ASSESSING THE EVIDENCE:

CLIMATE CHANGE AND MIGRATION IN THE UNITED REPUBLIC OF TANZANIA

PIK
Potsdam Institute for Climate Impact Research

IOM
UN MIGRATION

Supported by:

Federal Ministry
for the Environment, Nature Conservation
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based on a decision of the German Bundestag

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IOM is committed to the principle that humane and orderly migration benefits migrants and society. As an intergovernmental organization, IOM acts with its partners in the international community to: assist in meeting the operational challenges of migration; advance understanding of migration issues; encourage social and economic development through migration; and uphold the human dignity and well-being of migrants.

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Cover photo: Unidentified African women walking with water containers on their heads in a village near the city of Dar es Salaam, United Republic of Tanzania. © Shutterstock 2017/Rashad MAMMADOV

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EPICC
East Africa Peru India Climate Capacities

cooperación alemana
Deutsche Zusammenarbeit

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International Climate Initiative (IKI)

FOREWORD
BY THE POTSDAM INSTITUTE FOR CLIMATE IMPACT RESEARCH

From the top of the Kilimanjaro, the lush Tanzanian landscapes seem everlasting in their beauty and indestructible in their resilience. But the snapshot of natural grace is deceiving. Powerful changes are underway and threaten to disrupt climate stability and biodiversity. Global warming has already undermined traditional farming techniques and has led to unpredictable rainfalls, droughts, and sea-level rise. These changes have contributed to a peculiar mosaic of human migration in the United Republic of Tanzania. This pattern includes (a) the vulnerable prisoners of climate change (forcibly immobile), (b) internal migrants (encompassing rural–rural dynamics as well as rural–urban movers) and (c) the transnational elite (the urban, high-skilled minority). Global efforts to reduce greenhouse gas emissions will determine whether damaging impacts will remain manageable, or if the region will slip into a permanent state of emergency, with great human suffering, adverse migration outcomes and potentially violent conflicts.

The effects of the still unfolding COVID-19 pandemic reveal, across the globe, many weaknesses regarding development concepts, social protection schemes and universal access to basic services. And it becomes increasingly clear that certain strategies needed to build local and regional resilience in East Africa are as relevant for the absorption of shocks like the corona crisis or the recent locust infestations as they are for meeting the climate challenge.

Prior to the pandemic, internal migration was typically a secondary issue for governments in East Africa. However, as containment measures spread across the region, reverse migration of people en masse from urban to rural areas largely caught governments off guard. The flow of much-needed internal remittances to rural households – typically transferred through mobile money such as M-Pesa – dwindled to a trickle in some areas and swelled to a flood in others (*The Economist*, 2020). Migrants in urban areas faced the difficult decision to either remain in destination areas, risking unemployment and homelessness in many cases, or return to challenging alternatives in their home areas.

Amid this complex topography of fragility and crises, the publication of *Assessing the Evidence: Migration, Environment and Climate Change in the United Republic of Tanzania* is timely. Focusing mainly on the internal, rural-to-rural migration flows that are still prevalent in the country, this report considers a wide range of factors that influence communities' livelihoods and subsequently alter their mobility patterns. The bulk of the content is dedicated to articulating the rich mosaic of migration forms and motivations, as well as their likely trajectories as climate change evolves over the course of this century.

This report therefore represents a comprehensive and up-to-date account of current knowledge of critical climate change impacts in the United Republic of Tanzania, as well as their links to human mobility trends. It aims to initiate and assist evidence-based policy dialogues on understanding, addressing and managing the current migration mosaic and its likely evolution in a rapidly changing environment. Among the important recommendations offered is a multi-tier adaptation strategy that addresses different timescales. This strategy ranges from currently needed interventions to provide insurance to populations already affected by climate change to a combination of traditional approaches and novel technology to help farmers cope with slowly evolving changes in the environment, and to a long-term strategy of investments in reforestation that would buffer local climate change and could diversify livelihoods. Migration can support adaptation if adequate preparations are taken, but this requires the mainstreaming of the topic into existing initiatives for development.

In a context of uncertainty, it is not enough for governments to learn the critical lessons of today's crises; they must stimulate broader understandings of complex realities in a rapidly evolving risk landscape and continuously build capacities to apply these learnings to confront the crises of tomorrow.

