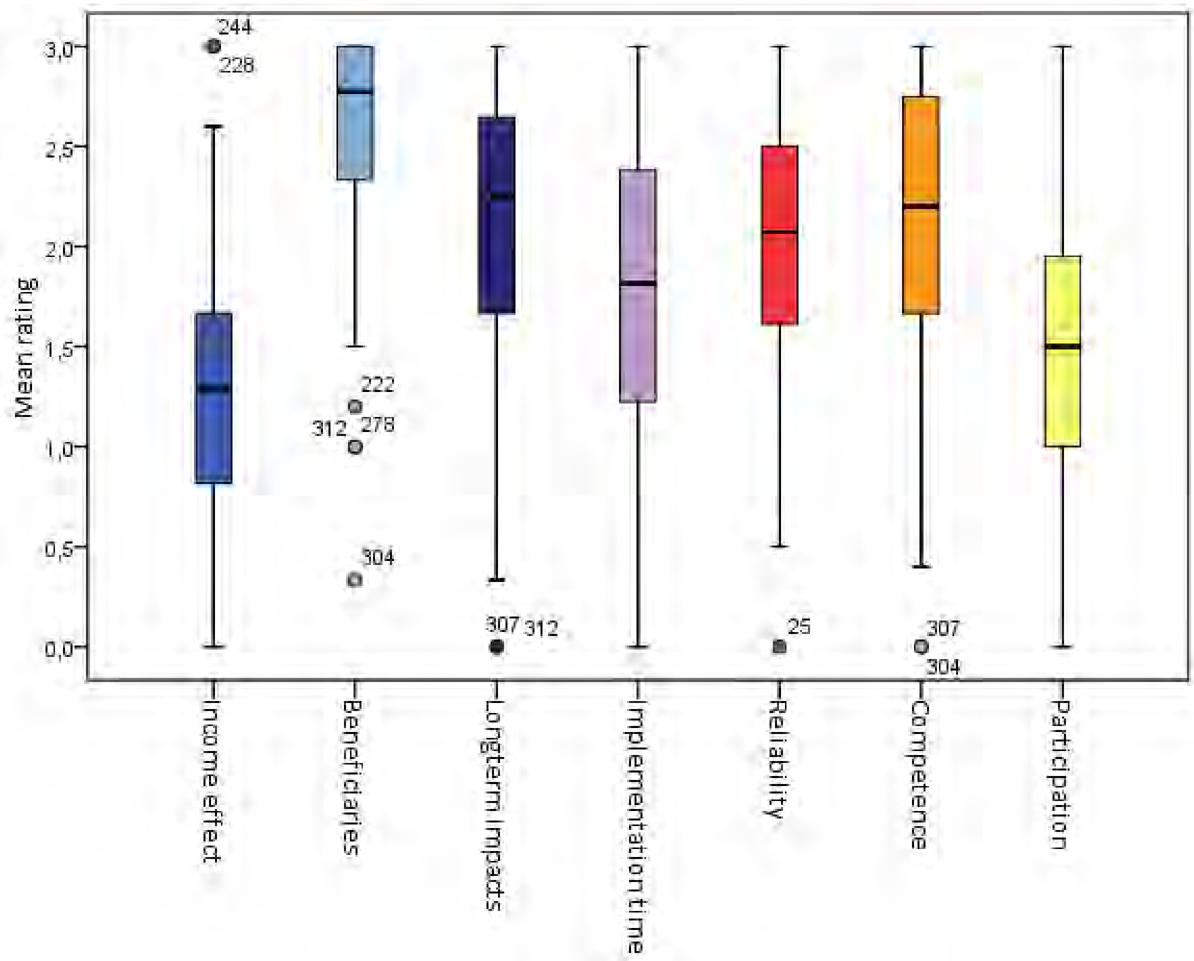


Figure 7.10: Weighting of selected evaluation criteria by different stakeholder groups (Source: Authority interviews, group discussions with commune authorities and households, M. Schwab 2012)

The group discussions and the authority interviews revealed several sometimes **significant differences in the perception of government officials** at the different administrative levels (see Table 7.4). At all levels, the effect on the income of local households was mentioned as the most important or second most important evaluation criterion. Only the staff of the Farmers' Association attached less relevance to this criterion. The proportion of beneficiaries was in nearly all interviews and discussions among the three most important criteria. Officials in Kim Son commune ascribed the highest importance to this goal. Only the staff of the Farmers' Association stated that the number of beneficiaries was not of high priority. Furthermore, the judgement of participation varied between the different authorities. It was most important to commune officials in Don Xuan and third most relevant to officials in Ngoc Bien commune and the FA. The other interviewees did not judge it as decisive in their evaluation of strategies. There was little difference between criteria of low importance such as food security, climate change adaptedness and competence. All these criteria were only mentioned in one discussion/interview and were in these cases of merely minor importance. Climate change proof was only named in Kim Son commune, and food security and competence only in Ngoc Bien commune. Reliability was merely mentioned by staff of the FA. In this case, it was found to be the most important criterion of all, though. The largest disparities in the weighting of evaluation criteria were observed in the judgement of costs. At the communal level costs were of no or only minor importance whereas district- and province-level officials ranked it as the most decisive or second most decisive criterion in the evaluation of a strategy. The commune authorities reported on several occasions that the budget came from a higher level, was bound to a specific measure which had to be implemented according to given conditions, and the money had to be spent anyway (e.g. GD-A-KS-0112, AI-C-NB-1103).

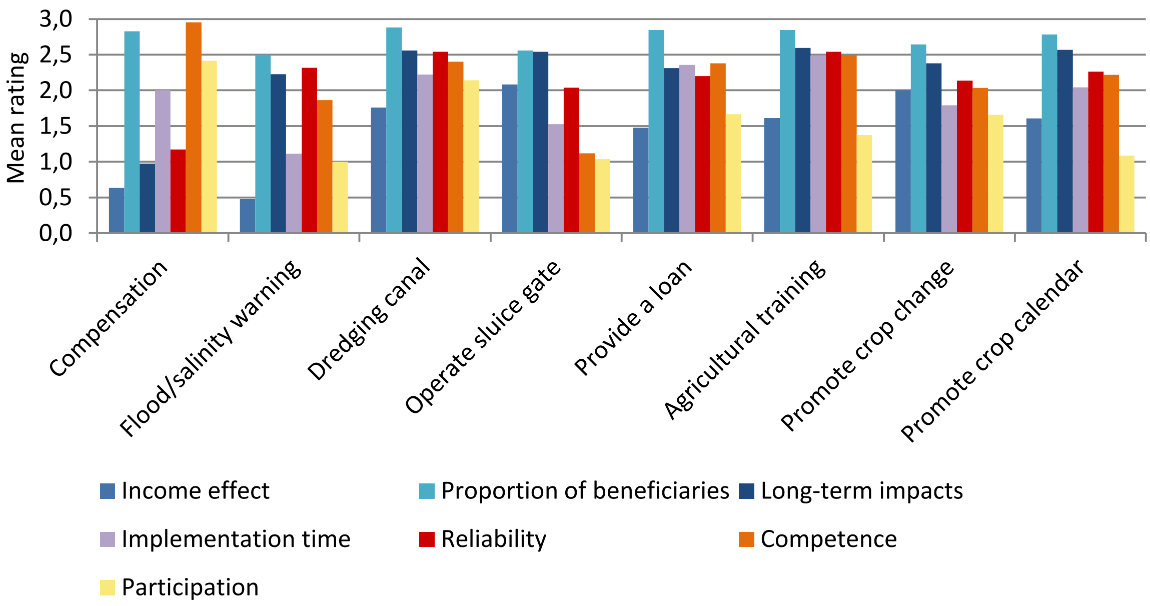
The group discussions and interviews also revealed a sometimes notable **mismatch between the goals of households and the goals of formal actors** (see Table 7.4 and Figure 7.10). Households seemed to ascribe far more importance to the effects on the income situation of the local population than officials did. Environmental protection and climate change proof was not of any relevance to households in the group discussions. The Farmers' Association and the officials in all three communes, in contrast, attached importance to these criteria. Accordingly, the immediate income-related informal goals of households seemed to be opposed by more future-oriented goals from formal governmental actors. The participation of the local population in the planning, implementation and evaluation of governmental measures also seemed to be valued differently. In none of the group discussions with households participation was perceived to be of relevance. It played a role, however, for nearly all interviewed authorities. For officials in Don Xuan commune and for Farmers' Association staff in Tra Cu, it was even among the three most important criteria. Other process-oriented criteria, i.e. reliability, implementation time and competence, were, in contrast, judged to be more important by households than by authorities. Across all criteria, the mismatches between households and the interviewed commune authorities were largest for aquaculture producers in Don Xuan commune. The average difference between the ratings of households and commune authorities was as high as 3.1 points per criterion. The average difference in Ngoc Bien commune was 2.2 and in Kim Son commune 1.95 points, in contrast.



Explanation: Households were asked whether a statement which positively describes the characteristics of respective governmental strategy applies. This was undertaken for a set of process- and outcome-oriented criteria and was judged according to the following rating scale. The statement applies: 0='not at all'; 1=slightly; 2=moderately; 3='much'. Only households who benefited/were affected by the respective measure were asked to rate it. For this reason, the population varies between the different strategies.

Interpretation: The outliers at the upper end of the rating scale (similar to other highly positive ratings) were related to the evaluation of hamlet leaders (each hamlet leader was interviewed using the same questionnaire as households). Most of the hamlet leaders seemed to feel obliged to rate all strategies positively and were reluctant to rate the strategies more negatively. No links were found between the actor groups and the outliers at the lower end of the rating scale. The interquartile range and the median were in the upper half of the rating scale for the judgment of the number of beneficiaries, long-term impacts, reliability and competence. The number of beneficiaries seemed to be judged negatively only in single cases across all strategies. Most of the interviewees appeared to think that the implemented government strategies provided benefits to a large number of households, led to at least a moderate improvement in livelihoods in the long-run, were reliable, and were competently implemented (at least to a moderate degree). The medians of participation and income effects were, in contrast, located in the lower half of the rating scale, i.e. the majority of households thought that the given strategies improved their income situation only slightly to moderately or that they were slightly to moderately involved in the planning, implementation and evaluation of formal measures.

Figure 7.11: Average rating of a given set of evaluation criteria for selected government strategies (Source: Household survey, M. Schwab 2012)



Explanation: Households were asked whether a statement which positively describes the characteristics of respective governmental strategy applies. This was undertaken for a set of process- and outcome-oriented criteria and was judged according to the following rating scale. The statement applies: 0='not at all'; 1=slightly; 2=moderately; 3='very much'. Only households who benefited/were affected by the respective measure were asked to rate it. For this reason, the population varies between the different strategies. The following strategies were not considered due to too small a number of valid responses (n< 20): building a dike, upgrading the dike, vocational training classes and 'other strategies'.

Figure 7.12: Average rating of selected governmental measures according to given evaluation criteria (Source: Household survey, M. Schwab 2012)

The criteria-based **evaluation of governmental measures** in the household survey has also shown to be diverse – with regard to the different strategies applied, the respective criteria and the evaluations of different stakeholder groups[161]. The evaluation was based on a set of relevant criteria. These criteria were selected against the background of their relevance to the households. Based on the results of the group discussion, the survey therefore included the effect on household income, the proportion of beneficiaries, implementation time[162] and reliability. In addition, long-term effects were included. In the interviews and group discussions, long-term impacts on local livelihoods were often implicitly mentioned or were perceived to be part of the income effects. Moreover, in an analysis of coping and adaptation strategies in light of ongoing changes, it was a decisive aspect to be included. Farmer implementability was, in contrast, not integrated because it did not apply to all strategies as a quality criterion (e.g. construction of a dike or dredging the canal). The costs of the government-led strategies were also not included. Households were, in most cases, not aware of the extent of investments required and could therefore not judge the government strategies according to this criterion. In addition to criteria that seemed relevant to households, criteria that appeared to be

[161] The stakeholder-specific evaluation of some strategies will not be considered in the following paragraphs due to too small a number of responses. Upgrading the dike, supporting a cooperative and vocational training classes were rated by fewer than 23 households. Dredging the canal was not considered for aquaculture hamlets (n=1), compensation payments were not considered for sugarcane (n=1) and aquaculture producers (n=0), crop calendar suggestions were not considered for sugarcane households (n=2), building a dike was not considered for rice producers (n=1), the operation of the gate was not considered for aquaculture producers (n=1), and the dredging of the canal was not considered for aquaculture producers (n=1).

[162] Implementation time referred to the time needed from the plan or noticed need to the actual implementation of a strategy, the promptness of a measure (early warning), or the appropriateness of the time spent (training classes).

relevant to the authorities were included in the evaluation, i.e. participation[163] and the impact on the environment. The following paragraphs will assess how the previously introduced government strategies were rated based on each of these evaluation criteria[164] (see Figure 7.11 and Figure 7.12 for a depiction of the overall rating of government strategies and Annex 12.12 for a depiction of the evaluation-based disparities between interviewees with different economic, ethnic and education backgrounds and production type).

Criteria-based evaluation of selected government strategies

The effects of implemented government measures on **household income**, i.e. on the seemingly most important criterion to households in the group discussions, were rarely acknowledged. The given strategies were rated, on average, lower with regard to their income effect than with regard to any other criterion (average rating of 1.2; see Figure 7.11). Early warning and compensation payments for the loss of production were most commonly judged to have only little or no effect on household income (see Figure 7.12). In the case of early warning, this finding indicates that the share of interviewees who received early warning did not think that it significantly inhibited production losses. The low income effect is not surprising with regard to compensation payments. They were not meant to increase income but raise the short-term capability to financially cope with losses. The income effects of infrastructure-related measures (operating the sluice gate and dredging the canal) were, in contrast, often perceived to be high. The interviewees accordingly trusted in the protective function of the dike and the consequential effects on production income. The survey further showed that the evaluation of strategies varied not only between different strategies but also between different actor groups (see Annex 12.12). Khmer rated income on average higher than Kinh households did; and interviewees with a higher formal education level rated it higher than those with a lower education level. Moreover, not-poor interviewees mentioned a positive income effect of public measures more commonly than poorer ones. This was most apparent in the example of building a dike (average rating of 1.38 by not-poor interviewees compared with 0.55 by poor interviewee). Between the different production areas only slight differences were observed. Training classes and promoting the crop calendar were more often judged to raise income in rice-producing hamlets (average rating of 1.93 respectively 1.71) than in aquaculture hamlets (average rating of 1.11 respectively 1.00).

The **number of beneficiaries**, i.e. the proportion of households who were able to benefit from the respective governmental measure, was rated high compared with the income effects of formal strategies (average rating of 2.6; see Figure 7.11). It was more often mentioned among rice producers and Khmer interviewees than among sugarcane and aquaculture producers and Kinh (see Annex 12.12). All interviewees in the rice producing hamlets agreed, for instance, that loans bring benefits to a large proportion of households in the hamlet whereas there was a notable number of aquaculture producers who did not think so (average rating of 3.0 compared with 2.4; see Figure 7.12). This coincides with the fact that the share of households who reported a loan scheme in the hamlet and the share who received a loan from such a scheme were highest in the rice-producing areas. Overall, merely the operation of the sluice gate and the flood and salinity warnings were less commonly judged to bring benefits to many people, i.e. strategies which had a predominantly negative impact (sluice gate operation) or had no notable impact on production (warning alerts). Flood and salinity warnings were rated, on average, higher among rice producers (average rating of 2.7) than among sugarcane and aquaculture producers (average rating of 2.17 respectively 2.22). This reflects the fact that the proportion of households who said that a warning alert was issued was highest in the rice-producing area.

[163] Public involvement in the evaluation was not included in the survey as most of the government strategies were not evaluated anyway.
[164] See the questionnaire in Annex 12.5.4 for more details about how the criteria were described for each strategy.

The **long-term impacts** of the implemented strategies were also rated comparatively high (average rating of 2.1; see Figure 7.11). Khmer mentioned positive long-term effects more often than Kinh and crop-producing households more commonly than aquaculture producers (see Annex 12.12). The long-term benefits of governmental loan schemes revealed the most notable differences. They were rated on average higher in rice than in sugarcane and aquaculture hamlets (average rating of 2.6 compared with 2.2 respectively 1.6); i.e. in aquaculture hamlets where loans were the largest and the most long-term-oriented, households seemed to think that the loans did not bring benefits in the long-run. The long-term benefits of compensation payments were, in contrast to most other strategies, only rarely mentioned. This coincides with the intended short-term orientation of this strategy. For all other strategies the long-term impact was rated similarly high (on average between 2 and 2.5; see Figure 7.12).

Participation of the population was rated relatively low compared with the long-term impacts of government measures and the proportion of beneficiaries (average rating of 1.6; see Figure 7.11). Kinh interviewees felt the least involved in public decision-making (see Annex 12.12). Participation was rated highest in the case of compensation payments and dredging the canal. In the case of dredging the canal this perception confirmed the officially stated involvement of affected farmers in the forefront of dredging a canal. In the formal regulation about the compensation payments participation was, in contrast, not explicitly mentioned. Despite the lack of formal requirements, households felt involved in decision-making. This was often related to the fact that households communicated their losses directly to the hamlet leader and were, in several cases, in a mutual exchange with him since then. The promotion of the crop calendar and particularly the operation of sluice gates were, in contrast, rated low. The decision-making for both strategies was received from the district level without the local population being involved at any point in time. This was most apparent with the example of the sluice gate operation, where, for a long time, households did not even know whether and/or which decisions were taken with regard to the operation.

The **competence** in planning and implementing of governmental strategies was judged comparatively positive (average rating of 2.1; see Figure 7.11). The average judgement across the selected governmental strategies was similarly high among groups of different ethnicity, education, production types and poverty classification. The disparities were also relatively small between the different strategies, i.e. the majority of households seemed to trust in the competent implementation of the prevalent strategies. Only the sluice gate operation was judged to lack competence by a large number of households (see Figure 7.12); especially rice producers thought so (average rating of 0.9). This reflects the large losses in rice production in 2011 which, according to the majority of households, were caused by inadequate operation of the sluice gates. The promotion of crop/variety changes were, in contrast, judged to be more competently planned and implemented in rice-producing hamlets than in the other production areas (average rating of 2.3 compared with 1.57 in aquaculture hamlets). Based on the previously outlined findings, many aquaculture and sugarcane producers accordingly introduced a new variety although they did not trust in the quality of the recommendation. This was related to the fact that households often merely followed the decision of other farmers or simply reacted to the government supply system. The competence with regard to flood/salinity warnings was rated highest in the sugarcane areas (on average 2.7 compared with 1.7 in the other areas). This indicates that there may have been only a few households that received flood warning alerts in the sugarcane areas but the households which received it found that the information provided was reliable and helpful. In the rice-producing areas, a comparatively large number of households received the warnings but it was in most cases too late and/or the coping recommendations did not prevent a loss of harvest.

Reliability was judged to be as positive as the competence of the implemented government strategies (average rating of 2.1; see Figure 7.11). It was rated lowest in the case of compensation payments (average rating of 1.1). This indicates that households were aware of the official statement that compensation payments would not be paid again for crop failures in the winter-spring rice season. Dredging the canal and agricultural training classes were, in contrast, often found to be reliable (average rating of 2.5). These were the strategies which were most commonly and regularly applied in the research areas. Differences were also observed between the actor groups. Loan schemes and flood/salinity warning were perceived to be more reliable in rice-producing than in the other hamlets (average rating of 2.4 respectively 2.5). In this case, the perceptions also reflected the more regular nature of these measures in rice-producing compared with other areas. Overall, Kinh found that the implemented government measures were more reliable than Khmer, interviewees with a low education more than those with a higher level of education, and crop-producing farmers more than aquaculture producers (see Annex 12.12).

The required **time** for the implementation of government strategies or the timing were judged more negatively (average rating of 1.8; see Figure 7.11). Early warnings in particular were perceived as not having arrived early enough. This was most commonly mentioned in rice producing areas (average rating of 1.0 compared with 2.0 by sugarcane producers) where the large majority of the households were not able to respond rapidly and effectively to salinity intrusion. The dredging of the canal and the provision of loans was, in contrast, perceived to have arrived shortly after the need was noticed. The dredging of the canal therefore seemed to be not only regular in nature but also conducted when necessary. The perceived timeliness of receiving a governmental loan reflects the reportedly uncomplicated procedures for obtaining a loan. The time to receive a loan was most often judged to be short among poor interviewees (average rating of 2.6 compared with 2.1 among not-poor interviewees) and among households with a higher education (on average 2.5 compared with 2.0 among households with a lower education level). Poor households had better and easier access to loans whereas interviewees with a higher education level seemed to be better able to acquaint themselves with formal procedures. Moreover, agricultural training classes were commonly perceived to take an appropriate amount of time, i.e. they were neither lengthy nor too short. Across all strategies, time was judged more positively the higher the education level, and less positively in aquaculture hamlets than in the other production areas (see Annex 12.12).

Overall quality judgement and comparison of different government measures

The perceived qualities of government-led strategies and the acknowledgement of their relevance in the context of salinity and flood-related risks indicate **preferences for or against certain measures**. In a pairwise comparison of five relevant government strategies which was conducted in the household survey, a strong preference for protective and productive infrastructure became apparent (see Figure 7.13). The large majority of households decided that they preferred measures related to the protective infrastructure over all the other suggested government measures. The upgrading of the dike was most often preferred over other strategies by sugarcane producers. This reflected, on the one hand, the need for a more regular upgrading which was not undertaken so far and showed, on the other hand, that the interviewees assumed that this upgrading would bring more benefits to them than most other strategies. The operation of the sluice gate seemed to be most important in the rice-producing hamlets. The interviewees there preferred on average an adequate sluice gate operation over all other strategies. This was largely due to the fact that most households made the sluice gate operation responsible for being affected by saline intrusion. It was one of the strategies which were judged most negatively with regard to several aspects, most notably participation and competence.

Besides infrastructural measures, loans were commonly preferred over other strategies. Loans were of most importance to aquaculture producers. In the criteria-based evaluation, governmental loan schemes were, however, judged the most negatively in those areas compared with the other production areas, i.e. aquaculture producers attached the greatest importance to loans but were the least content with the implementation of the respective loan schemes. Moreover, poor households attached higher relevance to loans than not-poor households. In the criteria-based evaluation, they were on average more convinced about the quality of implementation and planning. The outcomes of loans were, in contrast, more commonly judged positive by not-poor households.

Educational measures increasing the capacity of response were rarely chosen in comparison with other strategies. The large majority of households preferred agricultural training classes only over vocational classes and vocational classes were, on average, not preferred over any other strategy. The lack of appreciation for vocational classes coincides with the fact that most of the households were not able to make use of the acquired know-how and did not think that it would have income effects or long-term impacts on the training participants. Agricultural training classes, in contrast, changed the production behaviour of the large majority of participants and they were acknowledged for their positive long-term impact. Nevertheless, compared with infrastructural measures and with the provision of loans, those advantages seemed to diminish in relative value.

Figure 7.13: Pairwise comparison of selected governmental measures

	Agricultural training classes	Vocational training classes	Loan for production	Upgrade the dike
Vocational training classes	**223** 89			
Loan for production	115 **197**	99 **213**		
Upgrade the dike	93 **218**	65 **247**	128 **183**	
Operation of sluice gate	91 **220**	81 **231**	127 **183**	**172** 136

Explanation: The interviewees in the survey were asked “Which [out of the given two] option would you prefer in order to be better adapted to salinity in future if you had the choice?”. The numbers in the cells depict the total number of households who decided for the respective strategy. The bold and underlined numbers represent the most commonly preferred strategy. The total population is 312.

Source: Household survey, M. Schwab (2012)

7.3 Evaluating formal and informal strategies – key findings and interpretation

The previous subchapter addressed two central components of an anatomy of adaptation and coping, i.e. “what does the response look like?” and “how good is the response?”. These questions were addressed for both household- and government-led strategies.

The household-led strategies were most commonly short-term-oriented responses to past hazards and only a few measures were long-term oriented adaptation strategies to future hazards. Risk-specific strategies were also only rarely applied, particularly among salinity-affected households. The large majority of interviewees reported having applied more general risk-related strategies than flood-/salinity-specific strategies. An evaluation along the lines of “theories of change” revealed that exposure reduction was rarely addressed by local households. Merely selling land changed exposure patterns in some areas and this alienation of property was a strategy which was, so far, put into practice by only a few households in the context of flooding/salinity. Strategies which intended to reduce the susceptibility of households were more commonly applied. Those responses often had a merely limited impact, however. Only the maintenance of protective infrastructure and crop changes seemed to have had a notable vulnerability-related effect on a larger number of households. The majority of strategies were applied to raise the capacity of response. Increasing the short-term availability of financial capital (i.e. taking a loan and buying on credit) may have been the most prominent response but it reduced rather than raised the response capacity in the long-run. Measures which intended to increase the capital endowment (e.g. migration and off-farm employment on site) were, in contrast, more effective with regard to raising the response capacity in the short- and long-run.

At the governmental level, a diverse hierarchically organised network shared the responsibilities with regard to flood-/salinity risks. Formally, Vietnam is a centrally planned state where the majority of regulations arrived from the respective higher level. This had also been the case in the research area. Households, however, seemed to judge the officials on the local level as most decisive actors for dealing with flooding and saline intrusion, most notably the hamlet leaders. In contrast to the household level, most of the strategies which were put into action by the different state actors were long-term oriented strategies. Immediate response measures to increase the short-term capacity to cope were rarely applied, particularly in the flood-affected hamlets. Climate-change related measures were merely implemented on the province level.

The “theory-of-change”-based evaluation of those measures revealed that exposure-reducing strategies were the most influential measures in the context of flooding and saline intrusion. This was also reflected in the strong preference for protective and productive infrastructure among households and among government officials. The system of dikes and sluice gates protected a large number of people in the areas inside the dike but at the same time seemed to increase the susceptibility and response capacity of many households. These negative implications were also reflected in the subjective criteria-based evaluations. The operation of the sluice gates was, for instance, among the most negatively judged strategies, particularly with regard to process-oriented criteria. Strategies that aimed to reduce the susceptibility of households were less prominently addressed than exposure-reducing strategies. Some of these measures, i.e. the promotion of crop changes and crop calendars, also had merely a limited vulnerability-related impact. Dredging the canal seemed to be comparatively effective in this respect and it was judged to be more positive than most other strategies applied in the research context. The majority of governmental measures intended to increase the capacity of response. The short-term oriented strategies (i.e. compensation payments and flood-/salinity-warning) seemed to have merely an immediate effect on the capacity to cope, if any. Moreover, these strategies were judged to be comparatively negative, most notably with regard to outcome-oriented criteria. Agricultural training and public loan schemes were the most commonly applied long-term oriented strategies. These strategies were judged more positive than the other strategies. Nevertheless, the pairwise comparison showed that infrastructural measures were on average found to be more decisive than these measures.