Prof. Hans Joachim Schellnhuber
Director Emeritus
Potsdam Institute for Climate Impact Research

FOREWORD
BY IOM

Climate change is a major concern for the international community, and its impact on migration, including displacement, is the object of increasing concern for policymakers and researchers. It is now widely recognized that migration in both its forced and voluntary forms is increasingly impacted by environmental and climatic factors and that migration in turn also impacts the environment as clearly described in many IOM publications, such as *The Atlas of Environmental Migration* (2017).

Yet, knowledge in this field remains limited and fragmented for the context of the United Republic of Tanzania. The country is vulnerable to the increasing adverse effects of climate change, which must be better understood in order to effectively safeguard the lives and livelihoods of its current population and future generations. The relationship between climate change and migration is complex. The consequences of climate change on migration present humankind with an unprecedented challenge. It is evident that environmental degradation due to climate change and the corresponding impacts on socioeconomic systems have the greatest negative impact on the most vulnerable people, particularly those who rely on natural resources, such as rain-fed agriculture. For people whose livelihoods are vulnerable to climatic change, migration has proven to be an effective means of adaptation, bringing positive impacts to individuals and their dependants through sustained and diversified livelihoods.

Therefore, the nexus between migration, environment and climate change is an important one to be better researched and understood. In the United Republic of Tanzania, human migration has historically taken place within and between rural areas. However, climate change has altered mobility patterns and fostered migration from rural to urban areas, especially towards big cities, such as Dar es Salaam, which are perceived to offer better livelihood opportunities. For households affected by climate shocks, migration is therefore seen as a risk management or adaptation strategy to climate change. Migration enables families to spatially diversify their income and therefore reduce the risk of the entire household's income being affected by adverse weather events.

IOM has been working on the links between migration, environment and climate change since the 1990s. Since 2007, Member States have requested IOM to report on this work within its governing bodies, including at its Council, the Standing Committee on Programmes and Finances, and the International Dialogue on Migration. In 2014, Member States requested IOM to scale up action on migration, environment and climate change, which led to the establishment of the Migration, Environment and Climate Change (MECC) Division in 2015. This institutional change formalized IOM's engagement in this thematic area, making IOM the first international organization to have established an institutional division fully devoted to this topic.

IOM's strong message is that the challenges of climate change must be part of migration policy debates and human mobility considerations must be part of climate action. Part of conveying this message requires making the migration, environment and climate nexus more visible, which is precisely what this publication does. This report is part of the IOM series Assessing the Evidence: Migration, Environment and Climate Change, which includes country profiles for Bangladesh, Cambodia, Dominican Republic, Haiti, Kenya, Kyrgyzstan, Madagascar, Mauritius, Morocco, Namibia, Papua New Guinea, Tunisia and Viet Nam, and a regional overview of South Asia.

Finally, I am grateful to the Potsdam Institute for Climate Impacts Research through its project East Africa–Peru–India Climate Capacities (EPICC) and to other stakeholders that contributed to this publication. I am confident that this report will serve its purpose of helping realize the potential of migration for the benefit of all migrants and societies.

Dr Qasim Sufi
Chief of Mission
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2 The EPICC Project (www.pik-potsdam.de/epicc) runs within the period of 1 January 2018–31 August 2021, and is also known as Climate Capacity Building: Risk Anticipation and Minimization.

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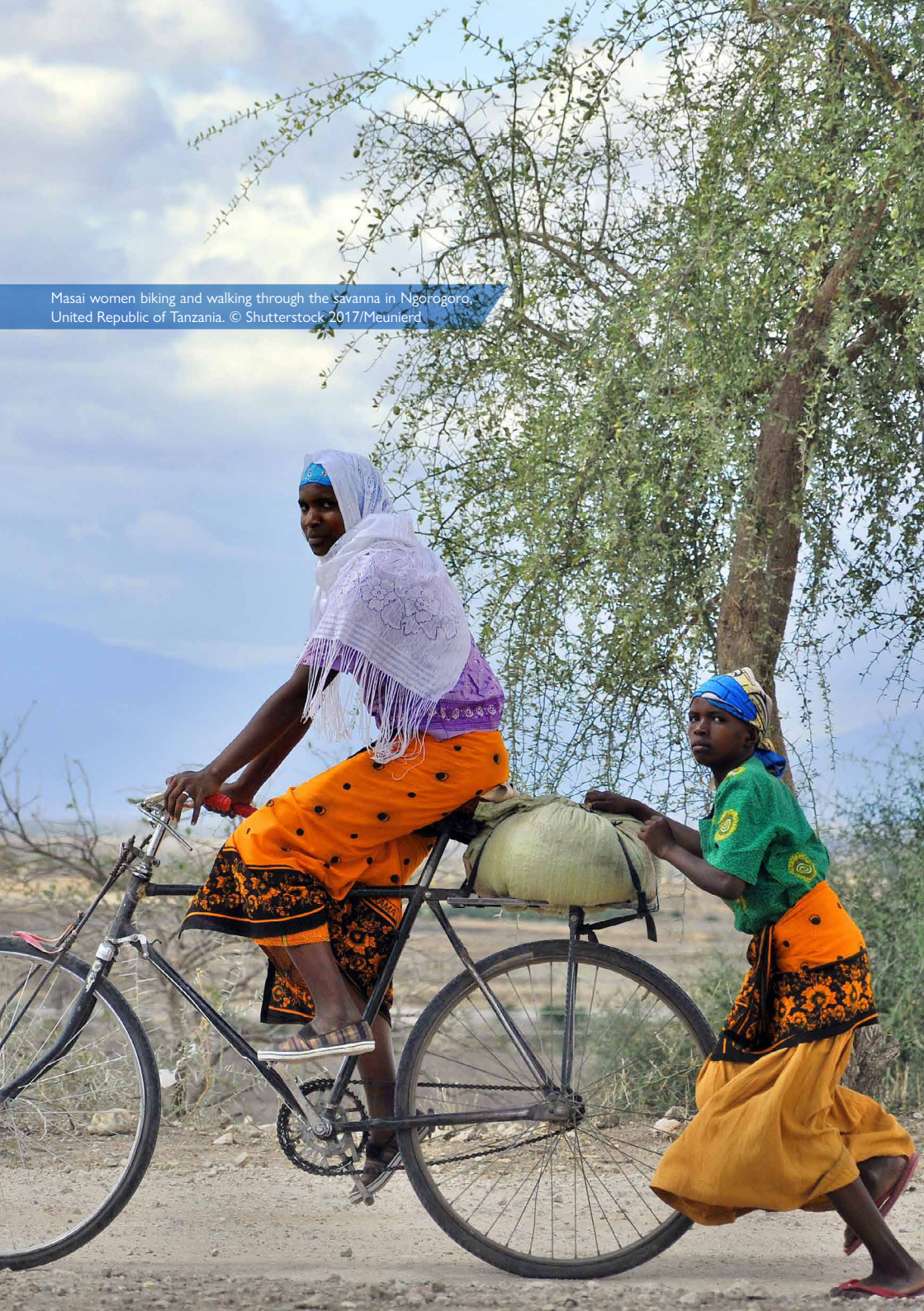


Masai women biking and walking through the savanna in Ngorogoro, United Republic of Tanzania. © Shutterstock 2017/Meunierd

ACRONYMS

CCM	*Chama Cha Mapinduzi* (Revolutionary State Party)
CDA	Capital Development Authority
CHIRPS	Climate Hazards Group InfraRed Precipitation with Station data
COVID-19	coronavirus disease 2019, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)
CUF	Civil United Front
ENSO	El Niño–Southern Oscillation
IDP(s)	internally displaced person(s)
IOD	Indian Ocean Dipole
IPCC	Intergovernmental Panel on Climate Change
ISIMIP	Inter-Sectoral Impact Model Inter-comparison Project
ITCZ	Inter-Tropical Convergence Zone
KHDS	Kagera Health and Development Survey
MoHCDGEC	Ministry of Health, Community Development, Gender, Elderly and Children (United Republic of Tanzania)
NAPA	National Adaptation Programme of Action
NBS	National Bureau of Statistics
NPS	National Panel Survey
PIK	Potsdam Institute for Climate Impact Research (Potsdam-Institut für Klimafolgenforschung)
PPP	purchasing power parity
RAI	Rural Access Index
RCP	representative concentration pathway
REDD+	Reducing Emissions from Deforestation and Forest Degradation, plus the Sustainable Management of Forests and the Conservation and Enhancement of Forest Carbon Stocks in Developing Countries
TAFIRI	Tanzania Fisheries Research Institute

TDHS-MIS	Tanzania Demographic and Health Survey and Malaria Indicator Survey
TMA	Tanzania Meteorological Agency
TIC	Tanzania Investment Center
UN DESA	United Nations Department of Economic and Social Affairs
UNHCR	(Office of the) United Nations High Commissioner for Refugees
VPO	Vice President's Office
WFDEI	WATCH-Forcing-Data-ERA-Interim reanalysis data

EXECUTIVE SUMMARY

General population trends

The population of the United Republic of Tanzania is rapidly growing and remains largely rural.