In conclusion, the previous chapter provided answers to the central research question “How are coping and adaptation processes on site interrelated with differential vulnerabilities to water-related hazards” and “how are different strategies evaluated?” (see Figure 7.1). In combination with an understanding of the overall social-ecological risk context (see chapter 5) and the decision-making processes on site (see chapter 6), many decisive answers to the overall research question “how and why rural stakeholders in the Vietnamese Mekong Delta cope with and adapt to changing water-related risks in a beneficial way” have so far been provided. One of the central components of this overarching research question, however, still remains open, i.e. the question “What are the barriers of and limits to “good” adaptation and coping and how can they be identified and overcome?”. This question will be addressed in chapter 9. Answering this last question and imparting a more concise understanding of the answers to the previously addressed questions requires a summary, interpretation and discussion of the key findings. This will be the content of the following chapter 8.

8 Distinct nature and diverse values of risk-related strategies - Summary, interpretation and discussion of the empirical findings

The study builds on the conceptual argumentation that the distinct nature and diverse values of risk-related strategies are determined by *revealed* and *perceived* realities. The analysis of these realities encompasses the risk context (described in section 8.1) and the nature and quality of risk-related strategies (outlined in section 8.2). An integrative understanding of these aspects provides the basis for indentifying the barriers and opportunities to strengthen “good” adaptation and coping. To draw relevant and concise theoretical and methodological conclusions, contextualise the findings, and delineate recommendations for action (undertaken in chapter 9 and 10), it is in the first instance necessary to summarise, interpret and discuss the findings against the background of the concepts, regional context and methodology presented in part I. The following chapter will therefore, firstly, describe the implications of revealed risks and the perceived realities in the research area and will, secondly, characterise coping and adaptation options and compare them against the background of different evaluation approaches.

8.1 Revealed and perceived risks in the research area and in the wider context

Based on the review of a wide body of literature and preliminary conclusions drawn during field research, it has been argued that revealed risks and perceived realities are not only complex but also dynamic in their interaction with risk-related strategies (see chapter 2). They determine the motivation and capability to act, the nature of the actions, and the quality of coping and adaptation. The perceived and revealed risks are thereby essential prerequisite for answering how and why stakeholders respond to risks in a beneficial way (i.e. the central research question). The empirical chapters 5 and 6 presented empirical evidence depicting the revealed risks, perceived realities and their implications for coping and adaptation on site. Finding out whether and how far these findings reflect the existing literature and which region-specific insights and additional information could be acquired, requires a concise presentation and interpretation of the data, though. In the following sections, the empirically most relevant results will therefore be summarised and reflected against the background of ongoing debates on social-ecological risks and individual decision-making both conceptually and in the Mekong Delta context.

8.1.1 Revealed threats against the background of the conceptual and region-specific literature

The discussion of vulnerability concepts led to the assumption that threats are represented by the function of hazard, exposure and susceptibility (see section 2.1 and 2.2). This term has been identified as central conceptual element for answering how and why people respond to changing water-related risks in a beneficial way. It has been argued that an analysis of revealed threats can indicate why certain action should be taken and how relevant and appropriate they are in the given risk context (see section 2.4.2). Section 5.2 thus presented empirical primary data along the lines of these concepts. The following section will summarise and interpret these findings against the background of previous research and single out new insights.

Being a coastal area in the Vietnamese Mekong Delta, tidal flooding and salinisation were the most threatening **natural hazards** for the local population (see sections 3.2.1 and 5.1). Official hydro-meteorological records show that those hazards underlay significant fluctuations in the recent past, similar to most other regions in the Mekong Delta. Extreme flood events occurred in 2011 and extreme salinity events in 2010. Climate change is predicted to enhance these hazards and continuously increase pressure on the social-ecological system. Sea level rise (SLR) appears to play a significant role in this regard. Being a low-lying delta region, SLR is expected to submerge large parts of the region (MONRE 2012; see sections 3.1.1, 3.2.3 and 5.1). Such predictions and scenarios have to be treated cautiously, however. They were in most cases not transparent with regard to their source and were often developed independently from the socio-economic scenarios (see section 4.6).

Exposure to salinisation and flooding was, on the one hand, linked to spatial aspects of natural geography, i.e. elevation and the proximity to the sea. On the other hand, it had been, as with most areas in the hydraulic landscape of the VMD, substantially shaped by large salinity and flood control projects (Käkönen 2008; see section 3.1.2). This illustrates the dynamic coupling processes between the social and the ecological system as described in the conceptual discussion of Social-Ecological System theory (see vulnerability framework based on Turner et al. 2003 in section 2.4.2). After manifold human interventions in the ecological system, it was the location in relation to the dike and proximity to the canals which were the most dominant factors shaping exposure patterns in the research area. In consequence, people inside the dike had been widely protected from saline intrusion and flooding (see section 5.2.2). The exposure-shaping factors were, however, contrary to the findings of several vulnerability assessments in the Mekong Delta (Vo Van Tuan 2013; Nguyen Thanh Binh 2010; see section 3.3.1), not significantly determined by socio-economic or cultural characteristics (see section 5.2.2).

The empirical findings also confirmed that **susceptibility** is shaped by the dynamic interplay between ecological and social factors inside the place (see modified framework based on Turner et al. 2003 in section 2.4.2 and empirical analysis in section 5.2.3). Agronomic indicators related to crop sensitivity and cropping schedules appeared to be the most essential determinants in this regard. The production of winter-spring rice in the dry season made households most susceptible to salinisation. Despite the high salinity exposure of coastal regions in this season, the production of winter spring rice has steadily increased in the coastal provinces of the Vietnamese Mekong Delta (Miller 2003; see section 3.1.3). In the research area, most of the farmers inside the dike started growing this third rice crop only in 2010, i.e. later than in other coastal regions (see section 5.2.3). It mainly seemed to be a result of the centrally planned hydraulic developments and the continuous intensification of rice production (see section 3.1.2). Accordingly, the change in production made many households highly susceptible to salinisation in comparison with the more salinity-exposed households outside the dike where many households produced less saline-sensitive commodities (mainly sugarcane). The empirical data also reveal that susceptibility was shaped, as conceptually defined (see section 2.4.2), by the diversity of the capital endowment. One would think that the diversification policies since the 2000s had diminished susceptibility (Ngo Thi Phuong Lan 2011; Garschagen et al. 2012; see section 3.1.2). However, these policies brought apparently no major diversification of individual livelihoods - in both the areas outside and inside the dike (see section 5.2.3). At a regional level, the land use plan promoted different cropping systems; on a more local scale the production structures were, in contrast, still monotonous[165].

[165] The diversity in income sources is slightly larger though, especially in the rice production area. Overall, there have been only few smaller differences found with regard to the susceptibility of different socio-economic groups (see section 5.2.3).

8.1.2 Perceived threats in light of revealed threats and the wider context

The conceptual discussion has further shown that it is not the *revealed* threat but the individually *perceived* threat which determines why and how actions are taken (Grothmann, Reusswig 2006; Krömker, Mosler 2002; see section 2.4.3), i.e. central aspects for answering the overall research question. Based on this argumentation, section 6.1 therefore described the empirical data basis with regard to the individual threat appraisal patterns. In how far these data backed the assumptions made in secondary literature and which additional implications could be withdrawn, will be discussed in the following section. Moreover, the direct comparison with *revealed* threats allows putting *perceived* threats into relation and facilitates identifying potential mismatches and biases.

The assumption made in the conceptual discussion that the perceived hazard exposure and the perceived susceptibility are decisively influenced by a lack of **risk experience** was confirmed by the findings of this study (Grothmann, Patt 2005; see sections 2.2 and 2.4.3). In contrast to other empirical works, also in the Mekong Delta context (see e.g. Le Thanh Sang), it seemed to be even the most decisive driver of threat appraisal. The largest differences in terms of threat perception were found among households with other production types. The empirical data show, in this respect, that there was a substantial mismatch between perceived hazards and officially recorded hazard characteristics in the rice-producing hamlets while in the aquaculture and sugarcane hamlets households had a comparatively “data reflecting” view of threats (see sections 5.1 and 6.1.1). This also held true for the perceived susceptibility (particularly with regard to crop sensitivity). Given that in both sugarcane and rice producing hamlets, flooding and saline intrusion did not play a role in training classes or any other awareness-raising programs, the level of risk experiences seemed to be the main determinant in the individual appraisal of threats. The perception-based mismatches and biases can therefore mainly be explained by the fact that households in the rice producing areas did not have to deal with saline intrusion ever before whereas flood affected households had to deal with it regularly.

Social discourses have also been shown to be decisive factors in the individual threat appraisal, most notably the frequent exchange within the community and high level of reliance on the experiences of other farmers. They seemed to have reduced the feeling of being exposed to saline intrusion for most of the households in the rice producing area, both before and after they were affected by salinisation (see section 6.1). The empirical findings thereby indicate that the interaction within the community-based network played a crucial, if not even the most important, role in social discourses - making it a pertinent but often neglected topic for both the conceptual and empirical debate in the Vietnamese context. Hoa Le Dang et al. (2014) confirm this finding. In their study about risk perception in the Mekong Delta, it has also been shown that communication with friends, family and neighbours influenced farmers’ risk appraisal the most. In contrast with larger-scale and/or more physically visible disasters, such as the riverine floods in the Northern provinces, the media was not the main channel of “risk amplification” (Kasperson et al. 2005: 15). This contradicts Le Thanh Sang’s (2010) finding that the TV is the most influential determinant of risk perception. In the case of creeping disasters which cannot be directly observed (salinity in the channels is not visible) and/or which have a lower immediate impact (tidal flooding), the main drivers of risk amplification/attenuation seem to be informal social interaction between households in the same hamlet or between households and the local government rather than media attention.

In addition to social discourses and individuals’ risk experiences, the literature review suggests that **reliance on other actors** plays an important role in the individual appraisal of threat (Grothmann, Patt 2005; see section 2.4.1). The empirical findings approve this assumption. They show that reliance on state actors was of particular importance in the research area (see sections 6.1.1). Being present, visible and accessible to the people, the local government seemed to be an important actor on which people relied (see sections 6.2 and 6.3). In the group discussions and in interviews with households the sentence “all other strategies are the responsibility of the government; we cannot do more than that" (HI-S-RB-L24-0305) was a common end to the question for potential coping and adaptation options at the household level. Households thought that the government should provide financial means in times of crisis and that the public protective infrastructure and its operation were the only real long-term measures to adapt to flooding and salinity. In the region inside the dike, a strong faith in protective infrastructure seemed to have conveyed a feeling of safety among the farmers. The people outside the dike were, in contrast, rarely lulled into a sense of security. The government was, however, often not the only actor people relied on. Also the reliance on other households played a role in this context. This is an aspect often neglected in socio-cognitive models of decision-making (see sections 2.2 and 2.4.3). In the sugarcane-producing hamlets some households reported, for instance, that they relied on other households preparing the communal embankment. Reportedly, several households did not feel the compulsion to help repairing because the other households had to repair the dike anyhow. This is a prototypical example of a free rider problem. Nevertheless, such empirical evidence of moral hazard situations was comparatively rare – making it no less empirically and conceptually relevant for a more in-depth case study, however; particularly when considering the rapidly changing social and ecological system.

The disparities in the threat appraisal provided differential **motivation to take action** (see sections 6.1 and 6.3), as assumed in socio-cognitive models of adaptation decision-making (Grothmann, Patt 2005; Rogers 1975; see sections 2.2.2 and 2.4.3). In the flood-affected hamlets, the perception of a high probability and the awareness about one's own susceptibility fuelled the motivation to take adaptation measures such as the exposure reducing activity of building individual embankments around the fields/ponds. In addition, the cultivated products there, i.e. shrimp and sugarcane, were more adapted to saline conditions. In contrast, salinisation was not perceived to be a major threat in the areas inside the dike, at least not before 2011. Besides a focus on maintenance works to "keep the Delta machine running" (Biggs 2006) in terms of governmental input, adaptation to salinisation had therefore been lowercased for years. The motivation to adapt to water-related threats was accordingly not very high - at least to the threats which were described in the vulnerability assessments (see sections 5.2.2 and 5.2.3). This does not mean that farmers did not want to adapt at all, though; they had the motivation to adapt to the *perceived* and not the *recorded* hydro-meteorological situation. The motivation to introduce a third season of rice during the time of highest salinity exposure was based on what they heard from other people and not on what the data suggested, i.e. it was a response to better and not worse water availability. This shows not only the relevance of addressing the individuals' perception but also reveals why it is of importance to account for perceived opportunities and not only for perceived threats. Nevertheless, this is rarely the case in the decision-making literature (see section 2.2). Adaptation to risks that were not experienced before were not observed. The large majority of interviewees mentioned the same future risks as the ones which were experienced in the past. The only exception was health-related risks. Some households told that they expect to have problems with regard to their health in the future which they did not have at that time. Natural hazards like taifuns were not mentioned to be a risk, neither today nor in the future.

The empirical results also point out how the **perception of threat can change over time** (see sections 5.2.2 and 5.2.3) - an aspect of central importance which nevertheless has rarely or never been explicitly addressed in the literature on socio-cognitive models of decision-making (see sections 2.2.2 and 2.4.3). These changes seemed to be at the same time substantial in their extent and transient in their nature. This becomes particularly apparent in the example of the perceived threat of salinisation. The strong sense of security seemed to be widely lost in the year 2011 – all within only one season. In that year, people experienced, for the first time, substantial losses due to salinisation. In particular, trust in other agents' actions was substantially disturbed, most notably in the protective infrastructure and the operation of the sluice gates. The perception of the threat also increased because nearly all households had lost all their production. This conveyed a feeling of being highly susceptible. This feeling was most likely even higher than the actual susceptibility because people did not have any reference point other than the year 2011. As is also described in the theoretical literature (e.g. Rohrmann, Renn 2000; Zinn, Taylor-Gooby 2006, see sections 2.2.2 and 2.4.3), the cognitive bias seemed to have resulted from the fact that the severity of the event found greater attention in social discourses than tidal flooding (despite an expectedly lower probability of severe saline intrusion). In the political debate, this attention led to compensation payments, a coping measure which had never been discussed for flood-affected households. The immense feeling of threat stopped people from growing winter-spring rice in 2011/2012. Surprisingly, the feeling of unprotectedness seemed to have faded away as soon as it came. When the news of governmental sluice gate control mechanisms spread, the feeling of being protected also returned, i.e. the reliance on other agents' actions was strengthened and one's own feeling of security rose again. This reinforced the will of most people to grow winter-spring rice again - already in 2012/2013 (see section 6.3).

In conclusion, the previous section found some answers to central questions in the research context. It highlighted the fact that the geographic location of the production area and agro-economic indicators determined vulnerability decisively. The section also pointed out that the revealed threats were often significantly different from the perceived threats. This seemed to be mainly related to risk experiences, social discourses among villagers and reliance on other actors (particularly on the government). It was also indicated that perception differs not only between different stakeholders but also on a temporal scale.

Nevertheless, the mere analysis of revealed and perceived threats is, according to the conceptual discussion (see section 2.4), not sufficient to understand which strategies *could* and which *were intended* to be taken. It is therefore important to address the capacity of response. In this respect, an analysis of the revealed capacity of response shows how different stakeholders *could* adapt or cope with water-related hazards whereas the examination of the perceived competence reveals how people *thought that they can* respond. The perceived and revealed capacities and the specific determinants will accordingly be summarised and interpreted in the following sections.

8.1.3 Revealed capacities of response in the research area, the Mekong Delta and the wider context

The empirical findings presented in section 5.2.4 described the *revealed* capacities of response and provided thereby a solid basis for finding out how people could deal with water-related risks. In order to better understand the general drivers of revealed capacities and to put the findings in the wider regional and conceptual context, the following section will summarise the key points and interpret them against the background of the existing literature.

The empirical findings confirm the conceptual assumption that the **capacity of response is shaped by a multitude of social-ecological characteristics**, especially by wealth in terms of livelihood assets (see sections 2.4.2. and 5.2.4). Historically, economic liberalisation and agricultural modernisation have brought about a substantial increase in productivity, a significant reduction in poverty, and continuously improving living standards in the whole Mekong Delta as well as in the research area (Garschagen et al. 2012; see section 3.1). For many farmers in the region, this seemed to have resulted in a better capacity to respond to salinisation and flooding (see section 5.2.4)[166]. At present, many households had the financial capital to implement a better protective infrastructure, they possessed the freedom and property rights to change the production type, and they had access to loans and other assets to secure their livelihoods even in times of crisis. Of particular importance is the access to land. Like previous studies in the VMD (e.g. Vo Van Tuan 2013, Le Coq, Trebuil 2005; see section 3.3.1), this research reveals that land was the basis for generating a livelihood, it served as

[166] An in-depth analysis of the historical developments in the light of socialist transformations has not been undertaken in the present research context, though.

collateral, and it could be alienated in cases of hardship. In addition to gains from the capitalist transformation, Vietnam is still a socialist system geared towards the provision of equal access to, for instance, formal education and specific training classes. This further strengthened the capacity to respond to natural hazards, also in the research area.

Nevertheless, this **socialist paradigm of equality is in many ways afflicted with the open-market system** (see section 5.2.4), as also indicated in other studies undertaken in the context of the Vietnamese Mekong Delta (e.g. Käkönen 2008; Le Coq, Trebuil 2005; Shank et al. 2004; see section 3.1.4). Poor and landless farmers opposed by a small number of well-off farmers represented the social divide which results from these conflicts. A capitalist spiral driven by a more and more resource-dependent agriculture prone to unpredictable market risks in combination with the inflexibility of socialist planning structures had fuelled the disparities. Moreover, it had made farming an often precarious business where the state determined what to do while the farmer had to bear the risks of doing so (see also section 7.2.1). This was most obvious in the aquaculture region. Here, only farmers who had sufficient financial means were able to grasp the opportunities of shrimp farming as promoted in the vein of diversification policies (see section 3.1.2). The others had no or few alternatives left to sustain a living, mainly due to rigid planning and inflexible infrastructure measures. Those who were able to implement shrimp farming were often not able to absorb the losses in the event of production failure. Farmers were therefore more indebted than in the other research areas and many had already lost their land. Even the ones who had been successful were at risk of losing their land; not because of entrepreneurial failures but because planning found them to be in the region where an industrial zone was planned to be constructed within the following years. Similar aspects also held true for the other regions of the research area and seem to represent common challenges all over the Mekong Delta (see section 3.1.4).

Land use planning, as described above, is also an illustrative example for how **socio-economic developments seemingly outweighed the effects of climate change** on household vulnerability (see sections 5.2.2, 5.2.3 and 5.2.4). The planned industrial zone will most likely provide many non-agricultural employment opportunities and the resettlement might diminish the number of households living in a highly flood/salinity exposed area (although it is not clear whether they will be resettled to another highly exposed zone nearby). These socio-economic developments will, accordingly, change the vulnerability patterns substantially. Climate change, as predicted in the medium emission scenario for the end of the century, might have a lesser effect on vulnerability patterns. Even if tidal flood and salinity levels increase, the region might be less vulnerable than today due to socio-economic changes. It is very likely that the predicted economic developments will lead to fewer households living in the exposed areas, less agricultural production susceptible to salinity/flooding, and a higher capacity to deal with the hazard impacts.

The example of the sluice gate operation also depicts a situation where social drivers can outweigh natural processes. In 2011, the year when households suffered the most from salinisation, it was actually not a year of high salinity levels because of a severe lack of local rainfall, a lack of water from upstream or particularly strong winds from the sea (as suggested in the literature review in section 3.1.1) but it seemed to have been a mere failure of the sluice gate operations. Had they not been opened with inappropriate timing, salinisation would not have hit the region so adversely. One could therefore assume that it is not the hydrological and climatic circumstances or the hydropower developments in upstream riparians which count but the quality of sluice gate management. There is a wide range of literature in the Vietnamese context which also holds the opinion that socio-economic transformation is the most essential driver of vulnerability (see e.g. Adger 1996; section 3.3.1). Nevertheless, taking scenarios of a sea level rise of one metre or even more might change the picture substantially (MONRE 2012; see section 3.2.2). In such scenarios dikes might not be able to protect the area any more, the industrial zone might not be held up in a totally submerged region, and people would have to move to faraway places to sustain a living. Adaptation on site would, in many cases, not be possible anymore.

The assumption that **Khmer** are clearly disadvantaged compared with Kinh, which has often been made in the literature related to socio-economic disparities in the VMD (e.g. Truong Ngoc Thuy 2012; Nguyen Quang Tuyen 2011; Nguyen Thanh Binh 2010; AusAid 2004; see section 3.1.4 and 3.3.1), cannot be confirmed at large (see section 5.2.4). Khmer were on average more often classified as poor and had a lower education level. Nevertheless, these differences were relatively small and not statistically significant. In addition, the resulting implications for the capacity to respond to flooding and salinisation were in most cases negligible. One of the reasons might be that Khmer are not a minority but make up the majority of the population in most researched hamlets. At a local level, Khmer held a majority of governmental positions; not Vietnamese but Khmer was the prevalent language spoken; and also culturally Khmer influences prevailed. At the commune level and above, this structure was superseded by a Kinh dominated system. Direct negative implications of this structure were not observed at a local level, however. On the contrary, many people even told that Kinh households were the ones who were disadvantaged because they did not have access to benefits from the policies targeted to ethnic minorities. This picture might change when compared with areas where Khmer are the minority – as, for instance, was done in many other studies (AusAid 2004, Truong Ngoc Thuy 2012, Le Thanh Sang 2010).

Social capital, a highly relevant asset in terms of response capacities (Ashley, Carney 1999; DFID 1999; see sections 2.1.3), seems to be positively influenced by the Khmer dominance in the region. A strong connection to the pagodas, for instance, provided funds in the event of hardship and made education facilities accessible. Most important in terms of social capital were the bonds with the government, though (see sections 5.2.4 and 7.2.1). Crony capitalism seemed to prevail in many places, including at the most local level. Differences between the hamlets were, in this respect, sometimes substantial. The individual character of the hamlet leaders seemed to be the pivotal factor in this regard. He was the one who distributed poverty certificates and determined access to many of the governmental programs. Often it was the hamlet leader’s subjective judgement rather than more objective criteria which indicated a household’s need for support. Being on good terms with the hamlet leader could therefore provide access to programs which in turn improved the capital endowment of a household. The extent of cronyism apparently depended mainly on the personal character of the hamlet leader.

Another, widely neglected, aspect in the assessment of response capacity is its temporal dynamics and context-specific character (see section 2.1). The relevance of specific indicators of response capacities appeared to **vary on a temporal scale** as rural livelihoods change. Migration, for instance, will most likely lead to an ‘older’ rural society which is why physical health is also likely to gain in importance for the ability to cope and adapt in the future (see section 3.1.4). In the vein of the ongoing expansion of aquaculture and the still increasing modernisation of agriculture in the Mekong Delta, capital intensive production will most likely play an even larger role in the future. For this reason, financial capital might also take on greater importance with regard to the future adaptive capacity. Besides, new agricultural technologies and aquaculture are often more know-how intensive and people have fewer practical experiences with these production types. This might make human capital more relevant to certain actor groups.

On the whole, the findings show that capacity of response is a highly dynamic, complex and decisive factor for understanding the interrelated nature of risks and risk-related strategies (which is at the centre of the first research question of this thesis). It explains whether and how far people are able to take action. However, the revealed capacity of response does not decide whether a motivation to act is put into practice and does not unfold the subjective quality judgement of different strategy options (see sections 2.4.3). The perceived competence has been defined to be able to shed light on these aspects and will therefore be at the centre of the next section.

8.1.4 Perceived response options and self-efficacy against the background of revealed capacities in the research area and the wider context

The study shows on a conceptual level that only if you are aware of coping and adaptation options and trust in your capacity to implement these options will you be ready to take action (see sections 2.4.3). These aspects are reflected by the perceived competence and bring important insight with regard to decision-making and subjective quality judgements to light. The perceived response options and the perceived self-efficacy were therefore assessed in an analysis of the individual competence appraisal in section 6.2. The following paragraphs will summarise the key findings against the background of revealed capacities of response and will discuss them with regard to their relevance for the regional and conceptual literature.

The study assumes in the conceptual reflections that the **awareness of coping and adaptation options** - an aspect which has not been explicitly addressed in socio-cognitive models of adaptation decision-making so far - is the basis for assessing subjective competence (see section 2.4.3). The empirical findings confirm this assumption and show that mainly coping and only a few adaptation options were perceived at the household level (see section 6.2.1). These actions were mainly general risk-related strategies which were also applied in response to other risks such as high input prices or plant diseases. Households were rarely aware of strategies which specifically address the problem of salinisation or flooding. The study accordingly confirms the findings of Hoa Le Dang et al. (2013) who found that knowledge of promising adaptation options is widely lacking. The data also indicate that, as assumed in the conceptual framework (see section 2.4.3), mainly one's own risk experience and social discourses determined awareness of certain response options. This becomes most apparent when comparing flood- and salinity-affected households with each other. In the salinity-affected rice-producing hamlets, people were only aware of a few or no risk-specific coping and adaptation options whereas in the flood-affected hamlets people knew of at least some more specific actions to take.

The **perceived self-efficacy** is another highly relevant factor in the appraisal of individual competence - as acknowledged by several scholars in the field of adaptation decision-making (Grothmann, Patt 2005; Krömker, Mosler 2002; Rogers 1975; see section 2.2.2). Confirming Grothmann and Patt's (2005) assumption, the empirical findings show that the perceived self-efficacy of the households in the research area reflected the revealed capacity of response in many aspects. Cognitive biases occurred mainly with regard to intangible assets, i.e. with regard to what you can do with the endowment you possess (Bandura 2002: 94; see section 6.2.2). These are things which can hardly be assessed when only looking at the wealth of capital endowment as it was described in section 5.2.4. They mostly relate to the perceived structures and processes in which one is embedded (see section 7.2.1) and to one's own experiences in dealing with risks (see section 5.2.1).