From a current population of over 59 million, the population of the United Republic of Tanzania is expected to grow to 80 million by 2035 and to over 129 million by 2050. High fertility, reduced infant mortality and low life expectancy contribute to a broad-base population structure, for which more than half are working age (15–64 years old) (World Bank, 2019a). The working-age population doubled between 1990 and 2020, and will double again by the middle of this century (UN DESA Population Division, 2019c).

Rising income levels, government spending on health care, improvements to medicine and better planning increased life expectancy. The country saw a 55 per cent reduction in infant mortality rate between 1985 and 2010. However, the current generalized HIV epidemic may negatively affect life expectancy for decades to come (World Bank, 2019a).

Urban and rural transformations

Urban growth is among the highest on the continent.

The United Republic of Tanzania is urbanizing at a rate of 5.22 per cent per annum, with roughly 34 per cent of the population living in urban areas in 2018 (World Bank, 2018). Large cities like Dar es Salaam and Mwanza continue to grow at above 5 per cent per year since 2015. Dar es Salaam has steadily maintained roughly one third of the urban population in the country over at least four decades (Ørtenblad et al., 2019; Moshi et al., 2018; Christiaensen et al., 2018).

Decentralized urbanization, through more accessible services and market access, provides benefits for rural populations.

The category of "other urban areas" developed faster in recent decades than major cities, while the share of the national population residing in regional capitals declined from 55 per cent to 31 per cent (United Republic of Tanzania, NBS and

OCGS, 2015). Small towns and agglomerations in rural areas are more accessible to rural inhabitants, including migrants. Census information indicates that towns and smaller urban settlements grew from only 7 per cent of the urban population in 1967 to 34 per cent in 2012 (Ørtenblad et al., 2019). Migration to smaller towns and agglomeration is therefore currently a more likely vehicle for rural development than migration flows to large urban areas, which accommodate a minority share of migrants.

Vulnerability

Poverty has declined overall as GDP grew, but a large proportion of the population is clustered around the poverty line and vulnerable to shocks.

While the country has a developing mixed economy, the agriculture sector still employs the majority (65.7%) of the Tanzanian population (World Bank, 2019a). After plateauing in the first decade of the century, the poverty rate fell from 34.4 per cent to 26.4 per cent between 2007 and 2018. Yet a large proportion of all Tanzanians remains close to poverty, leaving them vulnerable to small changes to household resources that can push them into poverty – for example, minor changes to basic consumption items as precipitated by climatic or economic shocks. Between 2010 and 2015, about one in eight non-poor Tanzanians fell into poverty while one in six graduated out (World Bank, 2019d).

Although many human development indicators have improved, some groups remain excluded from this progress.

Inequality is growing, likely due to the disproportionate economic role of a few lucrative industries in which few Tanzanians participate (World Bank, 2019a).[3] The main cause of inequality, however, remains the disparity between urban and rural populations in terms of different social and economic mobilities that are often out of the individual's control. More than half (58%) of the urban population is in the highest wealth quintile, while roughly eight in ten rural inhabitants are in the three lowest wealth quintiles (United Republic of Tanzania, MoHCDGEC et al., 2016b). Rural populations are much more affected by multidimensional poverty as compared to urban dwellers. Moreover, regional differences and remoteness are highly linked to lower human development. Poverty is most prevalent in the western and lake zones, while wealth is concentrated in the eastern zones.

3 Industries like mining, manufacturing and natural gas employ only 7.3 per cent of the population but account for 25.1 per cent of GDP.

Climate impacts

The United Republic of Tanzania is already warming.

Average temperatures have been rising continuously throughout all of the United Republic of Tanzania between 0.1°C to 0.5°C per decade since 1981 (until the latest data from 2016). By these estimates, temperatures in the country have risen on average between 0.4°C and 2°C with respect to the 1981–2005 baseline period. Average temperatures can be expected to increase between 1°C and 2.5°C by mid-century and between 2.3°C and 5.2°C by the end of the twenty-first century (PIK, 2020).[4] Days in which temperatures exceed 32°C[5] will become more frequent in the twenty-first century across the country, increasing heat stress in rural and urban settlements.

Climate change is leading to more extreme and erratic rainfall.

There are significant regional differences in rainfall due to the country's geographic location, as the northern areas experience a bimodal rainfall distribution while central and southern areas have a unimodal rainfall regime (Noel, 2011). On average, the north of the United Republic of Tanzania has become wetter and the south has become drier in the last decades due to the lengthening or intensification of the short rains season (known as *vuli*, occurring in austral spring, generally starting in September) (Niang et al., 2014). However, the long rains season has declined throughout East Africa. This applies to the *msimu* rains occurring roughly from November to May in the unimodal areas (including the western, central, and southwestern highlands and the southern coast), as well as to the *masika* season that occurs in austral autumn in bimodal areas, roughly from March to May (including the lake zone, northeastern highlands, northern coast and northern parts of Kigoma region). Overall, climate models agree on a continued increase of total rainfall amount during the short rains in this century (Conway et al., 2007; Mtongori et al., 2016; Shongwe et al., 2011). This shift towards more extreme precipitation events is projected to continue throughout the twenty-first century, as rains will become more erratic and heavier rainfall is concentrated on fewer rainy days.

4 Figures are presented for the low and high end of the spectrum of emissions trajectories known as regional concentration pathways (RCPs): the low end is based on RCP2.6 and the upper end of is based on RCP8.5. These warming scenarios are further explained in Box 2.

5 Referred to occasionally in the text hereafter as very hot days.

A warming Indo-Pacific is linked to more droughts and heavy rainfall.

There is evidence for increase in droughts and heavy rainfall due to the warming of the Indo-Pacific, which affects the Indian Ocean Dipole (IOD) and the El Niño–Southern Oscillation (ENSO), alternately causing drought conditions and heavy rainfall with subsequent flooding (Marchant et al., 2007; Saji et al., 1999; Endris et al., 2013). ENSO especially impacts the short rains season in the northern coastal regions. Extreme El Niño events are projected to occur about as twice as often under both RCP2.6 and RCP8.5 in the twenty-first century when compared to the twentieth century (medium confidence) (Fer et al., 2017). El Niño increases rainfall, leading to crop damage, hydroenergy production overloading, and a surge in waterborne and vector-borne diseases that proliferate in flooding events. La Niña generally reduces rainfall, causing a reduction of crop yields and leading to food shortages.

Climate impacts on the United Republic of Tanzania's river basins are unclear, and further research is needed.

The impacts of climate change on the hydrological regimes of the Tanzanian rivers is projected to be non-uniform across the country. Moreover, research findings on the impacts of climate change on river basins are contradictory. Several studies report an increase in the overall water resources (IPCC, 2013). Others suggest land-use change and anthropogenic activities in the country may also outweigh or compensate the effects of climate change. The changes in the river discharges may have both positive and negative effects on agriculture and humans in the future.

The projected changes in the precipitation patterns and rainfall intensity in the river discharges most likely will affect crop growth and put the farmers at risk due to floods, soil erosion and droughts. Increased precipitation in some areas may also increase the potential for the expansion of irrigated agriculture. However, the resulting increase in discharge may also enhance the contaminated river runoff and intensify the spread of the waterborne diseases. Assessments of the climate impacts on the river discharge in the region are hampered by the uncertainties in the precipitation and temperature projections as well as the comparably low number of studies addressing the hydrological regimes of the rivers under climate change in the country.

Subsistence agriculture can be severely disrupted even by small environmental changes.

Agriculture in the United Republic of Tanzania is dominated by subsistence, smallholder, low-input and rain-fed agriculture, which makes the sector vulnerable

to the impacts of unfavourable weather conditions and climate change. Although still most of the population works in agriculture, it is becoming comparatively less economically attractive because inequality between rural and urban areas is rising. Poverty reduction has stalled in the country in recent years, while a relatively high GDP growth has largely come from other sectors of the economy, as the agriculture sector grew only 5 per cent between 2012 and 2018 (United Republic of Tanzania MoHCDGEC et al., 2016b; World Bank, 2019a).

Climate conditions in the United Republic of Tanzania are influencing agriculture through erratic and unpredictable rain, dry spells, the occurrence of pests and diseases, and extreme weather conditions. Because of a lack of irrigation systems, changes in rainfall variability can put livelihoods of many of the tens of millions of smallholder farmers at risk. However, today's poor agronomic management is a greater determinant of suboptimal agricultural productivity than climate and weather. For this reason, adaptation strategies should be developed at the local level and encompass building capacities in risk management and risk transfer solutions, like agricultural insurance.