According to the conceptual discussion, external **barriers and incentives** should also be taken into consideration in an analysis of the intention to adapt or cope (Kuruppu, Liverman 2011; Grothmann, Reusswig 2006; Grothmann, Patt 2005; see sections 2.2.2 and 2.4.3). The analysis of the regional context (see section 3.1.2 and 3.3.2) and the empirical findings (see section 6.3 and 7.2.1) show that the government is responsible for many of the perceived institutional barriers and incentives. Due to those, the implementation of several adaptation options was not for the households to decide alone or was not merely based on risk perception - neither in the research area nor in most of the other regions in the Mekong Delta (Käkönen 2008; Garschagen et al. 2012; see section 3.3.2). For instance, many households did not decide on a different crop or variety because they possessed the capability to do so but because the government set incentives to do so. The empirical findings show that centrally suggested land use plans still considerably restricted the production choices. Similarly, farmers stopped growing winter-spring rice not only because they were not able to continue production or because their risk perception was higher than before but also because the government said that they would not support them in the case of losses any more (although the compensation which was received before had been small). This shows that public policies were perceived to constitute important incentives/barriers which are to be followed even if they did not have more notable financial implications or were not legally binding. Being a socialist oriented *market economy*, the market also sets key incentives and barriers (Ngo Thi Phuong Lan 2011; see section 3.1.2). Land was, for instance, only alienable at a good price if there were people interested in buying it and if one was aware of the marketing conditions. The same held true for finding a new job which was not susceptible to water-related hazards. This did not so much depend on your qualification but on whether you know that such a job is available, especially a job which is further away. In Ba Giam A, for instance, a large number of people migrated to the same factory in the same city because other members of the community who worked there before told them about these job opportunities (see section 7.1).

Another aspect which has often been forgotten about is the fact that strategies are not applied merely because the households felt threatened or thought they have the capacity to react in a beneficial way but because “the others did it as well” (see section 6.2). This indicates that the reliance on the actions of other actors did not only lead to avoidant maladaptation but also induced an intention to adapt. People believed that strategies which were applied by many other households had to be “relevant” and/or “effective” (“otherwise there would not be so many people doing it”). This emphasises the relevance of identifying opinion leaders in the community which can initiate the common application of a promising strategy.

In summary, the **previous two sections** provided answers to the questions about the drivers of the capacity of response and the stakeholder-specific differences in the perception of competence. It was revealed that the capacity of response is most decisively determined by wealth in terms of livelihood assets. This wealth has undergone substantial changes in the recent past, particularly due to the socialist transformation. It was uncovered that this transformation has brought about many opportunities and challenges which often seemed, at first sight, more relevant than climate change. This assumption is refuted in consideration of climate change impacts which exceed certain thresholds. The perception of the competence to cope and adapt is shown to depend on the perceived strategy option as well as on one’s perceived self-efficacy. Both seemed to be stakeholder-specific and underlay temporal dynamics. Like the perceived threat, they were driven by personal risk experiences and by the reliance on other agents. The individual competence appraisal in combination with the threat appraisal formed the basis, as conceptually defined, for understanding why an intention to adapt is formed.

In **conclusion**, the interpretation of the key empirical findings in the preceding sections shows that a conjoint reflection on the revealed and perceived risks is expedient with regard to the study objectives and mutually fruitful from a conceptual perspective. The vulnerability-centred lens in a socio-cognitive decision-making model adds agency to the often one-sided reflection of risk perception as a mere function of the individuals’ appraisal of probability and magnitude of an event. On the other hand, a vulnerability analysis which comprises both revealed and perceived risks puts the often assumed “objective” vulnerability into perspective. In this regard, it was important to come up with a consistent and concerted definition of the divergently used terms in the different schools of thought. Especially the introduction of the terms “threat” and “capacity of response” was shown to be pertinent. They draw a clear line between what one should do (threat) and what one could do (capacity of response) rather than making a distinction between hazard and vulnerability or between the external and internal side of vulnerability (see section 2.1.3).

8.2 Applied strategies from an evaluation perspective – key findings and contextualised interpretation

An analysis of revealed and perceived risks conveys an understanding of the overall risk context and of why certain actions are taken. To arrive at a more holistic picture of coping and adaptation, as is the goal of this research, the perceived and revealed characteristics of strategies also have to be taken into consideration (see argumentation presented in sections 2.4.3, 2.4.4 and 2.4.5). Chapter 7 has therefore empirically shown which household-led and state-led measures were put in place and illustrated the vulnerability-related implications of these actions along the lines of "theories of change" (see section 2.4.4). In addition, stakeholder-specific and subjective multi-criteria analyses were conducted for formal and informal strategies (see sections 6.2 and 7.2.4). In order to understand the key categories and dimensions of risk-related strategies and to derive concise quality statement with regard to the perceived and revealed nature of these measures, the key empirical findings will be examined against the background of their regional and conceptual relevance. This provide the basis for identifying "good" adaptation and coping for different stakeholders and timescales (see research question 2) and for discussing the value of the suggested theoretical and conceptual approaches for a more comprehensive evaluation (see research question 3.1). Section 8.2 will therefore present the key categories of risk-related strategies and derive distinct quality judgements from different evaluation perspectives – both first for household-led and then for state-led strategies.

8.2.1 Key categories of risk-related household strategies

The empirical data show that households applied a large range of risk-related strategies - mostly in the context of flooding and saline intrusion (see section 7.1.1). This reflects the prevalent perception of being highly threatened by water-related risks and indicates the relevance of these risks in providing motivational energy to take action (see section 6.1).

However, most of the strategies were **not specific to salinisation/flooding** and were particularly not targeting climate change (e.g. taking a loan or rural-urban migration). The general risk-related strategies which are not applied in the context of water-related risks today but which already play a role in the context of other risks (particularly migration and selling land) might be strategies for dealing with an altered risk situation in the future. Analysing them and evaluating their subjectively perceived and objectively revealed quality, as is the case in this research, has therefore provided details about potential future adaptation and coping strategies which had not been acknowledged otherwise. This is of particular importance in the light of a rapidly changing social and natural system, as is the case in the VMD.

Moreover, a clear distinction between coping and adaptation has proven to be pertinent to this research. Among other things, this differentiation points out whether a strategy is reactive or proactive in the risk context (see argumentation of Birkmann 2011 and Schipper 2009 in section 2.1.2). The empirical discussion confirms the relevance of this aspect, particularly for an understanding of how risk perception leads to actual practices. The findings show that most of the applied strategies were ex-post **coping** measures and only a few of them were anticipatory **adaptation** strategies (see section 7.1.1). This was particularly the case in rice-producing hamlets. These results contradict, at first sight, the common perception of an increased future threat from salinisation (see section 6.1.1). Taking the perceived competence into consideration, as suggested in the theoretical literature on socio-cognitive models of decision-making (Grothmann, Patt 2005; Rogers 1975; see section 2.2), conveyed an understanding of why that was the case. Firstly, many of the households seemed not to be aware of appropriate adaptation options in the context of flooding and salinisation. Secondly, even if they were aware of appropriate options, they often thought that they did not have the means to adapt (see section 6.2).

The study also argues that it is important to consider household strategies in their interplay with formal coping and adaptation measures (as outlined in section 2.4.2). This is of particular importance in the Vietnamese context where the state has a strong influence on social life (Nguyen Thi Phuong Loan 2010; see section 3.1.2 and 3.3.2). The empirical findings revealed several strategies which were, at the same time, **autonomous and heteronomous**, i.e. household strategies which are implemented by the household but driven by planned governmental adaptation. One example for such strategies is the change of crop as a reaction to the promotion of a new crop by the government. After the market reforms in the vein of Doi Moi, households theoretically have the choice to grow the product they want (Taylor 2007; Kerkvliet 2005; see section 3.1.2). Nevertheless, some of the governmental incentives and awareness raising programs seemed to be restrictions and regulations rather than recommendations.

The empirical data also shows that many of the strategies applied were **based on the endowment** with production land, relied on the transformation of financial capital, and were determined by the employment of individual know-how, particularly agricultural production skills (see section 7.1.2). The findings, accordingly, indicate that those aspects were the most relevant determinants of response capacity. Based on this, one could reason that substantial disparities existed between different socio-economic groups and the types of strategies they applied. However, those disparities were in most cases not significant, particularly not with regard to the formal education level and ethnicity - both being commonly mentioned drivers of socio-economic inequalities in other studies conducted in the Vietnamese Mekong Delta (e.g. Käkönen 2008; AusAid 2004; see section 3.3.1). Being an agrarian society and dealing with hazards which mainly affect the agricultural production sphere, the agricultural production type has been shown to be the most decisive variable not only with regard to production-related strategies but also with regard to more general livelihood activities (e.g. migration or buying goods on credit). Accordingly, the kind of strategies applied varied most significantly between rice, sugarcane and aquaculture production areas and not between Kinh and Khmer or people with high and low formal education levels.

Furthermore, the study showed that households applied many **resource-depleting** and only a few **resource-augmenting** strategies (see section 7.1.2). Increasing inputs was, for instance, the most commonly applied strategy in the context of salinity. This was a strategy which was based on consuming inputs and therefore depleted the stock of financial resources. The same applied to strategies which were mainly based on natural, physical and social capital. Resource depletion rarely applied to strategies which relied on human capital, however. Reducing inputs by using a new production technique (e.g. “Three Reductions and Three Gains” mentioned in section 3.1.4) is an example for such strategies. This practice mainly relied on the employment of know-how, i.e. the use of this resource did not deplete but augment it. The empirical data, however, show that reducing inputs was only rarely applied as part of a new technology or as a coping strategy. Despite the contribution the differentiation between resource-depleting and resource-augmenting strategies could make for assessing the sustainability of coping and adaptation strategies, it is only implicitly addressed in the current theoretical and empirical literature (see section 2.1.2). There exists a differentiation between erosive and non-erosive coping (Devereux 1999; Waal 1989), but resource-augmenting strategies as such are rarely taken into account when classifying different types of strategies.

8.2.2 Distinct perspectives on quality judgements of household-led strategies

In the literature review it has been argued that the quality of strategies cannot be measured in absolute or overarching terms (see sections 2.4.5). There are significant differences in the definition of “good” adaptation and coping strategies – it is in particular specific to the evaluation method, the stakeholder, the spatial-scale and the time-scale. Based on the characterisation of household-led strategies in section 7.1.2 and the subjective perception of their quality in section 6.2, the following section will discuss in how far this assumption applies to the research area, will highlight the "best" and the "worst" strategies on site from different evaluation viewpoints, and will interpret the findings against the background of prior research in the VMD and in evaluation research.

Firstly, **"good" in terms of a strategy's vulnerability impacts** does not always coincide with **"good" as subjectively defined** in the appraisal of response efficacy by individual stakeholders (see sections 7.1.2. and 6.2.3). The introduction of winter-spring rice in 2010 depicts this argument well. The empirical data indicate that this strategy had the most detrimental effects on the households' vulnerability in the last years. Starting to grow a highly saline-sensitive crop in the dry season substantially increased susceptibility and the salinity-related loss of harvest in 2011 reduced the capacity of response not only in the short- but also in the long-run (see section 7.1.2). Nevertheless, even after the substantial losses, households thought that it was one of the most beneficial strategy options on hand. The large majority of households were convinced about its potential for increasing income (which had been defined as the most important quality criterion) and its good implementability. These advantages seemed to have outweighed the disadvantages as most of the people wanted to grow a third season of rice again (see section 6.2.3). In contrast to this example, other strategies seemed to be promising in terms of their vulnerability implications but were judged to be "bad" strategies. The data suggest that this was the case for migration. Working in a factory in one of the big cities was not only financially efficient and therefore increased the capacity of response, but it also reduced susceptibility because migration provided an additional source of income for the families (see section 7.1.2). Despite the potential for vulnerability reduction, migration was perceived to be a "bad" strategy by the majority of households. In the pairwise comparison, every other strategy was preferred over migration (see section 6.2.3). Both examples, accordingly, highlight that a comparison of the revealed with the subjective quality is of central relevance in a more comprehensive evaluation of strategies.

Secondly, **criteria** which determine the subjective quality of a strategy might **not be equally relevant**. The conceptual framework of this study suggests, like other evaluation frameworks (e.g. Debels et al. 2009; Mendoza and Martin 2006; see chapter 2.3), that evaluation criteria have a distinct influence on the subjective definition of a strategy's quality, i.e. some criteria are more important than others. The empirical results show that the effect on household income and the costs of a strategy were the most important to the people whereas long-term impacts and environment-based criteria played an only minor role (at least in the group discussions' critera rankings). However, the empirical data also show that those weightings did not apply equally to all strategies. This is of particular importance for studies which evaluate a multitude of strategies, as is the case in this study (which is only rarely the case in evaluation practice and research). Taking children out of school was, for instance, judged by most households to be a strategy which had a positive effect on the financial capital, was easily implementable, and reduced living expenses. The only disadvantage was the long-term effect of this strategy, i.e. a relatively *unimportant* criterion according to the group discussions. Nevertheless, in this case, nearly all people said that this single disadvantage outweighed all advantages of the strategy (see sections 7.1.2 and 7.1.3).

Furthermore, the previously described example of migration depicts the dynamic nature of evaluation criteria well. People did not say that it is a "bad" strategy because they were not aware of the positive effects on their income but because they did not want to leave their home and live far away from their family (see sections 7.1.2 and 7.1.3). This example illustrates a third highly important point, i.e. **some criteria are difficult to generalise** and extend beyond the commonly defined evaluation criteria. These criteria are often forgotten in evaluation research, despite their decisive function, particularly in highly standardised evaluation schemes (see section 2.3.2).

Fourthly, a **"good" strategy for one stakeholder does not mean that it is also a "good" strategy for another stakeholder.** So far, most evaluation approaches, particularly in development practice, only account for their target population and not for other groups (see section 2.3). In contrast to this benign neglect in practice, the empirical data show that the aspect of divergent adaptation/coping effects is of central relevance with regard to both the revealed and perceived quality of some strategies (see sections 7.1.2 and 6.2). The operation of the sluice gates in 2011 is one illustrative example (see section 7.1.2). The private actors who presumably opened the gates in the neighbouring district of Tieu Can were able to dispose polluted water from aquaculture and therefore reduced their vulnerability towards water-related risks. This vulnerability reduction happened, however, at the expense of rice-producing households in Tra Cu district. Households there lost all their rice production as a result of opening the gates in Tieu Can district. Beside the relevance for depicting divergent adaptation for the current research area, the results reveal a conflict which might take on even larger importance when considering the constant expansion of aquaculture in the Mekong Delta (Dang Kieu Nhan et al. 2007; Taylor 2007; see section 3.1.2). The empirical results also show that the *perceived* quality of strategies is stakeholder-specific. This is most explicit in the example of taking a loan (see section 6.2)[167]. The quality judgement of this strategy differed with regard to ethnicity, production type, education level and poverty status showing, as well, how important it is to account for evaluations by different stakeholders.

Fifthly, it was shown that **"good" at present does not necessarily mean that it is also "good" for the future**. In the research area, households generally prioritised strategies which face challenges today over long-term oriented adaptation strategies (see section 6.2). Decisions on immediate goals and coping strategies increased when hazard impacts became more adverse. This is a phenomenon also described by Cekan (1994) (see chapter 2.1.3[168]). An analysis of the revealed vulnerability implications of risk-related practices confirms this assumption and shows that coping strategies were particularly important and therefore prioritised after salinisation destroyed all the production in the rice-producing area. For instance, without a temporary increase of the coping capacity via taking a loan or buying on credit, it would have been difficult to sustain a living for many households. Nevertheless, those strategies were, as the theoretical literature often calls them, erosive in the long-run (Waal 1989; Devereux 1999; see section 2.1.2). In contrast to the suggested definition of coping (see section 2.4), they did not only have an impact in immediate terms but could also lead to change. Selling land to cope with a crisis could change, for instance, the livelihood from on-farm-based to off-farm-based or even non-farm-based livelihoods. Another example is taking children out of school. It seemed to reduce employment opportunities for the next generation and might therefore also have a substantial long-term effect. In the empirical and theoretical literature, a long-term perspective in the evaluation of strategies is often at the centre of interest (see section 2.3). Nevertheless, a clear distinction between the short-term effects and the long-term impacts on vulnerability is not always taken into consideration although this would be of central importance to impart a more holistic understanding of the quality of risk-related strategies.

Overall, the previous sections reveal that a big range of strategies was applied in the context of water-related risks in the research areas – each of these strategies has been shown to be distinct in their nature and diverse in the subjective definition of their quality. To unfold this, it was essential to apply an evaluation framework which is at the same time context-specific and actor-oriented. The findings also indicate that vulnerability and many of the household-led strategies (incl. their nature and quality) are driven by the state. The following section will therefore examine government-led strategies and their revealed and perceived quality in more detail.

[167] The disparities between the perceived qualities of the other strategies were only minor compared with taking a loan, though.

[168] This argumentation was part of the discussion around dynamics of vulnerability.

8.2.3 Central agents and categories of risk-related government strategies

The conceptual framework of this thesis argues for addressing not only household but also governmental strategies and advocates taking a combined look at both (see section 2.4.2). Like many other regions in the Mekong Delta (see sections 3.1.2, 3.3.2 and 3.3.4) the government had a high presence in everyday life (see particularly section 7). It determined vulnerability not only by being part of the transforming structures but also as an individual agent directly interconnected with private agents. This indicates the pivotal role of a concerted analysis of formal and informal strategies for gaining a better understanding of perceived and revealed qualities and of the dynamics of vulnerability.

An analysis of the **responsibilities** of government authorities in the research area with regard to risk-related response mechanisms depicts the omnipresent interplay of responsibilities in the Mekong Delta (see sections 3.1.2, 3.3.2 and 3.3.4). The centrally planned socialist system made itself felt in various (but not all) aspects (see particularly section 7.2; also sections 5.2.4 and 6). Similar to the results of other studies in a socialist context (e.g. Evers, Benedikter 2009; see section 3.1), also the stakeholders in the research area revealed a strong hierarchical thinking. This seems to be owed to the principles of a society of hierarchically defined relationships coupled with a hierarchy-based state organisation (Waibel et al. 2012; McCargo 2004; see section 3.3.2). The political system seems to be more of a "monolithic democracy" where the party represents the will of the Vietnamese people – yet they often seemed to have *forgotten* about asking them what their will is.

The majority of formal measures were initiated in one way or the other from the national level. The most common feature of all governmental processes on site was the continuous administrative progression from the national to provincial, from provincial to district, from district to commune, and finally from commune to hamlet or even sub-hamlet level. This seems to have created a subordinate mentality where initiative is often perceived to be the responsibility of the respective higher level and one's own responsibility is a merely reactive one. A strong state and its hierarchical organisation appeared to convey the strong reliance of authorities at lower administrative levels on those at higher administrative levels, including with respect to adaptation strategies. Socio-cognitive models of adaptation decision-making suggest that this reliance reduces the intention to adapt (Grothmann, Patt 2005; see section 2.2). This also seems to hold true in this research context, where many interviewees found that the future oriented strategies, in particular, were the responsibility of the respective higher level. This was not always the case, however. In some hamlets, the hamlet leader was the one to take the initiative. In Ba Cum hamlet, for instance, the hamlet leader brought reciprocity-based projects into being without any higher authority being involved; and in Ba Giam A hamlet, the hamlet leader promoted a change to corn because he himself was convinced of the potential local benefits of this crop and not because the higher-level authorities told him to do so (see section 6.2).

The previous examples indicate that substantial **agency** existed not only at the national or provincial level but also **at the most local level** – agency which is often overlooked in the literature (see sections 3.3.2 and 3.3.4). The empirical data show that the hamlet leader was locally perceived to be the most important actor not only in risk management but also with respect to most other spheres in public life (see section 7.2.1). The national state, province and district authorities seemed to play only a subordinate role, at least in the perception of those on site. Being part of the community themselves, hamlet leaders had seemingly strong bonds and moral commitments to the others in the community, knew the situation on site well, and were confronted with the same or similar risks as the other farmers. Several interviews showed that they often followed their own sentiments rather than government or legal requirements (a similar argumentation can be found in Waibel et al. 2012). These aspects played an important role against the background of the hamlet leaders' critical responsibilities. On the one hand, the hamlet leader was the one who brought transforming policies and structures into place. On the other hand, he was also the one to bring local people's opinions to governmental recognition. This resulted in positive as well as negative manifestations. In some hamlets, the agency of the hamlet leader highlighted discontent about the unfair distribution of poverty certificates or social benefits; in other hamlets, the agency of the hamlet leader seemed to have given a competent and understanding political voice to all members of the community. The interaction of the hamlet leader and the local population could accordingly be seen as an example depicting the concept of structuration, as Giddens (1994) calls it (see section 2.1.2). Despite the empirical relevance for a rarely depicted theoretical approach and its central importance in the Vietnamese context, the agency of local authorities and their intermediating role between the public and the private sphere has rarely been assessed to date (see section 3.3.2).

Overall, a wide range of risk-related measures were applied by the government in the research area (see section 7.2.2). Several of these strategies were **risk-specific** whereas others were more **general risk-related** strategies. On the side of risk-specific measures, a strong focus on hard exposure-reducing infrastructural measures was observed. In accordance with the general preference for hydraulic infrastructure development in the Mekong Delta (Evers, Benedikter 2009; see section 3.1.2), the most prominent strategy was the building of large systems of dikes and sluice gates. Accordingly, the focus was on control rather than living with salinity and flooding (see also Käkönen 2008). Risk-specific soft measures aiming to strengthen the capacity to respond to salinisation and flooding did not play a major role. Most of the capacity-strengthening strategies which were applied in the research area did not target flooding and saline intrusion specifically but were general risk-related strategies. Most important in this regard were training classes which are prevalent in the entire Mekong Delta (see sections 7.2.3, 3.1.4 and 3.3.4). They increased the capacity of response in different ways. Besides conveying specific knowledge of how to deal with risk (which was rarely the case in the research area), they aimed to increase productivity and therefore the financial capacity to cope and adapt. Some of the new techniques suggested by training classes also aimed to reduce inputs and therefore improved or at least conserved natural capital. Moreover, other strategies such as vocational training classes, the provision of loans, or the promotion of new crops indirectly reduced vulnerability. Accordingly, several strategies existed which affected the vulnerability of households in a positive yet indirect way. This conclusion supports the argumentation of an increasing body of literature (see e.g. McKenzie Hedger et al. 2008; Brooks et al. 2011), which argues that it is important not to address DRM/CCA strategies in isolation from development-oriented strategies – a perspective which was widely neglected for a long time (see sections 3.3 and 2.1).

The empirical findings also demonstrate that there were **several strategies named as in place at the higher level but which were not perceived to be in place at a more local level** (see sections 3.3.4 and 7.2.2). This was particularly the case for climate change-related activities. Tra Vinh province may have implemented a Provincial Climate Change Action Plan (PCCAP) following the National Target Program to Respond to Climate Change (NTP-RCC) but this plan seemed to have lost relevance and visibility in the continuous administrative top-down progression. The provincial level described several measures being implemented in the vein of the PCCAP, the district level showed awareness with regard to the program but did not implement specific measures, and at the communal and hamlet levels authorities were neither aware of the program itself nor reported related measures being in place. Moreover, some institutional support schemes with regard to risk management were named as being implemented by the responsible authorities but were not mentioned by local households. Authorities in Kim Son commune said, for instance, that they mobilised households and supported them financially to upgrade individual embankments. However, none of the households seemed to be aware of such measures (see section 7.2.2). An example where institutional support existed on paper but did not come into effect locally was the Committee for Flood and Storm Control (CFSC). It is meant to be summoned in cases of emergency (see section 3.3.4) but never was in the research area - despite several tidal flood events (see sections 7.2.1 and 7.2.2). This was not primarily the result of a rigid hierarchical or locally non-adapted governance system but was mainly due to the local definition of natural disasters. In the Ordinance on Prevention and Control of Floods and Storms tidal flooding is defined as being the responsibility of the CFSC (see section 3.3.4). Local authorities, in contrast, underrated local flood events, saying that they were not severe enough to be the responsibility of the CFSC. In their opinion, flood disasters in the Mekong Delta occurred in the form of long-lasting riverine flooding only (see section 7.2.1), as is the case in the Northern provinces (see section 3.2.1). This reveals the need to take a look at subjective definitions of threat and related thresholds for taking action.

Overall, most of the empirical findings highlight the need to look at the local level too when seeking to judge the governance system with regard to climate change or disaster risk reduction. So far most studies, including in the Mekong Delta context, only look at the national level, however (see e.g. Fortier 2010; Hashimoto 2001; see section 3.3.5).

8.2.4 The quality of governmental coping and adaptation against the background of different evaluation approaches from research and practice

This study argues conceptually that the quality of strategies cannot be judged in absolute terms (see section 2.4.5). In due consideration of this sheer impossibility, it is still the overall goal of the thesis to find a more encompassing evaluation scheme than the existing ones. It should account for different perspectives, criteria, dimensions and time-scales and integrate these aspects in the evaluation where possible and appropriate. The following section therefore provides an evaluation of governmental strategies which may not be comprehensive but which is context-specific (i.e. considerate of the risk context), actor-oriented (i.e. subjective actor-specific perspectives are considered) and adaptable (i.e. a wide range of evaluation aspects are applied where appropriate and possible).

The literature review shows that scientific communities, practitioners and the government itself have already put a wide range of **evaluations in place** (see section 3.3.5.). However, some of these evaluations seem to exist on paper only, particularly the governmental evaluation schemes. The empirical data reveal that, at a local level, disaster risk reduction was not evaluated as formally described in the national legislation, and local authorities were not involved in environmental impact assessments (see sections 7.2.2 and 7.2.3). At the provincial and district level, the existence and relevance of given evaluation schemes may have been acknowledged but more detailed information or reports were not provided to the researcher (see section 4.6). The evaluations which were actually in effect and conducted were in most cases one-dimensional, looked at only a single measure, evaluated from the perspective of merely one stakeholder, and/or accounted for tangible aspects only. Even if the evaluation documents included a range of different criteria and approaches, like the National Target Program to Respond to Climate Change (MONRE 2008; see section 3.3.5), they apparently did not find application in practice. In consequence, it was shown that it is, firstly, important to put existing evaluation schemes not only on paper but also into practice and that it is, secondly, essential to acknowledge that “good” is no universally valid benchmark.

First of all, “good” strategies judged with one **evaluation approach** might not be “good” strategies when judged with another evaluation approach (see section 2.4.5). The study argues that it is crucial to account for various types of evaluation. Some of the most relevant empirical examples supporting this argumentation will be introduced in the subsequent paragraphs (based on the classification of Silva Villanueva 2011 outlined in section 2.3.2). In this context, the most and the least promising strategies will be outlined as suggested by the different evaluation approaches.

A **process-oriented evaluation** looks at how well one adapts/copes (GIZ 2011) and is based on principles of procedural justice (Rawls 1976; see section 2.3.2 for a definition of process-based evaluations). Based on governmental reports and authority interviews, such an evaluation might suggest that the building and upgrading of dikes is the most effective strategy on site. According to official sources, farmers and local authorities have to be involved in decision-making and planning;

competence has to be ensured by regular controls and assessments at different stages in the planning and implementation process; and a regular upgrading has to be safeguarded by periodical assessments and immediate damage reports at the most local level. All other strategies would perform more poorly in such an evaluation (see section 7.2.3). Periodical assessments and controls were stipulated in a few cases only; and local participation did not play a significant role in several of the strategies applied by the government. The institutionalisation of the sluice gate operation, for example, took place without any major assessment in the forefront, without any local officer being involved, and without many households being even aware of the existence and/or conditions of the new sluice gate regulations.

Nevertheless, when analysing this strategy with an **input-output-outcome oriented (IOO) approach** (see section 2.3.2 for a definition of this type of evaluation), the introduction of the newly established rules for the sluice gate operation seems to be one of the “best” (if not *the* “best”) implemented strategies for rice farmers in Tra Cu district (see section 7.2.3). Despite not being involved, the new institutionalisation reduced the probability and severity of saline intrusion and made it possible to introduce a third season of rice production for the areas inside the dike – all of that, at comparatively low costs. Accordingly, exposure was reduced and the potential to improve the capacity of response was increased for rice producers. These outputs, outcomes and impacts gained even greater importance when considering that they also matched the priority setting of the local population, particularly with regard to the highest rated criteria, i.e. improving productivity and income (see section 7.2.4). The strategy as such also changes the behaviour of rice farmers, but in a way which made households more susceptible to saline intrusion - as they introduced winter-spring rice.

A **behavioural-change-based evaluation** scheme (see section 2.3.2 for a definition of this type of evaluation), which sees vulnerability reduction as its major goal, would therefore query the quality of the regulation of sluice gate operation – particularly against the background of looming climate change. In contrast to IOO-evaluations, behavioural change-based analyses would likely come to the conclusion that the provision of agricultural training classes is the “best” strategy currently available (see section 7.2.3). Agricultural training classes seemed to have the most significant impact on farmers’ behaviour because they succeeded to change the agricultural production patterns of the large majority of participants. The classes may not have specifically targeted exposure and susceptibility reduction – particularly not with regard to climate change adaptation (nor did most other behaviour-changing measures) - but improved the capital endowment and accordingly also their capacity to respond. In contrast with other measures (such as vocational training classes or the promotion of crop calendars), it was a strategy by which the large majority of households were reached and behaviour was effectively changed, i.e. a many farmers changed their production patterns.

An **economic cost-benefit-analysis** (see section 2.3.2 for a definition of this type of evaluation) might argue that the promotion of crop changes is the “best” strategy on site – at least with regard to financial cost-efficiency (see section 7.2.3). This strategy owes its positive judgement mainly to its low marginal costs. No highly expensive infrastructure had to be build, no trainer had to be paid, no farmer had to be compensated for anything, and also the administrative effort was relatively low. Often it was only the persuading and persuasiveness of the hamlet leader which was required and – depending on the extent of the CBA – the allocated share of research costs to find an appropriate crop to be promoted. Assuming that an appropriate product was found and that it is this product which is promoted, the strategy can efficiently reduce vulnerability compared with a given baseline. The promotion of corn in Ba Giam A hamlet showed that it was, due to its low costs, probably more efficient than many other strategies - even if only a few people actually changed their crop. Such a “utilitarian” approach (IPCC 2012) would not account for distributional justice (Rawls 1976) meaning that a strategy can be rated “good” even if it disadvantages the most vulnerable in society.

Among the previously addressed evaluation approaches, CBA seems to be the preferred evaluation concept from government side. This may be one reason why the government often prefers low-impact adaptation options as long as they are measurable and attributable and come at costs even lower than the benefits. This may inhibit taking transformative adaptation actions which are often cost-intensive, loaded with uncertainties, not attributable to a strategy, and hardly measurable due to the long time horizon (see argumentation of Kates et al. 2012 and section 2.3 on the specific nature of CCA evaluation). Added to this, "taking action" and not necessarily "taking effective action" is often perceived to be the thing that counts. This means that taking one measure (preferably the easy implementable one) reduces the motivation and pressure to take other measures. In rural areas, the government implemented a large range of low-cost measures which had a merely minor or no effect (e.g. compensation payments). Despite the low impact, it seemed to have increased the belief of households that the government fulfils its function of protecting and supporting the people.

Besides the evaluation approach, the evaluation perspective changes the meaning of "good" adaptation and coping (see section 2.4.5). Accordingly, the **external** definition of a "good" strategy does not necessarily coincide with the **subjective definition** of a "good" strategy. Providing agricultural training would, for instance, be judged to be the "best" strategy from a behavioural change perspective and also cost-benefit analyses and vulnerability-oriented IOO evaluations would rate it positively, it could still be subjectively defined as a "bad" strategy. Households found that these classes contribute only a little to a better income (by far the highest rated quality criterion for them) and most of the interviewed farmers decided against these classes in a pairwise comparison with other strategies (see section 7.2.4). In contrast, there was a clear preference for exposure reducing hard infrastructure which came, despite seemingly positive processes, at high monetary costs and brought about negative vulnerability effects for a wide range of stakeholders (see section 7.2.3). It is therefore important to account for both external and internal evaluations when aiming for a more comprehensive evaluation.

A major reason for the sometimes large disparities between the various definitions of a "good" strategy can be found in the differential weighting and definition of **quality criteria**. As outlined in the conceptual discussion, evaluation criteria are distinct in their influence on the quality judgement of a strategy (see section 2.3 and 2.4.5). The empirical results confirmed this assumption and showed that, firstly, there are some criteria which are generally rated to be more important than others (see section 7.2.4). Outcome-related criteria, such as income and proportion of beneficiaries, were generally perceived to be more important than process-oriented criteria such as participation or reliability. Secondly, the weight given to quality criteria varied between different stakeholders. Households attached, for example, much higher weight to income than authorities did, whereas authorities ascribed more relevance to process-oriented criteria than households (see section 7.2.4). Thirdly, the compliance of a strategy with regard to a goal also depended on the distinct definition of this goal. Participation was, for instance, named as a highly important criterion in nearly all the reviewed Vietnamese regulations and reports (see section 7.2.3). Based on a mere consideration of "participation" as a criterion, the Vietnamese government would therefore come off relatively well. Nevertheless, the term participation was kept vague, and it did not seem to coincide with a broader definition of this term (see Fortier 2010; section 3.3.5). Authorities defined participation mostly as having held a meeting where people were informed about a strategy being implemented. It has therefore often been more of an "alibi participation" (term used by Evers 2012). The involvement of local stakeholders in all stages of planning, implementation and evaluation, as defined in the scientific literature, was not encompassed in this definition. This seems to reflect the socialist paradigm of collectiveness which apparently still overshadows the rights and priorities of individual actors. It is accordingly important to keep in mind which distinct meaning is attached to goals and criteria and how much these goals and criteria matter in different contexts.

The current research also reveals that "good" measured in **present** terms is not always "good" in **future** terms. On the adaptation side it was shown that measures acted on different time scales and did not always induce positive changes for the future. The construction of dikes is one example for this. This measure can be defined as a transformational adaptation (Kates et al. 2012; see section 2.1.2). The dikes, which had been built since the 1990 (see section 3.1.2), had changed the coastal land uses fundamentally towards more rice production and had thereby transformed the overall livelihood systems. The perceived threat and the conviction in the efficacy of this measure had been so high that even the large investment costs did not prevent these measures (at least at the level of the international and national investors). However, this may have been an adaptation to water-related risks as defined at that time but it may not be sufficient in a region which is so strongly affected by sea level rise. Protective infrastructure like dikes also entail a range of second-order dangers (Taylor-Gooby, Zinn 2006) and therefore demand second-order adaptation, as already described in previous studies (Birkmann 2011a; Nguyen Thanh Binh 2010). These have to be taken into consideration when evaluating adaptation measures.

Being located in a centrally planned socialist system also gives weight to the question of whether **"good" for Vietnam is "good" for the Mekong Delta** and whether "good" for the Mekong Delta is **"good" for the respective locations**. The guiding principle for spatial planning from the national level seemed to be targeted towards a diversification of the economy, not only with regard to agricultural diversification but also with regard to progressing industrialisation (Garschagen et al. 2012; see section 3.1.2). At a more local level, in contrast, the province and district authorities still seemed to follow guiding principles based on the image of the Mekong Delta as Vietnam's rice bowl (see section 3.1); this is at least what the new sluice gate regulation indicated (see section 7.2.3). The authorities in that case decided for rice and against sugarcane and aquaculture production, even though the affected rice producers were not involved in the discussions. Whether one or the other guiding principle is good for the location depends, as outlined above, on the temporal scope, spatial scale, stakeholders involved and individual preference structures. The promising nature of these principles can therefore not be generalised (although the mere existence of such guiding principles suggests that this is exactly the case).

The study also shows, both conceptually and empirically, that the outcomes of a strategy can be "good" for one **stakeholder** and at the same time "bad" for another (see sections 2.4.5 and 7.2.3). This aspect became most apparent with regard to the construction and management of the protective and productive infrastructure (see section 7.2.3). The newly regulated operation of the sluice gates, for instance, may have reduced exposure and increased the capacity of response of the rice-producing households in Tra Cu district - but at the same time it reduced the agency of the sugarcane and aquaculture farmers in the neighbouring district of Tieu Can. The construction of dikes also had divergent impacts. A new dike system may have been good for the people living inside the dike whose hazard exposure was clearly reduced - but for the people living outside the dike, it had mainly negative impacts. These people had to deal with increased hazard exposure and all its adverse effects (loss of production, loss of income, loss of land, etc.). In consequence, the quality judgement of a strategy was also different (see section 7.2.4). Such divergent evaluations indicate potential and existing conflicts such as the one between aquaculture and rice production which is an increasing problem all over the Mekong Delta (Biggs et al. 2009; see section 3.1.4). These negative consequences may also raise doubts with regard to the good process-oriented judgement of dikes presented above. This leads to another important aspect which contradicts the existence of universally valid benchmarks.

The definition of a "good" strategy alters with the **data** on which the evaluation is based. Taking up the example of dikes depicts this aspect well and reveals that "good" on paper is not necessarily "good" on site (see sections 7.2.3 and 7.2.4). A process-oriented evaluation based on reports and interviews with province authorities shed a positive light on the strategy. The analysis of local-level data, similar to the findings of other studies (McElwee 2010: 100), provided a different picture of the same measure, however. Merely a few households reported having participated in a meeting to decide for or against a dike; none of the authorities was aware of any environmental impact assessment or a regular assessment of the state of the dike (not even the officers responsible for dike construction and management); and less than five percent of the households said that an upgrading of the dike took place at all. It is, accordingly, important to consider different data sources on various scales and triangulate them (see section 4.1).

In conclusion, the section 8.2 shows that there were many strategies applied in the context of water-related risks from both the government and households. There was a focus on and strong preference for exposure-reducing activities, especially by the government. Strategies which increase the capacity of response sparked less attention. The study also indicates that identification of the ”good“ and ”bad“ strategies depends on the criteria, actors, dimensions and timescales, making it difficult to identify what to support and what not to support. An acknowledgement of these limitations points out that an adaptable, actor-oriented and context-specific evaluation scheme for local strategies, as suggested here, has to be restrictive with regard to the absolute comparability of strategies. It is an approach which is not able to provide large numbers at the end of an evaluation sheet telling you what is better and what is worse. Nevertheless, it is an approach which provides comparability on another more qualitative level where an integrated understanding is at the fore. This provides a basis for identifying barriers to “good” adaptation/coping and for finding strategic points of intervention – the contents of the subsequent section.

PART III - DISCUSSION, SYNTHESIS AND RECOMMENDATIONS FOR ACTION

The following third and final part of this thesis aims to bring together the concepts, background information and the case-study specific findings. It is a reflection of the empirical findings presented in part II with respect to the overall rationale, the contextual literature and the research concept presented in part I. In the following chapters the barriers to “good” adaptation are identified and promising ways of overcoming these barriers are outlined; the merits and challenges of the conceptual and methodological influences in the given research context are presented; and finally key conclusions are drawn and an outlook is provided against the background of the study’s contribution to the scientific and practitioners’ communities.

9 Barriers for “good“ coping and adaptation – challenges, opportunities and recommendations for action

An identification of limits, barriers and opportunities for “good” coping and adaptation is an essential prerequisite for finding more sustainable development pathways in the light of water-related hazards. It has therefore been identified as a major goal of this research.

In order to arrive at an encompassing and systematic way of identifying and ordering these barriers, the following features are conceptually and empirically found to be of central importance: firstly, a distinction between limits and barriers is pertinent because it draws a line between the aspects which are not changeable and have to be accepted to some degree (at least momentarily and at that scale) and the aspects which can and should be changed. Limits are defined as “absolute and insurmountable obstacles which relate to a set of immutable ecological, physical, and technological thresholds [...]”; whereas barriers are “subjective and socially constructed obstacles which can be overcome” (based on Moser, Ekstrom 2010: 22026; Dow et al. 2013: 306; Adger et al. 2009: 335; see section 2.4.). Based on empirical conclusions and a review of the literature, the study identifies three major types of barriers: (1) socio-economic barriers, (2) knowledge-related and cognitive barriers, and (3) institutional barriers. Secondly, an identification of the limits and barriers along the lines of the integrative conceptual framework (see section 2.4.6) is of importance because it enables a systematic way of detecting the problems that are often forgotten, for example, a mere vulnerability-oriented approach might neglect the fact that there are barriers which emerge at the level of perceived strategy options or response efficacy, whereas a mere focus on awareness raising may overlook barriers which arise as a result of social-ecological coupling processes. The analysis is therefore based on three major components: (1) the social-ecological risk context, (2) individuals’ decision-making processes, and (3) characteristics of coping and adaptation strategies. Thirdly, it has been shown to be important to include an evaluation perspective into the analysis of barriers. Based on an actor-oriented and context-specific evaluation framework, the following sections thus address barriers to *“good”* coping and adaptation. The attribute “good” does not represent an absolute judgement of what is better and what worse but signifies an integrated and more qualitative understanding of a strategy’s quality. Fourthly, an identification of recommendations for seizing given opportunities and strategically removing the detected barriers has the potential to facilitate more sustainable development pathways.

Overall, this analysis thereby makes it possible to answer the third central research question, i.e. “What are the barriers of and limits to ”good“ adaptation and coping and how can they be identified and overcome?”. In the following section, the most relevant of the identified barriers and limits will therefore be delineated and introduced against the background of given opportunities and strategic points of intervention (the whole range of identified barriers, limits and opportunities can be found in Annex 12.13).

9.1 Limits to adaptation and coping

Overall, the empirical analysis reveals only a few local and context-specific **limits** to adaptation and coping[169]. At the level of individuals’ perception, there seemed to be more limits, however. Some of these *perceived* limits relate to revealed institutional barriers (see sections 3.1.4, 3.3.2, 8.2.3 and 9.4). In a strictly hierarchical system, as described earlier, orders received from above were often accepted as inviolable by the subordinate officer or by the farmers. However, those perceived limits are actually, in Adger et al.’s (2009) words, “subjective and socially constructed” and therefore also violable. Strengthening the awareness of one’s own agency is, accordingly, one of the most efficient ways to dissolve perceived limits (see chapter 9.4 for more details).

Most of the *revealed* limits were related to the ecological setting on site and the ecological influences outside the place. On site, the natural prerequisites, especially the characteristics of hydrological and climatic conditions as well as their short-term variability, were hardly changeable (see section 5.1). Being a highly resource-dependent agrarian society, these characteristics restricted and determined production choices and cropping calendars in particular. Outside the place (i.e. beyond the research area), it was mainly long-term changes that seemed difficult to influence (see section 3.1.1). Nevertheless, difficult to influence does not necessarily mean not influenceable at all. Particularly at an international level, actions can and must be taken. Low-lying delta regions such as the research area are most vulnerable to climate change and even though many of the negative impacts of climate change can no longer be stopped, it is of great importance to take mitigation efforts and prevent the ones that can still be stopped. Only in this way, can people in those areas have the chance to adapt at all. If no measures are taken and the sea level rises above a critical threshold, nearly all the barriers and opportunities delineated in the preceding sections will become limits – limits for adapting on site, at the place where people grew up, where they are culturally and socially connected, and where their knowledge and preferences are grounded. It is therefore important not to take all limits for granted and aim to tackle them even if the arenas where decisions are taken seem far away.

9.2 Socio-economic barriers

Socio-economic barriers are identified as one of the three most relevant groups of barriers in this research context[170]. In contrast to other authors (IPCC 2012; Jones 2010), who consider social and economic barriers separately (although not independent from each other), this research found a combined analysis more pertinent. The interconnected nature of social and economic barriers and the fact that the recommendations for action can rarely be detached from each other substantiates this assertion.

The majority of the socio-economic barriers and opportunities (e.g. market failures or social inequalities) go hand in hand with the overall **transformation process** in the Mekong Delta (see section 3.1.2). Agricultural modernisation has, for instance, brought about large productivity increases which have clearly supported adaptation and coping capacities on site. Despite these improvements, agricultural modernisation has also brought about various barriers. It has increased social disparities and it has raised the dependency on agro-chemical inputs, hydraulic infrastructure and international markets (see section 8.1). De-industrialised forms of agriculture, which promise constant or even increased productivity, could overcome some of these barriers. They require a smaller amount of investment and inputs and can accordingly reduce many of the existing

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[169] There surely exist more technological, physical, and ecological limits on a sub-national, national, international or global level. A detection of these limits is not in the scope of this research, though, because it focuses on a local and regional level.

[170] Most of the socio-economic barriers were identified by examining the social-ecological risk context (see section 5.2).

dependencies. Moreover, these production techniques are also implementable and beneficial for the poorer groups in society and could therefore contribute to more distributional justice. An example of a less input-dependent form of rice production is the System of Rice Intensification (SRI) (see Uphoff 2011 for more details on SRI). Having the potential to save on greenhouse gases, agrochemical inputs and water, this production technique contributes not only to lower costs but also to other sustainability-related goals such as climate change mitigation. New production methods can and already are distributed rather efficiently via agricultural extension staff and through an extensive prevalence of training classes. Nevertheless, SRI, which has been successfully introduced all over South East Asia, did not spark any attention in governmental programs in most of the Mekong Delta so far[171].

Further socio-economic barriers have arisen due to a lack of **diversification**. Firstly, such barriers existed due to a lack of *agricultural* diversification. The existing diversification policies for the whole Mekong Delta have already taken effect (Nguyen Duy Can et al. 2007; see section 3.1.2), but at the level of regional land use structures and not at a local farm level (see sections 5.2.3 and 8.1). At the local level, rigid land use plans, a lack of awareness- and capacity-building with regard to alternative and additional production types, and the preference for inflexible protective infrastructure measures seem to be major factors hampering the diversification of primary production (Garschagen et al. 2012; see section 3.1.4). Making land use plans more flexible, providing greater decision-making powers to farmers, and supporting their decisions with know-how to diversify could, accordingly, overcome an important barrier to susceptibility reduction.

Secondly, diversification should and does already take place by finding *non-agricultural* sources of income, mainly in places further away (see sections 3.1.4, 8.2.1 and 8.2.2). Employment opportunities have so far mainly been found in large cities such as Ho Chi Minh City or Binh Duong. The jobs which await people there promise higher incomes than in rural areas but they also come at high costs. Those costs comprised more than just financial costs (see section 8.2.2). It was *soft* factors such as the strong bonds to the family, traditions and rural lifestyles which determined the perceived quality of a strategy the most. Sweeping these factors out of the way may be neither possible nor desirable. What can and should, however, be done is a weakening of the push factors. In this way, people migrate to the cities not because they are forced to but because they prefer to go. An important prerequisite necessary to this end is the existence of employment opportunities on site. The rural industrialisation policy of the national government already strives for exactly these developments (see sections 3.3.2 and 8.2.4). Nevertheless, besides the creation of jobs, these planning processes also produce new push factors. Many households, for instance, will lose their land in the course of a resettlement without even knowing whether or where they will be resettled. To create opportunities, instead of further barriers (or even limits), it is, firstly, essential to inform and involve the local population in the planning processes and, secondly, to offer specific professional education and training (see the following section 9.3 for more details).

Further socio-economic barriers have arisen from the ecological **interconnectedness** coupled with social and economic processes and structures. Being at the lower end of a large river system, the water resources in the research area were determined by upstream activities (see section 3.1.1). Upstream–downstream conflicts were accordingly bound to occur. Given the rapid agricultural, economic and hydraulic developments, particularly in the riparian states of Cambodia, Laos and China, existing international water conflicts are likely to accelerate and new conflicts are predicted to arise (Künzer et al. 2012; see section 3.1.4). These international conflicts are often observed in the literature coming to the concerted conclusion that it is the most vital challenge to strengthen international efforts in integrated water resource management[172] (IWRM). Interregional or

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[171] The GIZ Tra Vinh started a pilot project to promote SRI in 2011. This is the first one of its kind in the whole Mekong Delta, however (OI-P-GIZ-1101).

[172] IWRM is a "process which promotes the co-ordinated development and management of water, land and

interprovincial conflicts have, in contrast, rarely been assessed so far. In addition, no major coordination efforts were undertaken by the provincial governments of the Mekong Delta and intra-provincial interconnectivities did not raise much attention among authorities and farmers in the research area (see section 7.2.1). The same held true for water resource management at the district level and below, as the example of the sluice gate operation shows (see sections 8.2.2). Not all the relevant stakeholders or administrative levels were involved, and institutionalisation did not comply with the principles of cross-sectoral management or social and ecological sustainability. It is therefore of central importance to create institutions for Mekong Delta-wide and interregional IWRM rather than only putting the focus on international IWRM (e.g. represented by the Mekong River Commission). Moreover, the principles of IWRM have to be translated in more operationalisable and concrete terms so that the plans do not only exist on paper but are also implemented in practice.

9.3 Knowledge-related and cognitive barriers

Another key category of barriers is related to knowledge and cognition[173]. In contrast to Jones’s (2010) grouping of barriers, which assumes that cognitive barriers are social whereas knowledge barriers are human and informational, this study argues for a joint analysis of cognitive and knowledge-related barriers. Firstly, knowledge-related and cognitive aspects mainly arise from the level of individual actors whereas, for instance, technological (grouped as informational barrier) and institutional (grouped as social barrier) drivers arise from conditions outside and inside the place (Turner et al. 2003). Secondly, the target groups for recommended points of interaction differ widely. Knowledge-related and cognitive barriers require measures which act on individuals whereas other social and human-informational barriers often call for action at the higher level. In the following paragraphs, some of the most important knowledge-related and cognitive barriers will be presented.

Knowledge-related barriers are of central importance in their role as **inhibiting factors of response capacity**, in particular with regard to what one can do with the capitals he/she possesses. Here, two main types of barriers are identified and will be outlined in the following paragraphs: barriers which hamper general livelihood diversification and barriers which hamper risk-specific measures.

Firstly, the study reveals that several knowledge-related barriers exist which **hamper the diversification of livelihoods**. A comparatively low level of postgraduate and vocational education seem to have a notable impact, particularly on employment opportunities outside agriculture (see sections 3.1.4 and 8.1). Better vocational or postgraduate education would help with seizing employment opportunities both in large cities and in the planned industrial zone on site (which offer a higher and often more stable source of income than agriculture). As a matter of fact, postgraduate support schemes and vocational training has been in place - but it did not show much effect (see section 8.2.4). In order to improve the effectiveness of the vocational classes, it is necessary to increase the number of training classes and, most notably, to adapt the content to demand – specifically to the demand arising from the planned industrial zone. The local population will only be able to seize the opportunities provided by rural industrialisation if they are able to meet the employment requirements for qualified positions. The planned industrial zone could even open up opportunities for a dual education system where learning takes place both at the work-place and in coupled training courses. This would allow for the development of specialist theoretical knowledge combined with occupational skills specific to the needs of the work place. Considering that the

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related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems” (GWP 2000: 22). Important principles and goals of IWRM relate to stakeholder involvement, cross-sectoral initiative and cooperation between riparian regions and countries.

[173] Most of these were identified by analysing the social-ecological risk context and the decision-making processes (see chapters 5 and 6).

demand for unqualified labour is likely to decrease whereas the demand for specialist knowledge and occupational skills is likely to increase, this aspect is of even greater importance (Reddy 2011; see chapter 3.1.4). Several programs such as the German Education Network for Employability (GENEV) already support dual education development today. They have successfully introduced vocational training in different locations in Vietnam and might also provide a pertinent education model for the research area (GENEV 2012).

Secondly, the empirical findings show that several knowledge-related barriers exist which **inhibit taking risk-specific measures**. Agricultural training classes would provide a promising platform to raise awareness and know-how with regard to water-related risks. They took place on a regular basis, were accessible to most of the households, and induced a change in the production behaviour of the majority of participants (see section 8.2.4). Considering that salinity and flood risk is likely to increase in the future, it is important to mainstream more climate change- and flood/salinity-specific aspects in the training schedules and raise the awareness of new and promising adaptation options. A more participatory approach in collaboration with local farmers and against the background of expert knowledge could be conducive in this context. Such a workshop should, most importantly, comprise an appraisal of location-specific threats and opportunities as well as an identification and evaluation of potential coping and adaptation options. This would impart a better understanding of the risk context, create more trust in expert and scientific information, facilitate the integration of local knowledge, and allow for more adapted solutions in scientifically approved training programs. According to the MARD, similar programs should already exist (see section 3.3.3). In the research area, however, no such public awareness-raising workshop had ever been conducted. The GIZ Tra Vinh implemented similar participatory workshops in the context of climate change (climate proofing workshops; GTZ, IFAD 2010; OI-P-GIZ-1101). Although these workshops were not conducted in the research area, it shows that such approaches are not only theoretically promising but also implementable[174]. Participatory training classes could also serve as a platform for social conflict mitigation if different stakeholder groups were involved. Many of the existing or potential conflicts arose or might arise from the unequal distribution of costs and benefits of certain strategies. Including different stakeholder groups, especially groups with potentially conflicting interests, would not only ensure that the divergent effects of coping and adaptation measures are accounted for but could also serve as a platform for conveying an understanding for the other stakeholders' preferences, interests and goals. Given existing training institutions, this could be realised at comparatively low costs. A particular focus should, in this regard, be placed on profound training for the trainers on participatory and qualitative methods as well as on scientific and expert know-how.