The imminent loss of the permanent snow cap on Mount Kilimanjaro has historical and symbolic importance, but the impact on livelihoods is negligible. Meltwater is a minor contribution to water output. Changes to the forest belt caused by wildfires and deforestation destruct the water reservoir it represents (Agrawala et al., 2003).

Migration

Turnover of short-term or short-distance internal migrants is likely to be higher than current estimates can capture.

An important distinction must be drawn between change of residence for work and other reasons, and the seasonal, semi-nomadic mobility practised by pastoralists. While internal migration flows are difficult to estimate, current estimates suggest annual internal outmigration flows are around 5–7 per cent of the total population. As for stocks of migrants, some 70 per cent of migrants move between rural areas (Hirvonen and Lilleør, 2015; Kubik, 2017). Available evidence suggests the proportion of the total population (migrant stock) that were living outside of their region of birth was approximately 15 per cent in both recent census years (UN DESA, Population Division, 2019a).

Numbers of migrants are low despite the demonstrated benefits of migration.

Economically motivated migration in the country tends to lead to positive human development outcomes regardless of the destination. While this may be in part due to unobservable characteristics that influence the self-selection of migrants (like ambition, ability, risk preferences and entrepreneurship), it is also because rural migrants tend to move into higher-return work. Migration from rural to urban areas is unambiguously positive for migrants and their children across human development indicators. The proportion of Tanzanians who are able to and choose to migrate permanently out of agricultural areas is less than 15 per cent by most estimates, and around a third of them move into higher sectors of the economy (United Republic of Tanzania, NBS and OCGS, 2015).

Working-age men from comparatively wealthy households remain the most likely to migrate, while the propensities are low for poor households.

On average, young men most likely migrate internally for work, while women migrate for marriage. Education, household size and income levels are all positively related to migration probabilities. Research is mixed on the importance of the migrant's relationship to the head of household. Most research agrees that the poor are unable to afford to migrate, while comparatively wealthier people may invest in migration to diversify household resources. The phenomenon of return (urban–rural) migration in the United Republic of Tanzania is related to labour market failures for men and to the end of marriages for women (Hirvonen and Lilleør, 2015). As compared with findings from other developing countries, there is limited evidence that return migration is beneficial for local development.

International migration rates are very low, less than 1 per cent of the population.

International migration rates in the United Republic of Tanzania are historically low, even after restrictions on international migration were lifted (UN DESA, Population Division, 2019a). Remittances have historically been low but are growing slowly. The costs of sending and receiving remittances in the country are among the highest in the world (World Bank, 2019b). Most money transfers, especially for internal remittances, are informal and thus subject to theft and disruption. Depriving rural households from a portion of the much-needed income is counter to communities' adaptation strategies and development. In order for remittances to deliver their development potential, strategies[6] can be employed with the Government and the private sector alongside efforts to expand Internet

6 Such as the strategies promoted by the World Bank Group: www.worldbank.org/en/topic/paymentsystemsremittances.

coverage. Such efforts could also help formalize current remittance channels for internal and international migrants, which rely on family and in-person services.

Remittances are important sources of household income, but the costs are high.

While remittances are difficult to estimate, foreign remittances are low while internal remittances are thought to be high. Informal channels prevail in the country, which are risky and easily disrupted. Rural households can lose much-needed income from remittances in the wake of shocks, including the coronavirus disease 2019 (COVID-19) pandemic.

Displacement

The United Republic of Tanzania has historically been an important refugees-receiving country.

In the past decade, hundreds of thousands of refugees in the United Republic of Tanzania voluntarily repatriated or were granted citizenship (UNHCR, 2018). There is no evidence to suggest environmental or climatic factors lead to cross-border displacement towards or away from the country.

A history of unplanned urbanization and high urban growth means a large number of people are exposed to hazards.

In Dar es Salaam, an important migrant destination, over 70 per cent of the population lives in informal settlements (Limbumba and Ngware, 2016; Sheuya, 2010). In other major towns and cities with high numbers of urban poor, this figure is between 40 per cent and 60 per cent. Many internal migrants in both rural and urban settings also have no choice but to settle in areas exposed to multiple hazards, such as along coastlines, riverbeds, flood plains or resource-stressed areas in the outskirts of cities (Hambati, 2013).