A further, more cognitive barrier arises from too strong a **reliance on the actions of other actors** – in particular on the response measures of other households and government authorities. The reliance on other households' actions became most obvious with the example of the management of commonly shared dikes (see section 8.2). This may not have been a major problem at that time but it could likely become a considerable conflict if flood risks increase. In order to counteract that one household is reluctant to repair the dike because he relies on the neighbour to do it coordination of community action is required. Supporting common interest groups by facilitating a clear distribution of responsibilities could lead to more systematic and reliable management, not only in the case of dike failure but also to prevent failures in the forefront. These common interest groups could also establish a community fund where each member contributes a small and affordable fee on a regular basis. In this way, the individual share of costs in case of dike breakage, which often exceeds the capacity of the poorest farmers, could be borne by this fund. The reliance of households on the government has been shown to be more manifest than the reliance on other households. In particular the illusion of being able to fully control water-related hazards by constructing large dike systems reduced the motivation of individual households to take their own adaptation measures (see

[174] The workshops were stopped in 2010 due to staff turnover and not due to a lack of success or implementability.

sections 3.3.5 and 8.1). It is therefore important to raise awareness with regard to the fallibility of protective and productive infrastructure. In combination with a reinforcement of the farmers’ belief in their own capability to reduce vulnerability, this would strengthen not only the motivation but also the intention to adapt. Participatory training classes, as suggested in the previous paragraph, could serve as an expedient platform to convey such awareness.

At the level of political decision-making, looming climate change and rapid socio-economic transformations issue **new challenges particularly to local policy-makers**. Complex and long-term oriented processes demand for more than the regularly collected household data, limited measurement records and policy planning reports received from higher level (see section 3.3, 4.6, 5.1). Scientific and expert knowledge need to complement this information. However, local authorities appeared to be restrained in making use of scientific know-how and lacked sufficient access to it (see section 8.1.2). It is therefore important to create sources of information which are not only freely accessible but also understandable to non-English speaking people without a scientific background. Moreover scientific information has to be more intuitively accessible and visual. In this way, scientific information can become more “attractive” to local policy-makers and thus the likelihood of it being used can be increased. Geo-information systems such as the water-related information system created by the WISDOM project can fulfil these requirements. The system is web-based and free of charge, provides scientifically solid hydrologic, hydraulic, ecologic and sociologic information and has a user-friendly interface where people can create appealing maps (Künzer, Mehl 2009). In combination with a range of training for local authorities and promotion activities across the Mekong Delta (which has been undertaken throughout the last few years), an information system like WISDOM can become a common tool for more informed decision-making.

The lack of information and a high level of uncertainty attached to the previously mentioned challenges also pose a barrier to more **informed decision-making at the household level**. Many response mechanisms can, for instance, only be effective if timely and reliable information about salinity is locally available (see section 7.2.3). Researchers at the College of Environment of the Can Tho University took up this challenge and initiated a project called “science for community”. It aims at a timely provision of salinity-related information at the most local level. In contrast to the salinity data presented in chapter 5, the data has not been generated by the HMI but by local farmers and children. They received basic low-cost salinometers and instructions to be able to measure the salinity concentration at the closest canals. The information was transferred via SMS and fed into a web-based geo-information system. Farmers in the study sites could send information requests via mobile and receive an automatic suggestion of appropriate coping and adaption options specific to the current salinity level and the regional context (EI-U-DVN-0424). Projects like this highlight that geo-information is on the rise and no longer only a valuable “raw material” for public or corporate organisations’ decision-making (see Greve 2002: 123) but also for household-led decision-making in remote areas of developing regions. The nearly ubiquitous access to information technologies (particularly mobile phones) presents new possibilities for timely, locally adapted and flexible information transfer.

9.4 Institutional barriers

A large range of barriers and opportunities relate to the institutional setting on site. Also several of the previously outlined challenges are interlinked with the institutions on site - in fact, overcoming barriers to “good” coping and adaptation is nearly always, in one way or the other, related to institutional changes. Nevertheless, there are some barriers and opportunities which are more principally institutional, particularly in the context of evaluation practice. These are therefore singled out in the following institution-specific section.

Being a centrally planned one party state seemed to have led to **elitism and a lack of democratic and**

participatory decision-making (see chapter 3.1.4, 3.3.2, 8.2.3 and 8.2.4.). An often unequal power distribution and the exclusion of some parts of the society from receiving public benefits formed an important institutional barrier to "good" coping and adaptation – most notably from the perspective of distributional justice and equity (see section 8.2.4.). The relation to the hamlet leader and access to mass organisations often determined whether one was on the side of the privileged or on the side of the unprivileged. Overcoming these barriers requires action at the most local level. Firstly, it is important to ensure equal access to mass organisations. This is theoretically established but has not always been practiced. Better control mechanisms to safeguard equal access would therefore be needed. Secondly, political decision-making has to become more participatory and democratic. This might not be easily implementable at the higher level, especially not at the national level, but there are some ways of introducing greater democracy at a local level. Today participation is already included in most public and legal documents, and a large number of the interviewed local households were included in governmental processes on a regular basis. This created a seemingly more pronounced culture of being politically involved than in many democratic states. Nevertheless, in the majority of these cases the degree of participation was at a low level (see sections 8.2.4). By building upon already established official participation requirements, the involvement of the local population at different stages in planning and the safeguarding of equal access to decision-making processes could smooth the way for greater local democracy.

Further institutional barriers have emerged from the **hierarchical state organisation and the subordinate mentality** of authorities and households (see sections 3.3.2 and 8.2.3). These factors often significantly hampered the formation of an autonomous intention to adapt. This led, for instance, to the fact that the agency of hamlet leaders was widely untapped and beneficial initiatives (such as the reciprocity-based support scheme of the hamlet leader in Ba Cum) often failed to appear (see section 8.2). Regular meetings between hamlet leaders from different regions could raise awareness of potential support schemes and present good-practice initiatives from other hamlets. This would not only increase the awareness of promising adaptation options but would also provide incentives to act. Kroemker and Mosler (2002), for instance, argue that the subjective evaluation of a strategy is not only based on potential financial benefits but also on the desire to meet the expectations of others and on other social incentives. This argumentation points out that the presentation of one's own initiative as a good-practice example pays tribute to the hamlet leader and provides motivation to act - also to the other hamlet leaders.

The highly **technocratic nature of the system** (Fortier 2010; see section 3.3.5) creates further institutional barriers (strongly linked to knowledge-related barriers). Generally, there exists an extensive data basis in Vietnam (see chapter 4.6); in particular, quantitative data are appraised regularly and in a timely fashion. Most of the data originate at the most local level where the hamlet leader collects information from each household in the hamlet on a regular basis. The long-term nature of socialist planning also provides a theoretically good basis for adaptation. Nevertheless, quantitative data and planning scenarios seemed to be taken for granted in many cases and were treated with too little scepticism. The promise of certainty in domains of uncertainty involves the danger of not being sufficiently prepared if barriers or opportunities are different than assumed or develop differently than predicted. This is of particular importance in the context of climate change (see section 2.3.2). To support more flexible no-regret options and hamper a mere focus on irreversible infrastructural measures, it is important to be more open with regard to the reliability of data. Government-promoted scenarios, in particular, have to be critically questioned. Despite a copious data basis, there is substantial room for improving the quality of existing data sets, planning documents and scenarios. Firstly, the appraisal of more qualitative and participatory data could serve as a basis for triangulation and could convey a feeling of ownership, understanding, and cooperation among different stakeholders. Secondly, the existing scenarios and planning documents should be developed in a more integrative and multi-dimensional manner. Climate change scenarios should better account for socio-economic and infrastructural development whereas socio-economic planning should account for climate change. Thirdly, transparency with regard to data source, methodology and quality should be strengthened. Fourthly, it is recommendable to rather reduce the load of reporting and compile fewer but more detailed reports.

Further institutional barriers have arisen in the context of **evaluation practice**. Overall, a lack of regulations and official demand for evaluations from the higher level, an unclear structure of responsibilities, vaguely defined criteria, and insufficient control mechanisms prevented evaluations of household and governmental strategies at various administrative levels (see sections 3.3.5. and 8.2.4). Accordingly, technical cooperation with the Vietnamese government which supports the implementation of a more encompassing, concrete and detailed evaluation system would be an important first step to arrive at more reliable evaluations. At the local level, it is important to facilitate more cooperation and coordination between NGOs, development organisations, researchers and the local government. All have some kind of evaluation or data interest which could be, at least partly, fulfilled by the existing resources and previous studies of the other institutions. To achieve more reliable and objective evaluations one could think about training and formally approbating independent evaluators. It is debatable in how far this is politically assertive, however. At least for international donors, it could be helpful to employ local independent evaluators rather than having evaluations only undertaken by local officers or by international experts.

Methodological shortcomings in evaluation practice constitute another group of institutional barriers. To overcome some of these barriers it is important, firstly, to account for different evaluation approaches and criteria. So far, the government puts predominantly efficiency-based economic evaluations in place. These evaluations are in most cases even more of a budgeting for superior authorities than an actual economic evaluation (see sections 3.3.5 and 8.2.4). Environmental criteria are almost only assessed in Environmental Impact Assessments (EIAs) which are, in addition, often not conducted where officially required. Other more process-based criteria may be included in the national strategies on disaster risk reduction (NS-DPCM) and climate change adaptation (NTP-RCC) but seem to have been rarely used in evaluation practice. Secondly, it is important to increase local participation in evaluation practice (see section 9.3 for more details on how to increase participation). This would not only improve the quality of evaluation data but would also raise awareness and the feeling of ownership. Thirdly, it is essential to improve and specify the evaluation guidelines and ensure that these guidelines not only exist on paper but are also met in practice. Fourthly, it has to be acknowledged that the methodological requirements outlined above demand high methodological competence. For this reason it is essential to provide profound training for evaluators, especially in qualitative and participatory methods.

This chapter has built on the summary and interpretation of the revealed and perceived risks and strategies (see chapter 8) in order to arrive at an identification of the most important barriers and limits to “good” risk-related responses. The insights gained from the empirical findings provided the basis for considering barriers and limits at different levels and delineated locally adapted and context-specific recommendations to overcome the barriers. This provides an expedient basis to address another highly important barrier – a barrier which arises from a lack of appropriate theoretical, conceptual and methodological frameworks to identify and overcome barriers to “good” adaptation and coping. The following chapter will therefore discuss the merits and challenges of the innovative research approach developed for this study.

10 An anatomical, adaptable and actor-oriented research concept – theoretical and methodological reflections

In the course of this research, an innovative framework has been developed for the evaluation of coping and adaptation strategies in a risk-prone environment. This approach builds on four main concepts from different schools of thought:

1) An anatomical view of coping and adaptation strategies and a social-ecological system perspective both of which are derived from vulnerability research

2) A socio-cognitive decision-making model originating in social psychology and adaptation research

3) An approach which builds on a multi-criteria analysis and theory of change-based assessment - both stemming from evaluation research and practice

4) An adaptable and context-specific methodology based on mixed-methods research and grounded theory

The following sections will identify and elaborate upon the challenges, merits and potential advances of these concepts.

10.1 A vulnerability centred-lens for evaluation research – potential advances and conceptual challenges

This research has built on an anatomy of adaptation and coping which takes a vulnerability-centred perspective and is derived from research into coupled social-ecological systems, disaster risk and climate change adaptation.

An **anatomical view** of adaptation and coping has been shown to support the claim for grounding evaluations “in the context, scale, sector, and nature of the endeavour**”** (Bours et al. 2013: 9)**.** This argument has been made by several authors in the field of evaluation (see also Jacob, Mehiriz 2012; UNFCCC 2010) but has only been taken up by a small share of studies so far (see sections 2.1.3, 2.3 and 2.4). Smit et al.’s (1999) anatomy concept provides a tool for a systematic operationalisation of this claim. It acknowledges the characteristics of the hazard and the vulnerability context within which an agent responds to the hazard. This PhD research has shown that a *context-sensitive* view is an important prerequisite to grasp two of the most relevant quality criteria in more depth. Firstly, it provides a solid information base to assess the *relevance* of coping and adaptation. Only through understanding the nature of water-related risks was it possible to acknowledge the need for action (e.g. changing salinity-risk patterns challenge the guiding principles behind sluice gate management and demand a more future-oriented institutionalisation, see section 8.2.4). Secondly, the analysis of the risk context within which action is performed facilitates a judgement of the *overall utility* of a response (e.g. the ultimate effects of changing the crop on household vulnerability can only be effectively scrutinised when vulnerability indicators and a detailed picture of vulnerability patterns have been established beforehand, see section 8.2.2).

The merits of a context-sensitive evaluation approach are, nevertheless, also accompanied by *challenges*. Resource scarcity, with regard to time and budget, restricts the level of detail with which an assessment can be undertaken. The more encompassing the selection of research objects is, the less detail can normally be achieved with regard to each of these objects. To ensure a profound enough data basis, it was important to apply an approach which is both strategic and flexible. A conceptualisation of risk which builds on an incrementally developed set of context-specific and multi-dimensional analytical components has been shown to meet these requirements.

This research has thereby built upon concepts from **coupled social-ecological systems** research grasping the risk context within which each agent performs actions. Even though an in-depth analysis of each of these coupling processes has not been possible within the scope of this study, the perspective of coupled social-ecological systems has provided several decisive insights for a context-specific and vulnerability-oriented evaluation – most notably that vulnerability: 1) arises from an interaction of social and ecological factors (e.g. flood exposure has been shown to be a function of geophysical as well as infrastructural and institutional features), 2) acts on different spatial scales and regions which are interconnected (e.g. the vulnerability-related implications of sluice gate management were divergent with regard to actors and scales), and 3) is highly dynamic (e.g. susceptibility patterns are transient in nature due to short-term changes in production patterns and cropping calendars). Vulnerability patterns thereby appeared to be an intermixture rather than a conglomerate of distinct analytical components.

In the conceptualisation of this intermixture of vulnerability components, it has become expedient to distinguish between **threats** (function of hazard exposure and susceptibility) and **capacities of response** (encompassing both the capacity to cope and the capacity to adapt). Instead of focusing on what is system-external and system-internal, as has often been argued in the literature (see e.g. Bohle 2001), the study differentiates between what one should do (based on the revealed threat) and what one could do (based on the revealed capacity of response). This adds a more action-oriented perspective to the debate about the nature of vulnerability. The Sustainable Livelihood Approach provides an appropriate basis for operationalisation of the components of vulnerability in this respect. In particular, the encompassing definition of a household's capital endowment served as indispensable foundation for grasping the character of vulnerability on multiple dimensions and scales (see section 2.1.3). The findings, however, also emphasised that the capacity of response is not a mere function of the capitals that one possesses but depends on the specific strategy for which they are needed (e.g. production-specific know-how is vital for applying most of the strategies in the agrarian setting of Tra Cu district but loses its relevance when people need to migrate). Considering that climate change implies the need for other or entirely new response measures, attaches even greater importance to this aspect. It highlights that capacities which are needed for climate-resilient development might fail to be addressed by merely counting the available assets.

The study has, furthermore, identified a range of relevant and purposeful strategy classifications and has demonstrated their value for various fields of research. One essential differentiation is based on Smit et al.'s (2000: 230) argumentation that adaptation takes place either as a direct response to the hazard or as an indirect response to the impacts of the hazard, i.e. the differentiation between **direct *risk-specific* strategies** and indirect or ***general*** **risk-related strategies**. This was of importance for several reasons. Firstly, the consideration of measures applied in various risk contexts indicates the *relative importance* of flooding and salinisation in the research area (e.g. the fact that most of the *general* risk-related strategies are applied in response to flooding/salinity and only comparatively few in response to other risks like health or commodity prices highlights the relevance of flooding and salinity risks). Secondly, it points out *potential* risk-related strategy options, including their subjective acknowledgement and their perceived quality. These strategies may not have been applied with regard to salinity and flooding at the time but *should or could* be applied in the future when risk patterns change (e.g. selling land or changing the crop). Thirdly, this classification supports the argumentation of an increasing body of literature not to address DRM and CCA strategies in isolation from development-oriented strategies (see e.g. IPCC 2012: 4f; McKenzie Hedger et al. 2008), i.e. *general* risk-related strategies targeting, for instance, economic development are examined against the background of their contribution to disaster risk reduction and climate change adaptation (e.g. vocational training).

The differentiation between **adaptation and coping** has also provided decisive conceptual and empirical insights. In the scientific literature, there is little conceptual clarity with regard to these two terms. Several scholars have an integrated view of coping and adaptation and/or make no clear distinction between them (see e.g. Agrawal 2010; Downing et al. 2004; Wisner et al. 2004: 114) whereas others emphasise the need to have a differentiated view (see e.g. Birkmann 2011a; Schipper, Burton 2009; Korf 2002). The findings of this study support the argumentation for a differentiated view from an evaluator's perspective. In line with what several authors from vulnerability research argue, coping and adaptation have been shown to imply different outcomes in terms of timescale and scope (see e.g. Birkmann 2011a; Schipper, Burton 2009; Adams et al. 1998). The majority of coping strategies have been shown to have a beneficial impact in the short-term but were erosive, as Devereux (1999) terms it, in the long-run (e.g. taking a loan). Most of the adaptation strategies revealed, in contrast, many positive longer-term changes but high costs in the short-term (e.g. investing in farmland, see section 8.2.2). Nevertheless, the outcomes of coping were not always positive in the short-term and negative in the long-run, nor did the opposite always apply to adaptation strategies. These results reveal, on the one hand, that it is important to go beyond either a short-term or long-term oriented view on the outcomes, and rather consider multiple temporal scales. On the other hand, the findings demonstrate that a classification of coping and adaptation may indicate different notions of outcomes but does not carry a definite quality-statement with regard to the outcomes (i.e. adaptation is not "good" by default and coping is not necessarily "bad" in the long-run).

A distinction which partly underscores this finding is that of **resource-depleting and resource-augmenting strategies** – a distinction which has not yet been made by the literature. The empirical findings reveal that resource-augmenting *adaptation* strategies are neither cost-intensive in the short-term (a commonly mentioned disadvantage of adaptation) nor are resource-augmenting *coping* strategies erosive in the long-term (a commonly mentioned disadvantage of coping). Strategies which predominantly rely on human capital (e.g. applying a new agricultural technique) can accordingly augment rather than deplete the stock of human capital and are thereby both affordable in the short-term and promising with regard to their impacts in the long-term (see section 8.2.1). An acknowledgement and a strategic promotion of resource-augmenting strategies can therefore contribute to *better* CCA and DRM.

The research also presents the merits of a distinction between **autonomous and heteronomous strategies** for further scientific research, particularly against the background of different state systems. In the given research context, where the state has a strong influence on people's everyday life, a number of strategies were at the same time autonomous and heteronomous (see section 8.2.1). This challenges the seemingly clear distinctions made between autonomous and planned as well as the distinction between formal and informal adaptation (see e.g. Birkmann 2011a; Fankhauser et al. 1999). Moreover, it can make household-led adaptation, which is theoretically defined as a proactive autonomous measure for reducing vulnerability (see section 2.4), into a reactive heteronomous action (as it is lead by state actions). Accordingly, such hybrids of strategies also question the definitions of adaptation and coping and should be taken up in the conceptual debate and in the "catalogue" of response classifications.

In conclusion, a vulnerability-oriented assessment of the risk context serves as solid basis to not only better understand the nature and quality of risk-related strategies but to outline more context-specific recommendations for action than other evaluation studies would have been able to achieve.

10.2 Merits and challenges of integrating socio-cognitive approaches in the assessment of risk-related strategies

This research also integrates concepts of socio-cognitive decision-making and subjectivity-based evaluations in its context-specific evaluation framework. These have been derived from social psychology and adaptation research. The focus of this concept lies on a differentiated analysis of the perceived threats and competences of actors in a risk-prone environment (mainly based on

Grothmann, Reusswig 2006; Grothmann, Patt 2005; see section 2.4.3). In line with the argumentation in the previous section, this classification distinguishes between what one thinks he/she *should* do (perceived threat) and what one thinks he/she *could* do (perceived competence)**.** It thereby adds a more action-oriented view of risk perception. A conceptualisation of risk perception in accordance with the suggested vulnerability framework improved its operationalisation and comparability of perceived with revealed risks and has therefore been vital in this research. Despite the merits of such an explicit coupling of risk perception and social-ecological risk concepts, little attention has been given to it in vulnerability and evaluation literature to date (see section 2.2).

The analysis of the **individual appraisal of threats**, i.e. the perceived hazard exposure and the perceived susceptibility (see section 2.2 and 2.4.3), has provided critical insights for the given research context and for future research. An issue which has rarely been addressed in the decision-making literature to date is the dynamic nature of risk perception (see section 2.2). Being strongly grounded in a dynamic conceptualisation of vulnerability, this research was able to analyse the *perceived* threats against the background of diverse changes. The empirical findings have thereby revealed that the changes in threat perception were both substantial and transient in nature (see section 8.1.2) - an important finding which would not have been made if it had not been for the dynamic perspective of risk perception. Findings like these carry insightful implications for understanding how to convey a realistic and more long-term oriented perception of present and future threats.

The analysis of perceived threats also imparts important information for evaluation by revealing the *perceived* relevance of taking action, i.e. an important quality criterion for subjectivity-based judgements of a strategy. This provides a good basis of comparison with respect to the *revealed* relevance of taking action (e.g. tidal flood-related threat perception of authorities seemed to contradict the recorded exposure and losses experienced by farmers).

An exploration of **individual competence appraisal** has been of particular importance in the current research context. It is an analytical component which has been taken up by many researchers in the field of socio-cognitive decision-making (see e.g. Grothmann, Patt 2005; Rogers 1983; Bandura 1978), but has rarely been addressed in other fields. Vulnerability and evaluation research, usually assess risk perception merely in its meaning of the individuals' appraisal of threats and neglect the relevance of addressing the perceived capacities to adapt and cope in a beneficial way (e.g. Kasperson et al. 1988; Burton, Kates 1963; see section 2.2). This research has demonstrated that an analysis of the perceived competences has the potential to advance adaptation and evaluation studies in several respects:

Firstly, assessing the *awareness of coping and adaptation options* has exhibited that people commonly decided against applying a promising response mechanism not because they were not aware of the threats or did not belief in their own competences, but because they were not aware of this option in the first place (see section 8.1.4). This is an aspect of particular importance in a system which is expected to experience substantial changes in the risk context and thereby requires entirely new response mechanisms. Given that people are rarely aware of such options at present, it is far from likely that these options are put into practice. This underlines the relevance of raising awareness with respect to the diversity of potential practices in order to improve the capability to make informed and preference-based decisions.

Secondly, the assessment of *perceived self-efficacy* has, amongst other things, contributed to finding a more appropriate and actor-oriented definition of the capacity of response. The empirical results demonstrated that the indicators for the perceived capacity of response varies, sometimes significantly, between different actor groups seemingly irrespective of the differences in their capital endowment (e.g. wealthier farmers perceived a lack of financial assets more often as restraining factor than poor households did, see section 8.1.4). It is therefore essential not to judge specific indicators of capability as equally important across all stakeholder groups - an aspect which has rarely been addressed in the vast literature on adaptive capacity assessments (see section 2.1).

This research also highlights the need to analyse **risk perception against the background of socio-cognitive determinants** (see section 2.2). The acknowledgement of risk amplification through social discourse has, for instance, indicated the most important channels influencing a household's risk perception (i.e. oral exchange with neighbours and local authorities, see sections 8.1.2 and 8.1.4). It is therefore an important analytical tool to reveal efficient context-specific ways of raising awareness and risk perception. This is of particular value for creeping risks and climate change-related hazards which are widely underestimated but can have detrimental impacts in the long-run. Reliance on other actors has also been an important variable in local decision-making, in particular the reliance on state-led measures. It explains why households lack initiative despite a high risk perception and highlights the importance of strengthening awareness and trust in one's own capabilities to respond in a beneficial way. In contrast to most of the models on adaptation decision-making, the reliance on non-state actors' actions has been integrated in the analysis (see section 2.2.2). This angle highlighted the relevance of the actions of other households in particular (e.g. the reliance on other households with regard to communal dike maintenance, see section 8.1.2) and demonstrated the importance of addressing this aspect more explicitly in future research into adaptation decision-making.

Overall, including socio-cognitive factors in evaluation approaches is an opportune way to identify why some strategies are applied while others are not. This allows for the identification of strategic and actor-oriented points of intervention in order to promote more promising, valued and acceptable measures. In spite of this, evaluation research and practice have rarely included risk perception. Investing in the conceptualisation and operationalisation of socio-cognitive aspects in evaluation approaches might therefore be a seminal area of further research.

10.3 The opportunities and drawbacks of an actor-oriented and context-specific evaluation concept

The evaluation approach of this study considers the risk context by integrating a concept from vulnerability research; it addresses decision-making processes and subjective evaluation through an analysis based on a socio-cognitive model; and it accounts for different approaches from evaluation research and practice. This innovative framework thereby aims for an actor-oriented and context-specific evaluation of coping and adaptation against the background of natural hazards and climate change.

In contrast to most of the current evaluation practice, this study has chosen to consider a strategy's **implication for multiple stakeholder groups**. Particularly in project assessments, the respective target group is at the centre of interest whereas other groups have often been neglected (see section 2.3). For one thing, this perspective revealed divergent spatial and social outcomes of risk-related strategies (e.g. the vulnerability-related implications of the sluice gate operation). For another thing, the comparison between priority-setting at household and government level has explained the differential expectations and valuations with regard to coping and adaptation and revealed a mismatch of *leitmotifs* between political decision-makers on different levels (e.g. the guiding principles behind sluice gate operation presented in section 8.2.4). The divergent outcomes and subjective evaluation-based mismatches have consequently indicated potential and existing conflicts as well as reasons for a lack of acceptance and trust in certain measures (see e.g. the divergent implications of dikes in section 8.2.4).

This evaluation study has not only considered more than one stakeholder group but has also evaluated more than just one strategy. The decision to develop an approach which can facilitate a **comparison between multiple strategies** is based on the assumption that the quality of a strategy always depends on the available alternatives. In a world of scarce resources, an actor cannot simply implement all strategies which seem promising. He/she needs to find the *best*, *second-best or third-best* solutions at hand and make a choice. Despite of this being critical to each and every evaluation only few studies aim for an assessment of more than just a limited number of strategies. The adaptable nature of the proposed evaluation framework enables an evaluation which fits various strategy types and can strategically compare a multitude of strategies with each other. In this way, trade-offs between different strategies could be identified (e.g. long-term vs. short-term oriented strategies) and the quality of one strategy could be judged in relation to another (see section 8.2.2 and 8.2.4 for examples).

The study builds also on a strategic and comparative **consideration of "subjective" and "objective"** evaluations – a perspective which has widely been neglected up to date. Evaluations studies which aim at an "objective" quality judgements have been numerous (e.g. Mechler 2008, Stern 2007) and subjectivity-oriented evaluations have gained importance in the wide field of multi-criteria analyses (Mendoza, Martins 2006). However, a strategic comparison of subjective with objective evaluations can rarely be found in the literature (see section 2.3). In this study, such a comparative perspective has been central. The empirical findings have shown that the evaluation perspective considerably alters the meaning of "good" adaptation and coping. This can lead to the promotion of either objectively promising strategies which are not accepted (e.g. migration) or subjectively prioritised strategies which may have negative implications for other actors or timescales (e.g. winter-spring rice production, see section 8.2.4). A comparison of objective and subjective evaluations therefore carries important implications for finding more sustainable and acceptable development pathways not only for the Mekong Delta but also in a wider regional and conceptual context.

Furthermore, the concept of risk perception suggested in this study provides a framework for strategically **integrating decision-making processes in multi-criteria analyses** (MCA). Most MCAs include a stakeholder-specific criteria weighting and quality judgement in their evaluation concept (see e.g. Debels et al. 2009; Dolan et al. 2001) but very few evaluations are explicitly linked to decision-making processes. The integrated analysis concept of this study goes beyond a mere stakeholder-specific evaluation and looks at how these judgements feed into the decision for or against applying a certain measure. The analytical components of the socio-cognitive decision-making model make it possible to integrate drivers of decision-making in evaluations because they reflect the most common criteria used in multi-criteria analyses. The assessment of perceived self-efficacy reflects *capability- and process-oriented criteria* (e.g. costs or implementability); the perceived response-efficacy addresses *outcome-oriented criteria* (e.g. income effects or environmental effects); and addressing perceived threats enables an analysis of the perceived *relevance* of an action (see sections 8.1.2, 8.1.4, 8.2.4 and 10.1). By explicitly linking subjective MCAs with decision-making models, this approach can accordingly indicate more substantial and concrete ways of promoting promising and acceptable measures (e.g. how to strengthen the acceptance of training classes; see section 9.3).

The study also highlights the need to consider more than one evaluation approach. The empirical results revealed that **different evaluation approaches** sometimes implied contrary quality judgements of the same strategy and thereby demonstrated how essential it is to cross-check different evaluation methods (see section 8.2.4). This has rarely been done in evaluation practice and research - also because the consideration of various evaluation approaches comes at the expense of a more detailed information basis than studies which focus merely on one type of evaluation (see section 2.3). This study did not, for instance, consider discount rates, calculate net present values, or account for internal rates of return as suggested in most studies focusing on economic evaluations, particularly in the field of climate change (see textbox 2.1). Similarly, a more structured and encompassing criteria-based judgement of governance indicators which is important to most process-based evaluations of strategies could not be undertaken. Instead of more detail in each of these evaluation approaches, the current framework provides a more holistic picture and thus meets more explorative purposes – conceptually, empirically and methodologically. The study thereby points out central aspects which are often forgotten, questions seemingly absolute quality statements, and provides a good basis for further, more in-depth evaluations, concepts, and methods.

An encompassing and interdisciplinary approach like this demands a conscientious and adaptable methodology which acts on different scales and dimensions. The preceding section will discuss as to how far the methodological approach chosen for this research could meet these requirements.

10.4 A promising and challenging methodology for actor-oriented and context-specific assessments

The complex and multi-dimensional nature of the previously discussed evaluation framework demands the *„widest array of [...] methodological tools that we possess“* (Trow 1970: 7, see chapter 4.1). The innovative **mixed-method approach** suggested in this study has been able to make use of the *widest array* of methods in an integrated and expedient way. On the one hand, a set of qualitative and participatory tools have accomplished explorative purposes and facilitated an assessment of complex processes and subjective meanings. On the other hand, a set of quantitative tools was able to achieve a certain level of representativeness, generate a sound basis of social and spatial comparison, and derive contextual and conceptual generalisations. Nevertheless, financial, administrative and time constraints challenged meeting the requirements of both quantitative and qualitative paradigms to some extent. The varied means of triangulation were therefore essential to ensure the reliability and validity of the study results. The developed mixed-method approach enabled a cross-checking of multiple data sets from both qualitative and quantitative sources. This revealed several, sometimes substantial, mismatches - in particular between primary and secondary data sets (e.g. the disparities between quality judgements of dikes based on secondary vs. interview data, see section 8.2.4). Moreover, a strategic triangulation and conscientious mixed-method process ensured that research phases could purposefully inform and complement each other (see section 4.3). Through such an approach, qualitative research was able to add meaning to numbers and numbers could add accuracy to words, pictures and narratives (Johnson, Onwuegbuzie 2004: 21).

Being a geographic study, the **selection of the research areas and social comparison groups** was an essential part of the methodology. It enabled a contrast of different risk profiles and thereby showed actor- and region-specific patterns and their interconnectivities (see chapter 8). The decision for more than just one comparison group may have come at the expense of the level of detail but implied advantages that were highly relevant to the given research context. The deliberate choice of comparison groups produced data which could enhance claims made by previous studies in the Mekong Delta context (e.g. potential conflict between aquaculture and rice producers) and could challenge the argumentation of others (i.e. the often assumed discrimination against Khmer). Moreover, the comparative nature of this study provided a pertinent basis for drawing conceptual conclusions for future research in the fields of vulnerability, decision-making and evaluation (see section 10.1, 10.2 and 10.3).

The appraisal of **primary data** brought about several challenges - especially with regard to the complexity of some research objects (see section 4.5 and Annex 12.3 for more details about the specific challenges). The field research experiences have illustrated how difficult it is to assess seemingly “objective” risks (e.g. the production-related susceptibility), make individuals’ perceptions explicit (especially goals and subjective evaluations) and empirically “prove” the quality of a strategy (particularly due to the context- and actor-specific disparities in the quality judgement). Some of the challenges were specific to the method used (e.g. quantifying subjective realities by a standardised survey design, see annex 12.3), and others were attached to the attempt to carry out research in a Vietnamese context (e.g. the critical role of gatekeepers, see section 4.6). It was also for these reasons that the presented discussion of empirical findings was not able to provide a ranking of the "best" coping and adaptation options on site (see section 8.2.2 and 8.2.4). In contrast, the data basis facilitated a qualitative understanding of local strategies and served explorative purposes. To ensure adequate reliability and validity despite these challenges, the realities presented in part II were based on a data appraisal that was as thorough and conscientious as possible (see section 4.5 for more details).

An innovative **participatory and actor-oriented approach** has also been vital prerequisite to reach the goals of this research and has the potential to influence the method development of further studies. By including local knowledge and multiple stakeholders, the approach could provide a good basis for conveying understanding of people's own situations and of the characteristics, priorities and problems of the other stakeholder groups. In this way, the methodology not only provided a reliable and valid data basis but created a field of interaction and a space for creating understanding among the different stakeholder groups on site. The study approach thereby implies promising concepts for the development of further transdisciplinary studies which are aimed towards participatory knowledge production, stakeholder involvement and conflict mitigation.

In conclusion, the actor-oriented and context-specific evaluation scheme for local strategies has to be restrictive with regard to the absolute comparability of strategies. It is an approach which is not able to provide large numbers at the end of an evaluation sheet telling you what is better and what is worse. However, it is an approach which provides comparability on another more qualitative level where an integrated understanding is at the fore. The final chapter of this thesis will in the following pages elaborate on the pivotal merits and challenges of this approach, draw key conclusions, and present an outlook for future research and practice.

11 Key conclusions and future outlook

The preceding chapters have illustrated that the opening scene of this thesis describes the Vietnamese Mekong Delta incisively: *water resources and life evolve continuously amidst a vibrant socio-economic setting and a fundamentally changing environment.* It has been revealed that rural livelihoods in the Vietnamese Mekong Delta have been and will continue to be at risk. The prosperous nature of the whole system therefore depends on the nature and values of coping and adaptation strategies. Water, the omnipresent resource in the VMD, creates many of these risks: seawater soaks into the fields; saline water parches the yields; and flooding washes away harvests. Despite their omnipresent nature, water-related risks and strategies present in various appearances. Not all farmers are affected by the same water-related hazard in the same manner; not all people have the same way of dealing with risks; and not all these strategies follow the same goals or: entail the same prospects of success. Successful strategies veritably pave the pathways to a sustainable Delta system in this risky environment. Finding recommendations for action which support "good" coping and adaptation strategies requires, in the first place, a holistic understanding and evaluation of potential strategy options. A context-specific and actor-oriented evaluation of risk-related strategies has therefore been the overall goal of this research.

This final chapter will now synthesise why, how and whether this goal has been reached and elaborate upon the relevance, merits and main drawbacks of this research. It will be illustrated in three sections along the lines of the three main research questions. Each section will thereby, firstly, highlight the underlying motivation for asking the respective question (i.e. describe existing knowledge gaps and needs). It will, secondly, outline how the research gaps were filled (i.e. the research approach) and will, thirdly, concisely and conclusively answer the question based on the research findings. This is the prerequisite for, fourthly, delineating major limits of this study and providing, fifthly, an outlook for future research.

11.1 Influential coping and adaptation decisions in a vulnerability context

Water- and climate change-related risks in the VMD have received increasing attention in recent years – mainly but not only from a natural science perspective. In addition, social vulnerability to these risks has been acknowledged and addressed. Research on the explicit inter-linkages with coping and adaptation processes is, however, still lacking both in the VMD context and on a conceptual level - primarily with regard to actor-specific decision-making processes and strategy-related impacts on multiple scales and dimensions (see sections 2.1 and 3.3). This research has therefore addressed the topic in its first research question by asking how coping and adaptation processes are interrelated with differential vulnerabilities (see section 1.2). To answer this question, the study developed an approach which is based on a vulnerability concept that considers different stakeholder groups (especially formal and informal actors), includes temporal dynamics, and accounts for social-ecological coupling processes. In order to make the inter-linkages with decision-making and evaluation concepts explicit, the vulnerability framework was aligned with a socio-cognitive decision-making model and was mainstreamed into evaluation perspectives (see section 2.4).

This innovative viewpoint unfolded the *relevance* of taking action. Not only are the people living in coastal areas threatened by water-related hazards and climate change but these people also seem to *feel* threatened by them. The perceived relevance may not necessarily coincide with data measurements and the majority of people may not be aware of the scientific dimensions of climate change but the threats seem to convey ample motivation to take action (see section 8.1.1 and 8.1.2). Hence, water- and climate change-related risks matter and taking risk-related measures is of high importance. Despite of this, adaptation measures were rare and seldom specific to the given risks, most notably at the household level. This was not only the result of the often cited low capital endowment in rural and coastal areas of the VMD or among ethnic minorities but has also been influenced by the perception of too low a competence to be able to respond (see sections 8.1.3 and 8.1.4). Driven by the revealed and perceived risks the households mainly adopted and preferred measures which targeted an incremental change in the capacity of response (see section 8.2.1). At the government level, in contrast, measures which aimed at transformative exposure reduction were applied and preferred (see section 8.2.3).

The findings accordingly reveal essential inter-linkages between vulnerability, related response mechanisms and decision-making. They did thereby not only answer the first of three central research questions but have also indicated fields which require further more in-depth research. Despite the complexity of vulnerability-related interconnectivities and the relevance of this aspect for various study contexts, it has rarely been a topic in the large body of vulnerability literature. It is therefore an interesting focal point for further studies in the field of rural development, natural hazard-related risks and climate change adaptation where social-ecological and temporal interconnectivities play a central role by default. The empirical analysis identified critical interconnectivities relevant to the whole of the Mekong Delta which have not been strategically scrutinised yet and can also add to the conceptual debate (see the following paragraphs).

The interconnectedness of production patterns was one of the most significant examples for a widely neglected but highly relevant field research. The conflict between aquaculture, sugarcane and rice producers implies decisive insights for other coastal regions. It represents the overall role and limits of hydraulic infrastructure in a struggle for agency and ascendancy between various stakeholder groups. It has thereby been shown that this is a struggle driven by vulnerability patterns and individual goals of households, but political institutions ultimately were the ones to tip the scales. The current research concept provides a diagnostic frame for addressing all these aspects in an integrative way. However, in the scope of this study, only the level of rice producers in Tra Cu district could be researched thoroughly. Further research into this topic which also looks at the other actors could not only provide a more in-depth insight into the social dimensions of hydraulic developments and diversification policies in the VMD (see section 3.1.2), but would also be a pertinent example to advance a conceptualisation of interconnectivities on multiple levels. A strategic transdisciplinary approach which involves different stakeholder groups might provide a reliable data basis whilst simultaneously creating a field of interaction for actors with conflicting interests. This puts field research on another level - a level where the methodology is a direct means to achieve the goal of more considerate, coordinated and preference-based decision-making at the most local level.

The current research concept applied in a vibrant context like the VMD would also be a foundation to developing adaptable and diagnostic scenarios of sustainable development pathways. Scenarios up to now mainly follow either the predictions from “hard” sciences or idealised political planning documents. This is even more so in a technocratic and hierarchical system, as is the case in the Socialist Republic of Vietnam. The strong belief in the scenarios promotes transformative, largely irreversible and commonly cost-intensive infrastructure measures. In a field of large uncertainty these can easily trap actors in a pathway which may – in the future – not seem as promising as today or which may be beneficial to some households but lock others into an undesirable point of no return. It is therefore vital to embrace the given uncertainties, involve different stakeholders and create integrated scenarios which account for climate change as well as for social and political transformations. Flexibility can be achieved by providing local agents with the skills and knowledge needed for making informed decisions. Participatory awareness-raising and scenario development workshops can contribute to achieving competent, preference-based and sustainable local decision-making. Moreover, these workshops would reveal locally preferred development pathways against the background of social-development plans and climate change scenarios.

The previous paragraphs have elaborated on the influential and dynamic linkages between coping/adaptation decisions and the vulnerability context. They have thereby revealed that the distinct nature and diverse values of risk-related strategies have played a role in each of these aspects and should feature prominently in the overall catalogue of future research needs in disaster risk reduction, climate change adaptation and sustainable development.

11.2 Distinct nature and diverse values of risk-related strategies

Assessing the nature and value of risk-related strategies is at the centre of the broad field of evaluation studies in science and practice (see section 2.3). It is largely established in development project control and has increasingly been addressed in the field of climate change adaptation – also in its interaction with disaster risk reduction and sustainable development. Nevertheless, only a few assessments consider more than one or two strategies, subjective stakeholder-specific evaluations, implications beyond the target group, different evaluation approaches and links to dynamic vulnerabilities on multiple scales. This research has asked for ways of understanding the quality of strategies in a more encompassing way (see research question 2 in section 1.2). It has therefore developed an adaptable evaluation approach which integrates all the above mentioned aspects (see section 2.4).

Building on this approach, the study has revealed that households often preferred or disliked strategies not primarily because of their positive or negative income effects (as is often assumed) but because of their long-term effects and/or more soft-factors (e.g. migration, see sections 8.2.2 and 8.2.4). Along the same lines, some strategies were judged to be "good" under one approach while another approach would categorise them as "bad" (e.g. sluice gate operation); or practices were beneficial/necessary at present but seemed to have negative implications for the future (e.g. growing winter-spring rice). This depicts that the "quality" of a measure cannot always be grasped by common quality criteria, is distinct and dynamic and is often more an intuition than a strategic judgement. The adaptable, actor-oriented and vulnerability-based evaluation framework developed for this study could not and did also not intend to provide "big numbers" as CBAs can or absolute "judgements" as requested in most project proposals - but it could convey an understanding of diverse values and the distinct nature of coping and adaptation in a risky environment. Given the rising risks due to a changing climate and ever more dynamic social transformations in many regions of the world, such approaches deserve to find greater attention in the scientific and public debate in future.

An incisive conception of altering goal structures and priority setting can reveal influential implications for research into more comprehensive and actor-oriented evaluations. The current research has touched upon this aspect but it has been out of its scope to go into greater depth with respect to the dynamics of individual preference structures. A life history-based assessment of changing priorities could be a valid approach to this. A country like Vietnam which has experienced a pervasive transformation after the Doi Moi reforms in the 1980s might be a promising study region for such analyses. An assessment of past government modernisation paradigms in comparison with changing goal structures at the household level could indicate how governmental *leitmotifs* change priority-setting at the local level. In the same vein, an analysis of the influencing power of international donors and increasingly globalised norms versus the still highly influential sphere of traditional values might open up new perspectives on global and international governance regimes. The conceptual and methodological framework suggested in this research could offer a starting point for an assessment of the dynamics of local preference structures initiated by a changing political, economic and social system. The scholarly works on the dynamics of vulnerability could contribute an interesting classification of coping and adaptation based on changing priority-setting along the lines of dynamic vulnerability patterns (see e.g. Watts, Bohle 1993; Corbett 1988; see section 2.1.3).

On the other hand, also an advancement of more structured evaluation approaches is of central importance for identifying sustainable development pathways in a transforming social and physical environment. The current research had predominantly explorative objectives and aimed at developing an innovative approach for more comprehensive evaluations. It achieved the identification of promising evaluation frameworks and outlined their limits. This perspective thereby provides a pertinent basis for improving future evaluations which focus on one approach only. Economic evaluations, for instance, offer a strategic and comparable assessment method for disaster risk reduction in a changing environment. Environmental economics provides in this respect a set of tools which enables the attaching of values to non-marketable and intangible goods for the past, present and future (e.g. contingent valuation, net-present values, choice modelling). These assessments can thus go beyond the often assumed focus on merely financial and physical assets in economic evaluations. Nevertheless, economic evaluations still widely lack flexibility, rest on restricted and unrealistic assumptions and provide too absolutist quality judgements. A cost-benefit analysis which is considerate of the context-specific nature of strategies, embraces uncertainties more explicitly, and involves other evaluation approaches (even if they are not undertaken in more depth) can compensate for several of these drawbacks. In a society which is dominated by technocratic and positivist expectations of science, as is the case in Vietnam, such an approach might find more attention than an explorative study because it is based on seemingly factual knowledge and hard statistics. It would, however, also account for other, more soft, factors and promote greater flexibility and openness in adaptation planning.

Based on these lines of argumentation, one can conclude that assessing the distinct nature and diverse values of risk-related strategies is complex, multifaceted and inevitable at the same time. The context-specific and actor-oriented approach of this PhD project has unfolded that one of the greatest claims in this respect is the need to go beyond the evaluation of strategies towards an identification of the barriers of “good” adaptation and coping.

11.3 Promoting “good” adaptation and coping

In recent years, research in the field of climate change has increasingly acknowledged the barriers and limits of adaptation. Along the same lines, this study has sought obstacles to adaptation/coping and aimed to carry the conceptual discussion in this field forward. In line with the existing diagnostic approaches, it is considerate of the adaptation process and structural elements (see e.g. Moser, Ekstrom 2010). However, by taking an evaluation perspective and integrating decision-making processes, it goes beyond existing approaches for identifying barriers (see section 2.5). This research has therefore not only asked for the barriers of adaptation but for the barriers of “good” adaptation and coping (see research question three in section 1.2).

It has been revealed that a context-specific and actor-oriented evaluation approach is a necessary basis for identifying barriers to “good” adaptation and coping. Only in that way, was it possible to identify barriers and limits at multiple temporal and spatial scales, identify barriers which arise at the level of individuals’ decision-making, and add a qualitative notion to the identification of barriers. The study has incrementally developed an appropriate concept stemming from different lines of thought and theories. It builds on an integrated framework which encompasses a vulnerability concept from social-ecological systems research; involves a decision-making model from social psychology and adaptation research; and consistently integrates these approaches in an evaluation based on multi-criteria analysis and theories of change (see section 2.4). An analysis along the lines of this framework revealed, for instance, that the socio-political transformation of rural livelihoods in Vietnam have not only torn down many barriers but created various new and challenging obstacles to sustainable coping and adaptation (see section 9.2). The promotion of de-industrialised and diversified income generation could create a way out of the underlying dependencies. This would, however, require overcoming some of the most essential knowledge and cognitive barriers (see section 9.3). Changes to the existing vocational training and agricultural extension system thereby seem to be a promising entry point. Many of the given barriers have also arisen at the institutional level (see section 9.4). The research revealed that it is, in this respect, necessary to strengthen the existing evaluation system, increase the coordination between different actors, and counteract elitism, a lack of participatory decision-making, and the technocratic nature of the system.

The current framework provides a pertinent way of identifying more than just economic or political barriers to “good” adaptation and links it to the upcoming debate about barriers to more inter- and intra-generational equity. The approach thereby offers empirical and generalisable evidence which can help overcome these barriers and strengthening equity in the research area, the Mekong Delta and in the wider regional and international context (see section 10). It was, however, beyond the scope of this study to take a closer look at the legal, institutional and cultural feasibility for implementing the measures suggested in this study. It is therefore important to go one step further and strategically identify promising processes to bring these recommendations into action. This requires, firstly, an assessment of the legal framework in the respective country or region and an identification of potent “agents of change”. Secondly, cultural norms and sanction mechanisms have to be examined in more detail – particularly as knowledge-related and cognitive barriers can only be overcome when considering these. Thirdly, international and inter-regional coordination mechanisms and institutional frameworks have to be looked at in greater depth. Fourthly, mechanisms for influencing the research agenda and monetary endowment of research institutions have to be found.

The study has also indicated that some of the *perceived* limits may not be limits in “*real”* terms (e.g. seemingly inviolable rules from higher level authorities; see section 9.1); limits to one system can be resolved by actors and institutions in other, often more distant arenas (e.g. changing risk patterns due to sea level rise; see section 9.1); and several of the limits which occur today can become barriers in the future (e.g. new agricultural technologies may counteract natural limits of production). The IPCC AR 5 addressed these obstacles by having introduced the term “soft limits” (Alam et al. 2014 based on Moser, Ekstrom 2010; Adger et al. 2009). The findings of this study highlight the significance of this category of obstacles and the dynamic nature of barriers and limits, in particular against the background of a high likelihood of climate change-related transformations. Despite of this, these aspects have widely been neglected in the conceptual and empirical debate. It is therefore up to future studies to convey more incisive conceptions and insights about “soft limits” and scrutinise the distinct meaning of it for adaptation to climate change across scales.

The empirical findings have further demonstrated the benefits of accounting for the quality of an adaptation option in the analysis of limits and barriers (see chapter 10). This quality aspect takes on even greater importance in a system like the Mekong Delta. The substantial environmental shifts which are expected in consequence of sea level rise may require adaptation at a much larger scale or intensity than up to date, fundamentally new adaptation options, or strategies which transform the overall social-ecological system (see argumentation of Kates et al. 2012; Pelling 2011; O’Brien 2012; see section 8.2.4 and 10.1). It is widely argued that such transformative adaptation is more often attached to cost-intensive and irreversible measures than incremental changes. In due consideration of the uncertainties related to the impacts of climate change and the (unintended) consequences of adaptation, it is therefore an essential need to undertake more research with regard to the specific limits and barriers of “good” (particularly flexible, affordable and robust) transformative adaptation.

Overall, the findings presented in this last chapter lead to the conclusion that there is still much research to be done. One of the most essential contributions of this PhD thesis may therefore be found in its potential to influence and guide future scientific endeavours. It has developed an approach which conveys an understanding of how and why rural stakeholders can cope with and adapt to changing risks in a beneficial way. A context-specific, actor-oriented and adaptable evaluation approach has thereby been the basis for deconstructing disparities and providing explanations for distinct patterns. This made it possible to unfold spatial and agentive characteristics which influence the quality of response mechanisms; and display temporal dynamics which explain change and transformation. In the end, this geographic viewpoint has thus been the foundation for understanding the individual nature and various values of coping and adaptation and has thereby contributed to finding more sustainable development pathways for the Vietnamese Mekong Delta.

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A1FI	High emission scenario of the Intergovernmental Panel on Climate Change (IPCC)
ADPC	Asian Disaster Preparedness Centre
Agribank	Bank for Agriculture and Rural Development
ASS	Acid sulphate soils
B2	Medium emission scenario of the IPCC
CBA	Cost-Benefit Analysis
CC	Climate change
CCA	Climate change adaptation
CFSC	Committee for Flood and Storm Control
CTU	Can Tho University
DARD	Provincial Department of Agriculture and Rural Development
DANIDA	Danish International Development Agency
DOLISA	Provincial Department of Labour, Invalids and Social Affair
DONRE	Provincial Department of Natural Resources and the Environment
DRM	Disaster Risk Management
EIA	Environmental Impact Assessment
FA	Farmers' Association
FGD	Focus Group Discussion
GEF	Global Environment Facility
GIZ/GTZ	Gesellschaft für Internationale/Technische Zusammenarbeit
GSO	General Statistics Office
HMI	Hydro-meteorological Institute
IFAD	International Fund for Agricultural Development
IMPP	GIZ/IFAD Programme for Improving Market Participation of the Poor
IPCC	Intergovernmental Panel on Climate Change
MARD	Ministry for Agriculture and Rural Development
MCA	Multi-criteria analysis
M&E	Monitoring and Evaluation
MARD	National Ministry of Agriculture and Rural Development
MONRE	National Ministry for Natural Resources and the Environment
NGO	Non Governmental Organization
NS-DPCM	Natural Disaster Prevention, Control and Mitigation
NTP-RCC	National Target Programme to Respond to Climate Change
OARD	District Office of Agriculture and Rural Development
OLISA	District Office of Labour, Invalids and Social Affair
PC	People's Committee
PCCAP	Provincial Climate Change Action Plan
PRA	Participatory Rural Appraisal
UN-ISDR	United Nations International Strategy for Disaster Risk Reduction
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention for Climate Change
UNU-EHS	United Nations University – Institute for Environment and Human Security
UNU-WIDER	United Nations University - World Institute for Development Economics Research
VMD	Vietnamese Mekong Delta
VND	Vietnamese Dong
VBSP	Vietnam Bank for Social Policies
WISDOM	Water-Related Information System for the Sustainable Development of the Vietnamese Mekong Delta
WU	Women's Union

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12 Annex

12.1 Central research questions and their methodological implications

Research question	Research components	Methods of data and information collection
RQ1: How are coping and adaptation processes on site interrelated with differential vulnerabilities to water-related hazards?		
What determines the vulnerability of households to water-related [...]?	Hazards and exposure Susceptibility Capacities of response	1. WISDOM I results and literature review 2. Governmental reports and statistics 3. Household survey (Production and hh-details) 4. Resource risk maps
What influences the decision-making of different stakeholders in the context of water-related risks?	Perceived threats	1. Participatory risk inquiry and ranking 2. Hh-survey (risk perception and ranking) 3. Seasonal hazard calendar
	Perceived competence	1. Participatory group discussions (strategy inquiry with cause effect diagrams; criteria inquiry and ranking; multi-criteria strategy evaluation) 2. Hh-survey ('would you do it if…' questions; advantages and disadvantages of hh strategies) 3. Migration centred interviews 4. Production-cost-benefit interviews
What are the effects of local coping and adaptation processes on current and future vulnerabilities?	Household strategies	1. Literature review 2. Participatory strategy inquiry with cause effect diagrams 3. Hh-survey (Hh strategy inquiry) 4. Migration-centred interviews 4. Production-cost-benefit interviews 4. Seasonal production and hazard calendar
	Governmental measures	1. Governmental reports 2. Participatory cause effect diagrams 3. Hh-survey (Gov. strategy inquiry) 4. Strategy-centred interviews with authorities
How can social-ecological and cognitive interrelations between vulnerabilities and coping and adaptation be conceptually and theoretically depicted?	Social-ecological system theory Socio-cognitive decision-making models	1. Literature review (literature on risk concepts, decision-making, and adaptation) 1. Exchange with colleagues and experts 2. Preliminary conclusions from field research
RQ2: How are decisions made and strategies evaluated?		
How can coping and adaptation options be characterised by different evaluation approaches?	Evaluation research Adaptation research	1. Literature review (literature on risk concepts, decision-making, and adaptation) 1. Exchange with colleagues and experts 2. Preliminary conclusions from field research
Which quality criteria are	Quality judgements of household responses	1. Participatory discussions (criteria inquiry and ranking; multi-criteria strategy evaluation)

important to different stakeholder groups and how do they evaluate household and government strategies?		2. Hh-survey ('good/bad strategy' questions; advantages and disadvantages of hh strategies)
	Quality judgements of governmental responses	1. Participatory criteria inquiry and ranking; multi-criteria strategy evaluation 2. Hh-survey (advantages and disadvantages of hh strategies; 'good/bad strategy' questions)
Which evaluation-based mismatches arise?	Criteria	1. Participatory criteria inquiry and ranking; multi-criteria strategy evaluation 2. Hh-survey (advantages and disadvantages of hh strategies; 'good/bad strategy' questions)
	Evaluation approach	
RQ3: What are the barriers of and limits to „good" adaptation and coping and how can they be identified and overcome?		
How can „good" adaptation and coping strategies be identified for different stakeholders and timescales?	Current evaluation approaches	1. Literature review 2. Governmental reports (EIA, reporting structure, E&M reports) 2. Pretests (Strategy evaluations) 3. Hh-survey (strategy inquiry and evaluation) 4. Participatory criteria inquiry and ranking 4. Participatory multi-criteria strategy evaluation
	Evaluation criteria	
	Methodology	
Which theoretical and conceptual approaches facilitate a strategic assessment of the barriers to "good" coping and adaptation across scales?	Social-ecological system theory	1. Literature review (literature on risk concepts, decision-making, evaluation research and adaptation processes) 1. Exchange with colleagues and experts 2. Discussion of empirical findings
	Socio-cognitive decision-making models	
	Evaluation concepts and theories of change	
	Other strands of concepts and theory	
What hampers „good" adaptation and coping and how can major barriers be overcome?	Socio-economic barriers and limits	Discussion of empirical findings: 1. Gov. reports 2. Production cost-benefit interviews 3. Hh survey (Hh and production details and strategy inquiry) 4. Migration-centred interviews 5. Strategy-centred and exploratory authority interviews
	Socio-cognitive barriers and limits	1. Participatory risk ranking, strategy & criteria inquiry and evaluation 2. Household survey (Risk perception, strategy evaluation) 3. Migration-centred interviews
	Environmental barriers and limits	1. Gov. reports (EIA, E&M reports) 2. Participatory cause-effect diagrams 3. Household survey (Risk perception, strategy evaluation) 4. Production cost-benefit interviews

Explanation: The table lists the major research questions, its sub-questions, and the conceptual components to answer the questions. The right side of the table depicts the data sources needed to answer the sub-questions in their chronological order (depicted by the numbering before each data source).

12.2 List of interviews

Type[175]	Period	Number of interviews: Officers	Number of interviews: Hh	Interviewee / institution	GD	Level	Purpose	Sampling method	Length of interview
Exploratory guideline-based interview	31.10. - 4.11.2011	3		DARD, DONRE, GIZ		Province	Exploratory interview	Purposive selection of institutions, Interviewee sampling by government authorities	1-1.5 h
		1		DARD		District	Exploratory interview		1 h
		2		PC		Commune	Exploratory interview		0.5-1.5 h
		2		Hamlet leader		Hamlet	Exploratory interview		1-1.5 h
			4	Households		Hamlet	Exploratory interview		1-2 h
	19.-23.12.2011	8		Hamlet leader		Hamlet	Exploratory interview, preparation group discussions (GD)	All authorities in charge in selected research sites	1-1.5 h
		4		PC		Commune	Exploratory interview, preparation GD		0.5-1.5 h
	6.2. - 10.2.2012	3		PC		Commune	Exploration of new hamlets		0.5-1.5 h
Group Discussions (GD)	26.-30.12.2011			Households	4	Hamlet	Risk and strategy appraisal	Interviewee sampling by authorities according to given criteria	3.5-4 h
	9.1.-14.1.2012			PC	3	Commune	Risk and strategy appraisal		3.5-4 h
	27.3. - 6.4.2012			Households	4	Hamlet	Institutional setting	Random stratified sample from survey population	2-3 h
Semi-standardised interviews	9.1. - 14.1.2012	3		DARD, DOLISA, DPI		Province	Risk and strategy appraisal	Purposive selection of institutions, Interviewee sampling by government authorities	1-1.5 h
		2		DARD, FA		District	Risk and strategy appraisal		1-1.5 h
		4		Hamlet leader		Hamlet	Lists of indicators, list of hamlet population, survey preparation	All authorities in charge in research hamlets	0.5-1.5 h
	6.2. - 10.2.2012	10		Hamlet leader		Hamlet			0.5-1.5 h
	26.2. - 15.3.2012		27	Households		Hamlet	Survey interviews complemented with open questions	Random sample from survey population	1-2.5 h
		10		Hamlet leader		Hamlet		All officers in charge	1-2.5 h
	27.3. - 6.4.2012		13	Households		Hamlet	Migration-centred interviews	Random stratified sample from survey population	0.5-1.5 h
Standardised household	6.2. - 10.2.2012		10	Households		Hamlet	Pretest (without enumerators)	Interviewees selected by	1.5-2.5 h

[175] Definitions and characteristics of the different interview types can be found in Annex 12.3.2.

survey								authorities based on given indicators	
	26.2. – 1.3.2012		24			Hamlet	Pretest (with enumerators)	Random sampling from total affected hamlet population	1-2 h
	1.3. - 15.3.2012		98			Hamlet	Long survey interviews		1-2.5 h
			182			Hamlet	Short survey interviews		0.5-1 h
	27.3. - 6.4.2012	10		Hamlet leader		Hamlet	Long survey interviews and general information	All officers in charge	1-2.5 h
	25.5. – 6.6.		312	Households		Hamlet/ Telepone	Complement survey interviews and resolve unclear points	Total survey population	0.1-0.5 h
Visualisation interviews	27.3. - 6.4.2012	10		Hamlet leader		Hamlet	Resource risk maps	All officers in charge	1-2 h
			40	Households		Hamlet	Cost-benefit analyses	Random stratified sample from survey population	1-3 h
Problem-centred interviews	16.4 - 21.4.2012	4		DARD, DONRE, HMI, GIZ		Province	Resolve unclear points	Purposive selection of institutions, Interviewee sampling by government authorities	1-1.5 h
		11		PC		Commune	Strategy-centred interviews and resolving of unclear points		1-2 h
		10		Hamlet leader		Hamlet	Resolve unclear points	All officers in charge	0.5-1 h
Total number of interviews		**80 Officials**	**386 Hh**		**11 GD**				

12.3 Description of data collection methods (on CD)

12.3.1 Secondary literature and data collection

12.3.2 Interviews

12.3.3 Group discussions

12.4 Description of data analysis methods (on CD)

12.4.1 Preparation and analysis of qualitative data

12.4.2 Preparation and analysis of quantitative data

12.4.3 Preparation and analysis of spatial and visual data

12.5 Interview guidelines (on CD)

12.5.1 Guidelines for explorative household interviews

12.5.2 Guidelines for risk and strategy appraisal group discussions (household and commune authority discussions)

12.5.3 Guidelines for risk and strategy appraisal interviews (with authorities on district and province level)

12.5.4 Standardised questionnaire for the household survey

12.5.5 Guidelines for migration-centred interviews

12.5.6 Guidelines for production-centred interviews/Cost-benefit analyses

12.5.7 Guidelines for participatory group discussions about the institutional setting

12.5.8 Guidelines for resource risk map interviews

12.5.9 Guidelines for strategy-centred authority interviews

12.6 Characterisation of interviewees of the survey, migration-centred interviews and production-centred interviews (on CD)

12.7 Hamlet resource-risk maps (on CD)

12.7.1 Map of Tra Cu C hamlet

12.7.2 Map of Bai Xao Doi hamlet

12.7.3 Map of Xoai Rum hamlet

12.7.4 Map of Sa Van A hamlet

12.7.5 Map of Rach Bot hamlet

12.7.6 Map of Ba Cum hamlet

12.7.7 Map of Ba Giam A hamlet

12.7.8 Map of Xom To hamlet

12.7.9 Map of Lo Soi A hamlet

12.7.10 Map of Bau Sau hamlet

12.8 Venn diagrams (on CD)

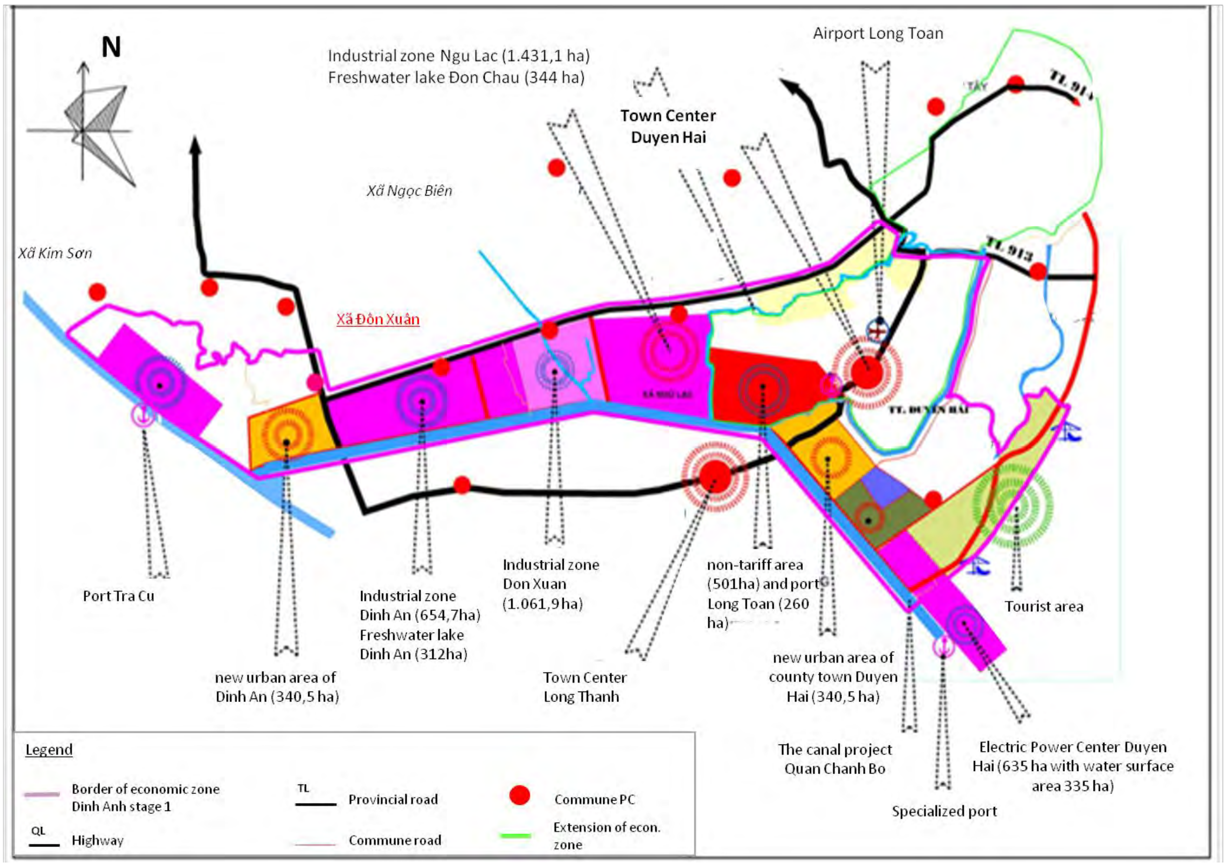
12.8.1 Venn diagram Lo Soi A hamlet

12.8.2 Venn diagram Ba Giam A hamlet

12.8.3 Venn diagram Rach Bot hamlet

12.9 List of hamlet indicators (on CD)

12.10 Map of the functional areas of Dinh An economic zone (planned for 2020)

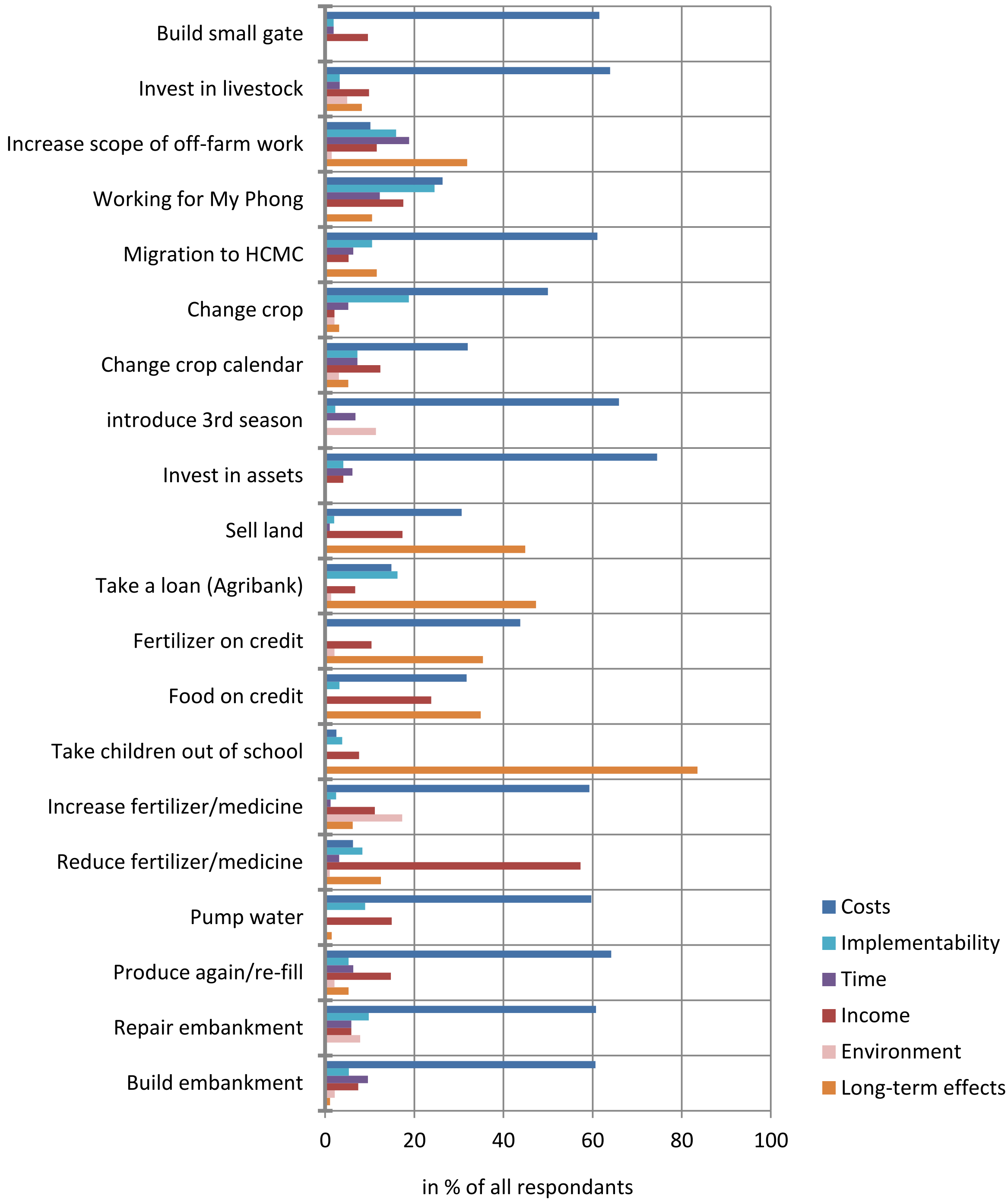


<u>Explanation:</u> The map is based on the governmental plan to transform the south eastern coastal districts of Tra Vinh province in an industrialised zone until 2020. The whole area comprises 15,403 ha which is why a resettlement and transformation of agricultural and aquacultural land is envisaged. Building a large port in Tra Cu district, an airport in Long Toan commune and several smaller and larger industrial zones (one of them in Don Xuan commune) will raise the employment opportunities in the secondary and tertiary sector and is meant to bring trickle down effects to the whole province.

Source: translated and complemented draft, data and cartography by Tra Vinh Economic Zone Authority (2012)

12.11 Relevant advantages and disadvantages of selected strategy options

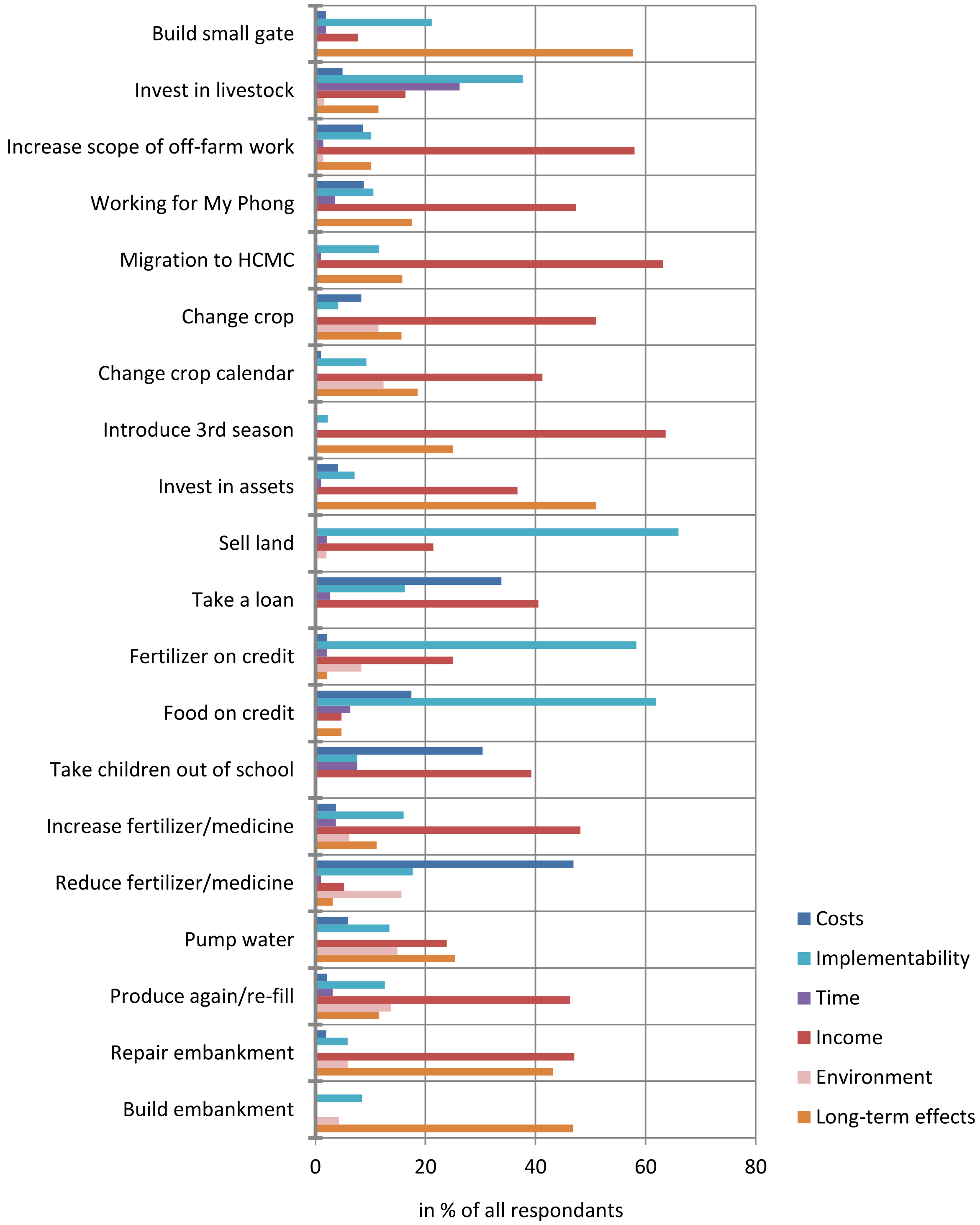
12.11.1 Relevant disadvantages of selected strategy options



Explanation: The interviewees in the survey were asked to name the three most important disadvantages of each strategy enquired in the survey (22 strategies for salinity-affected and 23 for flood-affected households). These evaluation questions were only included in the long questionnaires and were only requested for strategies which were risk-related and relevant for the respective household. In the figure, all the ranked advantages/disadvantages were considered. The x-axis depicts the percentage of households who ticked the respective advantage/disadvantage for the given strategy. The total population is 98.

Source: Household survey, M. Schwab (2012)

12.11.2 Relevant advantages of selected strategy options

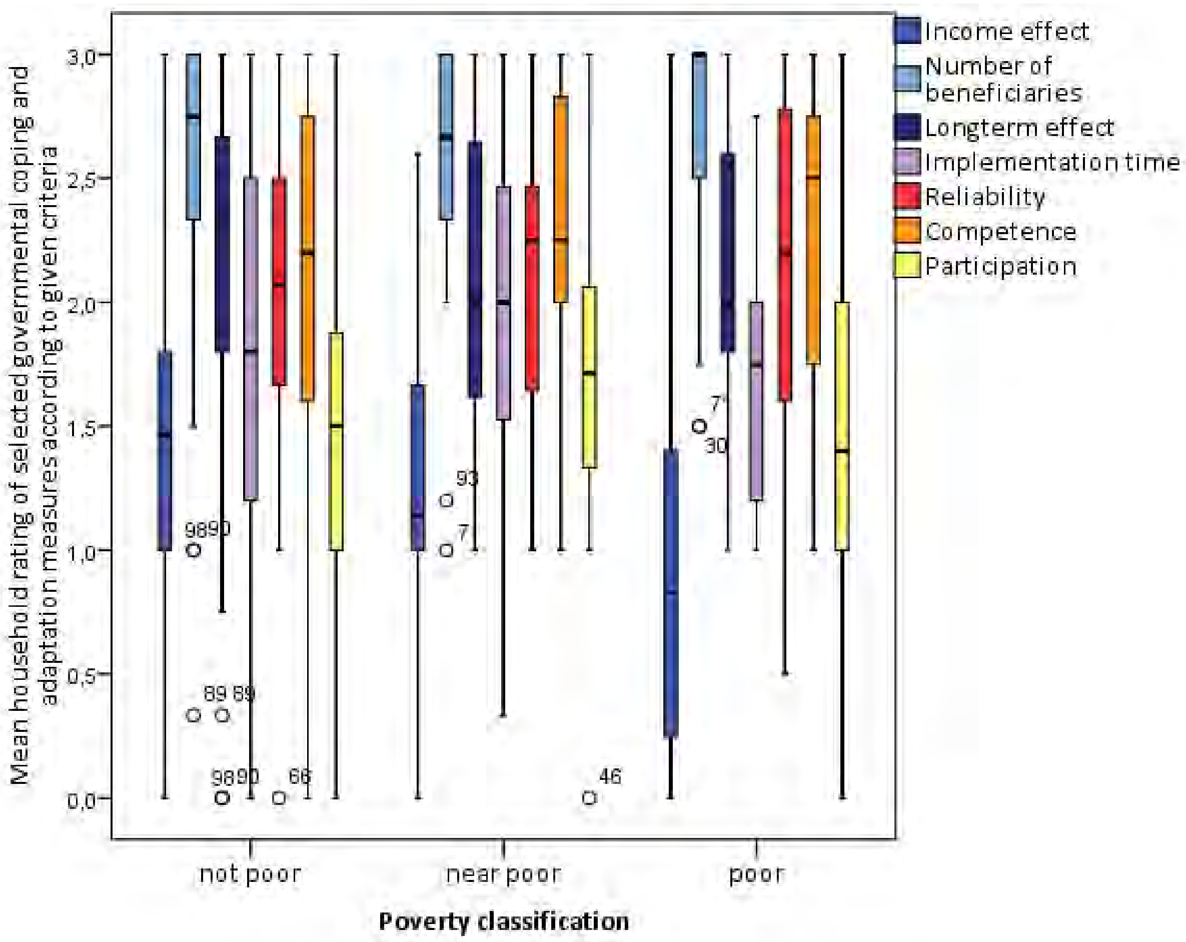


<u>Explanation:</u> The interviewees in the survey were asked to name the three most important advantages of each strategy enquired in the survey (22 strategies for salinity-affected and 23 for flood-affected households). These evaluation questions were only included in the long questionnaires and were only requested for strategies which were risk-related and relevant for the respective household. In the figure, all the ranked advantages/disadvantages were considered. The x-axis depicts the percentage of households who ticked the respective advantage/disadvantage for the given strategy. The total population is 98.

Source: Household survey, M. Schwab (2012)

12.12 Rating of government strategies according to a given set of criteria

12.12.1 Average Rating of government strategies according to a given set of criteria by poor, near-poor and not-poor households

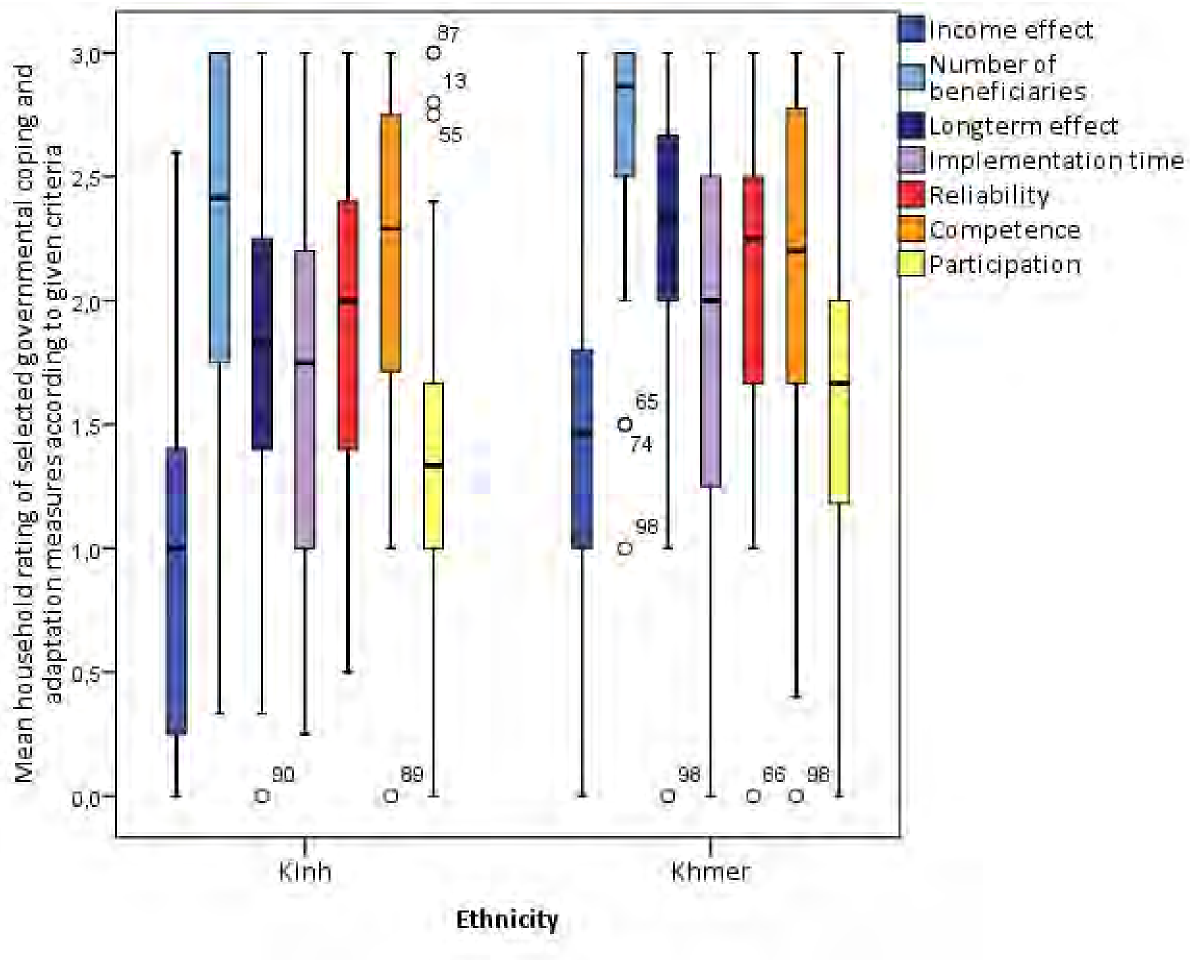


Explanation: Households were asked whether a statement which positively describes characteristics of the respective governmental strategy applies. This was undertaken for a set of process- and outcome-oriented criteria and was judged according to the following rating scale: The statement applies: 0='not at all'; 1='slightly'; 2='moderately'; 3='very much'. Only households who benefited/were affected by the respective measure were asked to rate it. For this reason, the population varies between the different strategies. Here, the mean value of each household's rating for all respective strategies is depicted. The poverty classification is based on whether a household has a poor, near-poor or no poverty certificate. The population of the different groups is: not-poor n=54; near-poor n=23; poor=21.

Interpretation: The largest differences were observed in the rating of income effects. The interquartile range of this criterion was completely in the lower half of the rating scale in the cases of poor households whereas the interquartile ranges of income in the cases of near-poor and not-poor households were located at the central part of the rating scale. This means that poor households mentioned more often that the implemented strategies did not or only slightly contribute to a higher income. The large width of the box indicates that the income judgments varied strongly between the poor households. The disparities with regard to the other criteria were only minor.

Source: Household survey, M. Schwab (2012)

12.12.2 Average rating of government strategies according to a given set of criteria by Kinh and Khmer

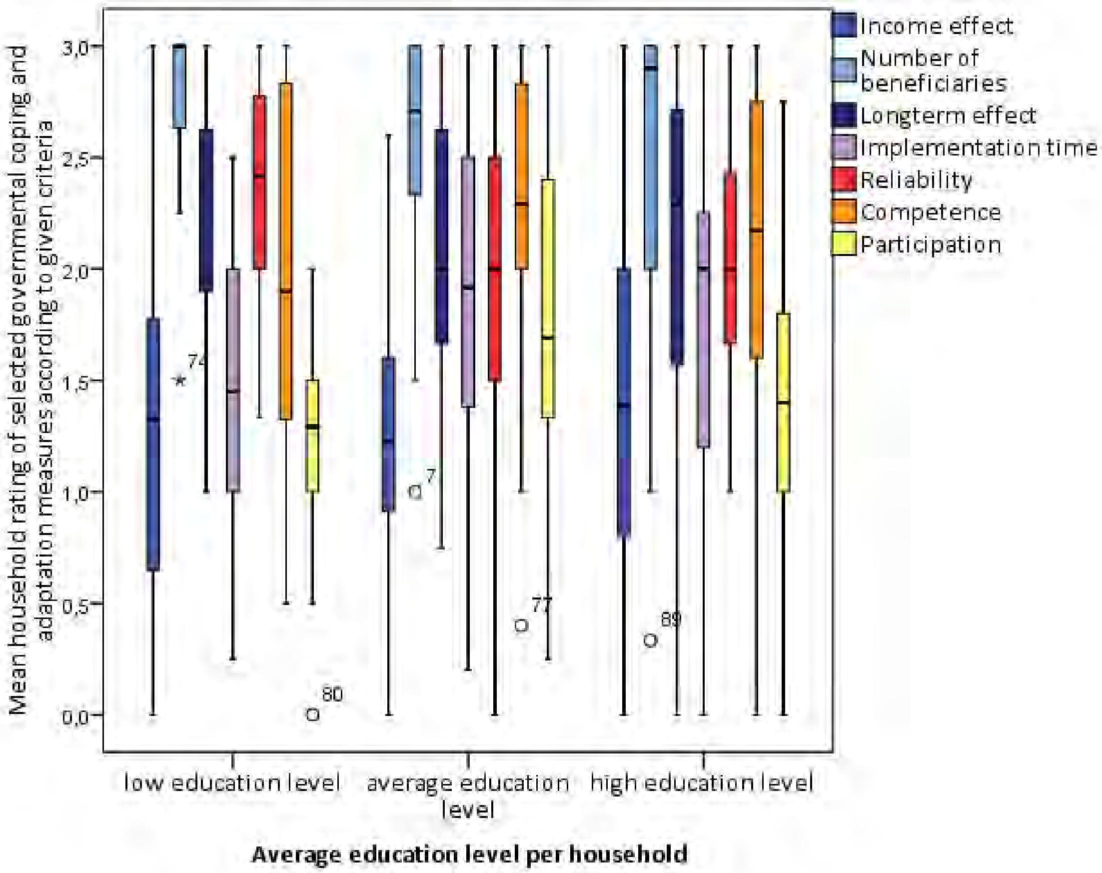


Explanation: Households were asked whether a statement which positively describes characteristics of the respective governmental strategy applies. This was undertaken for a set of process- and outcome-oriented criteria and was judged according to the following rating scale: The statement applies: 0='not at all'; 1='slightly'; 2='moderately'; 3='very much'. Only households who benefited/were affected by the respective measure were asked to rate it. For this reason, the population varies between the different strategies. Here, the mean value of each household's rating for all respective strategies is depicted. The population of the different groups is: Khmer n=68; Kinh n=30.

Interpretation: The largest differences were observed in the judgment of income effects and long-term impacts. Kinh households mentioned more commonly that an income effect was only slightly or not at all achieved by the given government measures than Khmer households (interquartile range at the lower end of the rating scale). The long-term effects were also more often judged negative by Kinh than by Khmer households (interquartile range in the central part compared with the an interquartile range in the upper third of the rating scale)

Source: Household survey, M. Schwab (2012)

12.12.3 Average rating of government strategies according to a given set of criteria by households with different education level

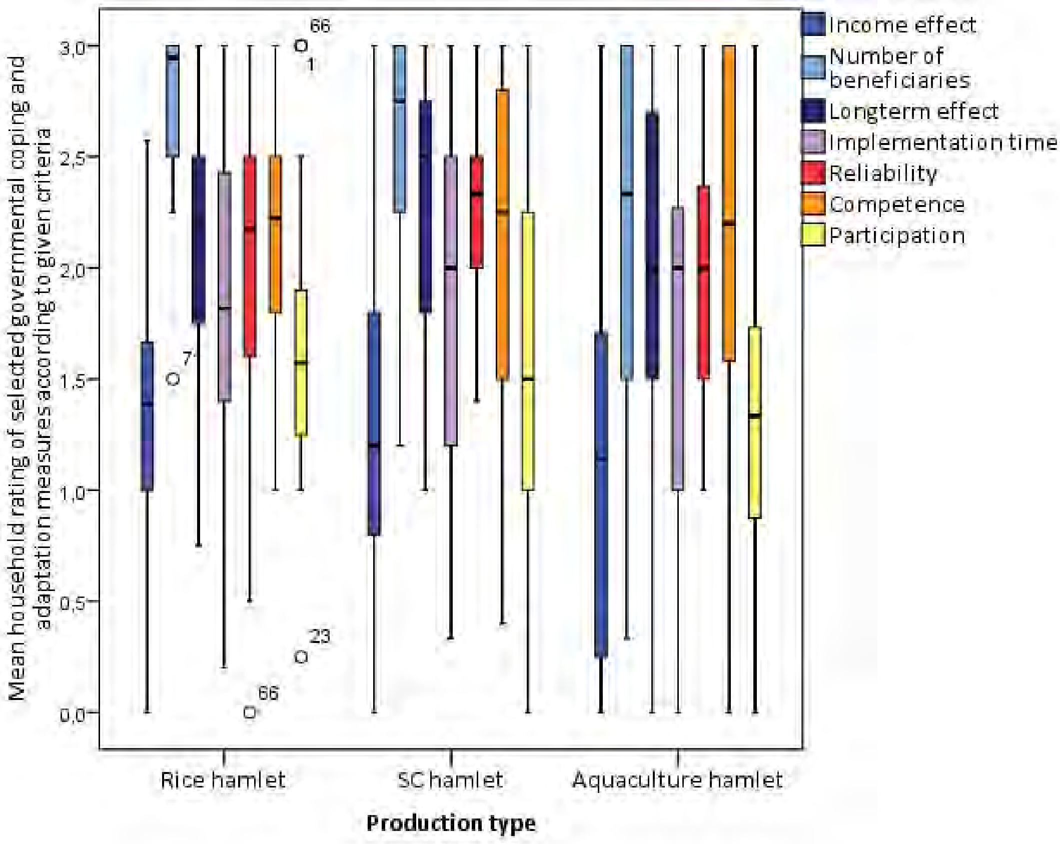


Explanation: Households were asked whether a statement which positively describes characteristics of the respective governmental strategy applies. This was undertaken for a set of process- and outcome-oriented criteria and was judged according to the following rating scale: The statement applies: 0='not at all'; 1='slightly'; 2='moderately'; 3='very much'. Only households who benefited/were affected by the respective measure were asked to rate it. For this reason, the population varies between the different strategies. Here, the mean value of each household's rating for all respective strategies is depicted. Education level (EL) represents the average of the household's members school education: low EL: never went to school (n=16); average EL: primary school (n=52); high EL: secondary/high school (n=30).

Interpretation: There seemed to be no major correlation between the education level and the rating of the government strategies.

Source: Household survey, M. Schwab (2012)

12.12.4 Average rating of government strategies according to a given set of criteria by households with different production types



Explanation: Households were asked whether a statement which positively describes characteristics of the respective governmental strategy applies. This was undertaken for a set of process- and outcome-oriented criteria and was judged according to the following rating scale: The statement applies: 0='not at all'; 1='slightly'; 2='moderately'; 3='very much'. Only households who benefited/were affected by the respective measure were asked to rate it. For this reason, the population varies between the different strategies. Here, the mean value of each household's rating for all respective strategies is depicted. The population of the different groups is: rice n=46; sugarcane n=29; aquaculture n=23.

Interpretation: The width of the interquartile range was hereby for nearly all criteria the largest in the aquaculture hamlets. This indicates that the variations in the judgment of strategies varied more in those than in the other hamlets. The differences in the medians of the government ratings were the most decisive for the number of beneficiaries, i.e. more sugarcane and particularly more rice producers compared with aquaculture producers found that the implemented strategies brought about benefits for a large share of the population. In the sugarcane hamlets, households seemed to also judge the long-term impacts of government measures more often as positive than in the aquaculture hamlets (median at 2.5 whereas the median in aquaculture hamlets was at only 2).

Source: Household survey, M. Schwab (2012)

12.13 Barriers and limits against the background of strategic points of intervention

12.13.1 Barriers and limits arising from the social ecological risk context against the background of strategic points of intervention

Conceptual approach - **Social-ecological risk context**	Barriers & limits		Consequences for the implementation of “good” adaptation and coping actions	Strategic points of intervention
Env. & human influences outside the place Other agents’ actions	Physical / ecological barriers & limits	Climatic conditions Variability of saline intrusion	- Creates uncertainty in crop choice and cropping calendar	*Limit* ▪Operation of the sluice gates continuously monitored & evaluated
		Globally induced climatic change & sea level rise	- Creates uncertainty in decision-making - Can become a limit to all sorts of adaptation on site	▪Mitigation actions at an international level
		Water pollution/regime from upstream	- Restricts production choices and productivity downstream	▪International and inter-provincial coordination efforts needed
	Knowledge barriers	Uncertainty with regard to scenarios	- Creates uncertainty in decision-making	▪Raise awareness about the uncertainty of scenarios ▪Increase future-oriented research activities ▪Create more integrated scenarios (e.g. integrated climate and socio-economic scenarios)
	Economic barriers	Agricultural modernisation	- Increased dependency on agro-chemical inputs, hydraulic infrastructure & international markets - increasing risk of income losses due to high market risk	▪De-industrialized forms of agriculture (e.g. SRI) ▪Increased diversification at farm level; short and robust trading webs; improved market information ▪ Risk sharing and risk transfer (particularly Index-based climate insurances)
		New industrial zone	- Loss of land inhibits production	▪Provide information about resettlement sites ▪Offer specific training
		Employment opportunities in big cities	- Aging rural society limits productive activities on site	▪More vocational training classes targeted at employment structure ▪Increase employment opportunities on site
	Technological barriers	Research cooperation	- Availability and access to more adapted production techniques - Reduces the usage of traditional and locally adapted species	▪Research and Development which includes traditional knowledge and is considerate of not only regional but also local characteristics
Place-based environmental and human conditions	Physical / ecological limits	Weather Soil Hydrological variability Elevation	- Limits choice of appropriate crops - Limits productivity	*Limit*
	Economic Barriers	Lack of financial and physical capital	- Hampers taking a loan, selling assets, investing in assets and other capital intensive strategies	▪Improve poverty reduction measures; ▪Improve access to appropriate loan schemes; ▪Move towards a less capital intensive and market dependent
		Increasing	- Hampers taking new	

		indebtedness	loans for coping and invest in adaptation - Threat of losing land	production (e.g. SRI) ▪Increase diversification at the farm level
		Lack of land	- Hampers productivity, production choice and taking a loan	
	Human capital Barriers	Aging rural society	- Limits employment opportunities and agricultural production	▪Create more employment opportunities on site
		Lack of formal and vocational education	- Hampers finding non-agricultural employment	▪Increase support for students ▪Raise number of training classes and adapt content to the demand
		Coverage of training classes	- Flooding and saline intrusion widely neglected	▪Keep up culture of training classes even if IMPP stops giving classes ▪Include flood and salinity-related know-how; ▪Monitor and evaluate classes to ensure quality
	Institutional Barriers	High relevance of links to the hamlet leader & mass organisations	- Exclusion of some parts of the society	▪Introduce control mechanisms for hamlet leaders ▪More local democratic decision-making ▪Ensure equal access to mass organisations

12.13.2 Barriers arising from individuals' decision-making processes against the background of strategic points of intervention

Conceptual approach - **Individual decision-making**	Barriers		Consequences for the implementation of "good" adaptation and coping actions	Strategic points of intervention
Perceived threat *(hazard exposure + susceptibility)*	Cognitive & knowledge barriers	Lack of hazard exposure and susceptibility-specific information in training classes	▪ Lower threat perception inhibits motivation to take action (especially risk-specific action) ▪ Misperception of threat raises motivation for (avoidant) maladaptation	▪ Compensate for lacking risk experiences by awareness raising and education in training classes, meetings and via extension staff (infrastructure and institutions already exist) ▪ Appraisal of location-specific threats and information needs together with the local farmers ▪ Local knowledge integrated in scientific research findings and scenarios ▪ Integration of this information in training and awareness raising campaigns ▪ Access to scientific knowledge, e.g. by improved open access web-based information systems
		Lack of personal experience (particularly with regard to salinity)		
		Risks not addressed by local staff (meetings, loudspeakers, notifications)		
		Lack of other people's risk experience		
		Deficient distribution of hydrological data (particularly in times of crisis)		▪ Hydrological data sets which are available should be distributed more regularly and timely ▪ The current expansion and upgrading of the measuring stations contributes to a better and more reliable data availability ▪ Projects like the "science for community" can provide timely salinity information at the most local level

		No reliance on the data provided		▪ Strengthen trust in available data ▪ Include local experiences and doubts in training etc. ▪ Provide information about the source of data and its reliability ▪ Create more "attractive" sources of information (e.g. geo-information systems)
		Reliance on governmental/formal action (especially dikes produce an illusion of being protected)		▪ Raise awareness of the fallibility of protective and productive infrastructure
		Reliance on the actions of other households (especially in context of common property such as communal dikes)		▪ Coordination and facilitation of community action to reduce free rider problem ▪ Community fund for people who cannot afford contributing to communal dikes
Perceived competence (self-efficacy + response efficacy + adaptation options)		Lack of personal experience in dealing with flooding/ salinity	▪ Reduces the intention to adapt in a beneficial way ▪ Increases the likelihood of (avoidant) maladaptation	▪ Compensate for lacking experiences by awareness raising and education in training classes, meetings and via extension staff ▪ Local knowledge integrated in scientific research findings ▪ Integration of this information in training and awareness raising campaigns
		Lack of other people's experience in dealing with flooding/ salinity		
		Unawareness of risk-specific strategies	▪ Reduces likelihood of implementing "good" risk-specific, resource augmenting and long-term-oriented strategies	▪ Appraisal of location-specific adaptation needs ▪ Identification of beneficial options ▪ Analysis of local capacities and barriers to implement these options ▪ Appraisal including experts, local farmers and local authorities
		Awareness of few "good" coping and, in particular, adaptation options		
		Awareness of few resource augmenting strategies		
		Inability to identify options which match the own goals	▪ Reduces likelihood of implementing acceptable adaptation and coping options ▪ Increases likelihood of conflict-producing strategies	▪ Information appraisal, analysis and distribution (training classes, campaigns, etc.) including different stakeholder groups (especially groups with potentially conflicting interests as well as formal and informal stakeholders)
		Lacking consideration of other agents' goals		
		Difficulties to agree on one option if communal action is required		
		Perception of unequal risk and benefit sharing		
		Little information available with regard to efficacy and implementability of strategies	▪ Reduces likelihood of implementing efficient, effective, fair and sustainable strategies	▪ Increase capability to evaluate potential options autonomously in workshops or training classes
		Misperception of temporal dynamics of capacities of response	▪ Unawareness of costs and benefits of existing options	
		Misperception of self-efficacy (particularly intangible assets and strategy-specific capacities)	▪ Reduces intention to adapt and cope in a beneficial way even if motivation is high ▪ Raises motivation for avoidant maladaptation	▪ Increase awareness of own capabilities and individual barriers to implement beneficial coping and adaptation options in workshops, meetings or training classes
		Compare and equate the own capabilities with the capabilities of neighbours and friends		
External factors influencing individuals'	Other social-ecological barriers	Social-ecological factors influence risk perception (objective vulnerability, social discourses,	▪ Reduce motivation to cope and adapt ▪ Reduce intention to adapt and cope in a	See *Annex 12.13.1*

cognition	*(See Annex 12.13.1)*	institutional barriers and incentives	beneficial way even if motivation is high ▪ Raise motivation for avoidant maladaptation ▪ Impede actual coping and adaptation action	

12.13.3 Barriers arising from inadequate evaluation against the background of strategic points of intervention

Conceptual approach - **Evaluation concepts**	Barriers		Consequences for the implementation of "good" adaptation and coping actions	Strategic points of intervention
General existence of an evaluation system *(relevant for all following paragraphs of this table)*	Institutional barriers	Relatively few regulations/ demand from the higher administrative level	▪ Prevents evaluations which are the basis for identifying and supporting beneficial adaptation and coping strategies	▪ Technical cooperation with the Vietnamese government for implementing a more encompassing, concrete and detailed evaluation system ▪ Coordination with the NGOs and development organisations ▪ Formally approbate independent evaluators and train them
		Unclear distribution of responsibilities		
		Criteria and guidelines often vaguely defined		
		Insufficient control mechanisms		▪ Regular and reliable controls whether evaluation regulations are put in place
		No local initiatives		▪ Awareness raising and support of local evaluation efforts (esp. targeting commune authorities and hamlet leaders)
	Economic barriers	Lack of financial means to conduct evaluations		▪ Awareness raising at the national and provincial level to raise funds ▪ Financial assistance from international donors (especially with regard to CC) ▪ Coordination with the NGOs and development organisations on site to save on cost and prevent an overlap of evaluation activities
	Knowledge/ cognitive barriers	Unawareness of official evaluation requirement		▪ Awareness raising at the district, communal and local level for increasing the acceptance and acknowledgement of evaluation needs ▪ Informing about formal evaluation requirements and responsibilities
		Lack of motivation to take evaluation action		
		Perceived lack of responsibility or/and competence		
		Lack of methodological evaluation capacity	▪ Reduces the likelihood of identifying the most appropriate strategy in the given risk context	▪ Methodological training (including especially participatory and qualitative methods; capacity to organise meetings and appraise quantitative data widely exist)

		Lack of required secondary data		▪ Exchange of secondary data between NGOs, international donors and different governmental organisations at different administrative levels
Formal and informal strategies considered	Institutional barriers	No requirement and implementation of evaluations for household (hh) strategies at a local level	▪ Reduces the likelihood of identifying appropriate autonomous options for households	▪ Institutionalise a system of regular evaluations of hh strategies at the local level ▪ Promoted techniques could be evaluated directly in the vocational and agricultural training classes ▪ Allows the promotion and training of locally adapted measures based on expert R&D
		Almost only academic research on agricultural practices (not at the local level)	▪ Discriminates against beneficial non-agricultural options which are locally adapted	
		Formal requirements of EIAs and CBAs for some gov. strategies exist but are rarely conducted	▪ Reduces the likelihood of identifying appropriate gov. adaptation and coping options	▪ Better control mechanisms on the local level which safeguard the execution of required evaluations
Multiple criteria and approaches considered	Methodol. & institutional barriers	At the governmental level, predominantly efficiency-based evaluations (more of a budgeting for authorities at the other levels)	▪ Discriminates against more equitable and socially sustainable strategies	▪ Specification of the criteria and the guidelines for implementing evaluations in the national target programs and the EIA guidelines ▪ Methodological training for local authorities ▪ Implementation of control mechanisms
		Process-based criteria are included in the national disaster risk reduction (NS-DPCM) and climate change adaptation strategy (NTP-RCC) but they are defined vaguely and are often only superficially assessed		
		Environmental impacts almost only assessed in EIAs (and EIAs are often not conducted where officially required)	▪ Discriminates against more ecologically sustainable strategies	
		Mainly based on technocratic quantitative data appraisal; qualitative and participatory data only rarely appraised	▪ Discriminates against socially acceptable and equitable strategies	▪ Integration of qualitative and participatory methods in evaluation guidelines ▪ Integration of evaluation for non-target group stakeholders in national evaluation guidelines ▪ Methodological training in qualitative and participatory methods ▪ Safeguard the participation of a random sample of households and authorities of each stakeholder group
Multiple stakeholders considered	Methodol. barrier	Focus on effects for target group, i.e. other affected groups often neglected		
		Evaluation mainly undertaken by authorities		
		Local farmers seem to be only involved in the evaluation of training classes		
	Institutional barrier	Supports existing local power relations	▪ Privileges strategies which reinforce local power relations	
		Socialist system of hierarchical responsibilities		
Vulnerability-oriented	Methodol. & institutional barriers	Strong focus on the impacts on hazard exposure	▪ Privileges exposure-reducing activities ▪ Discriminates against susceptibility-reducing and capacity-increasing strategies	▪ Promote vulnerability-oriented evaluations ▪ Implement guidelines both in national programs and in private project evaluations ▪ Methodological training for local stakeholders on vulnerability-oriented evaluations
		Impacts on susceptibility rarely considered		
		Impacts on capacity of response merely in form of income effects/productivity		

		considered		
Different time-frames addressed	Methodol. & institutional barriers	Long-term changes considered in planning documents at the various admin. levels but these are often only taken over from the higher level	▪ Reduces the likelihood of identifying locally adapted long-term oriented strategies	▪ Address time-frame in guidelines more explicitly both in national programs but also in private project evaluations ▪ Methodological training for local stakeholders on vulnerability oriented evaluations
		Short-term impacts mainly considered in form of short-term financial gains from governmental coping measures	▪ Short-term effects should also be addressed more thoroughly for long-term strategies. This could increase the acceptance of adaptation measures	
Subjective evaluations of households	Socio-cognitive barriers *(See Annex 12.13.2)*	Lack of motivation to evaluate potential options	▪ Inhibit an appropriate subjective evaluation of adaptation and coping actions by the respective agent (see *Annex 12.13.2*)	See *Annex 12.13.2*
		Lack of capability to evaluate potential options		
		Misperception of costs and benefits of potential options		

Nature and values of coping and adaptation

An evaluation of response mechanisms to changing water-related risks in rural areas of the Vietnamese Mekong Delta

by Maria Schwab

In the Vietnamese Mekong Delta (VMD), water resources and life evolve continuously amidst a vibrant socio-economic setting and a fundamentally changing environment. Looming water-related threats and ongoing changes require action and have aroused a great deal of interest. Strategic assessments of the nature and values of risk-related measures have, however, rarely been addressed – not only in the VMD but also internationally. This research has therefore aimed at demonstrating new directions in evaluation and risk research which convey a better understanding of coping and adaptation.

This PhD dissertation investigates the drivers, characteristics and barriers of 'good' and adapted response mechanisms through the example of rural areas in the Tra Vinh Province. A context-specific, actor-oriented and adaptable evaluation approach has provided the basis to convey an understanding of how and why rural stakeholders are able to cope with and adapt to changing water-related risks in a beneficial way. This geographic viewpoint revealed spatial and agentive characteristics which influence the nature and values of response mechanisms, shape temporal dynamics, and help overcome barriers to 'good' adaptation.

The research was conducted within the WISDOM Project, a German-Vietnamese Initiative to develop a Water-related Information system for the Sustainable Development of the Vietnamese Mekong Delta.

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