Disaster displacement is common, but it shows significant year-to-year variability.

Approximately 129,800 new disaster displacements were recorded in the country between 2008 and 2018 (IDMC, 2021a). High population growth, increasing population density and the prevalence of unplanned settlements will likely mean many more people will be exposed to hazards in the future in both rural and urban settings. Climate change and the general dearth of risk management in many communities will add pressure to these conditions (CRED, 2019).

Resource-based disputes often arise from tensions between customary and granted land-use rights, although the role of environmental and climatic changes may grow.

Resource-based conflicts, especially localized disputes between farmers and livestock herders, are currently primarily the result of poor implementation of land-use plans, including lack of adherence to sustainable strategies (Saruni et al., 2018). Such disputes are likely to continue and may become more common as competition over land and water resources increases.

Climate change and human mobility

Research on the influence of environmental and climatic factors on migration shows mixed results.

A review of research on environmental influences on migration in East Africa shows that the links are complex and not conclusive (Afifi et al., 2014; Charnley, 1997; Hirvonen, 2016; Kubik, 2017; Kubik and Maurel, 2016a and 2016b; Magesa and Pauline, 2019; Mbonile, 2005; Msigwa and Mbongo, 2013; Smith, 2014; Tacoli, 2011). In some cases, environmental stress increases the propensity to migrate while in other cases migration decreases. The impact depends on the type of event, seasonality/timing, duration of the change or stressor, household composition and attributes (especially gender and age), and on pre-existing socioeconomic factors. After controlling for socioeconomic factors, however, the results remain mixed. In some studies, slowly developing environmental stress like persistent droughts and land degradation is more likely to be associated with migration. Other studies found that sudden-onset events tend to increase the likelihood of migration while gradual environmental processes and events decrease its likelihood.

It is relatively well established that weather shocks change migration patterns in the United Republic of Tanzania. However, the results are mixed. Quantitative analyses at the national level found that the combined impact of temperature and precipitation increases the probability of migrating by 13 per cent on average (Kubik and Maurel, 2016b). Other studies using a representative survey of Kagera region found no effect of rainfall, whereas temperature shocks decrease the probability of migration on average (Cockx, 2019; De Weerdt et al., 2012). In both studies, overall migration rates remain lower than expected and are almost exclusively internal. Although more research is needed, the literature suggests that rural migrants are more likely to move to areas with more favourable weather conditions and land availability.

Household endowments determine response strategies to weather shocks.

Research suggests the impact of weather shocks on migration in the United Republic of Tanzania can lead to households with medium levels of wealth responding to environmental changes by migrating, while wealthier and poorer households are less likely to do so (Kubik and Maurel, 2016b).

Other studies point to the poorest households using migration to nearby locations as a survival strategy. Relatively higher wealth groups with greater market participation are able to leverage previous earnings to invest in higher-return migration.

Outlook: Human mobility in the context of climate change

Climate change is likely to lead to forced immobility, especially in the short and medium term.

The overall tendency of poorer households to migrate declines when agricultural yields and household incomes are reduced. Climate change will erode the livelihoods of farmers and pastoralists in particular and may push many of them into poverty. Because the costs of migration to urban areas remain prohibitive for many, the likely result for households with undiversified livelihoods is forced immobility in degrading conditions.

Heat and droughts may cross threshold values after which migration is increasingly likely, especially in the central, northern and coastal zones.

Climate change will erode the livelihoods of smallholder farmers and pastoralists. High levels of warming, very hot days, a shift and decline of the long rains season – *masika* in austral autumn (March–May) in bimodal rainfall areas of northern and central regions and *msimu* (November–May) in unimodal rainfall areas of central, coastal, southern and western regions – plus more erratic short rains (*vuli* in austral spring, beginning in September) in bimodal rainfall areas. El Niño and IOD phases continue to create drought conditions and heavy rainfall, with negative consequences for agricultural productivity and hence for households (Marchant et al., 2007; Saji et al., 1999; Endris et al., 2013). In similar contexts, when drought persists, outmigration becomes a more convincing strategy for more individuals. At the beginning of a drought, for example, the households with more assets suffer less and migrate less, while others with reduced options for coping migrate as a survival strategy (Gray and Bilsborrow, 2013; Warner and Afifi, 2014).

In a business-as-usual emissions scenario, adaptation in situ and through internal migration will fail.

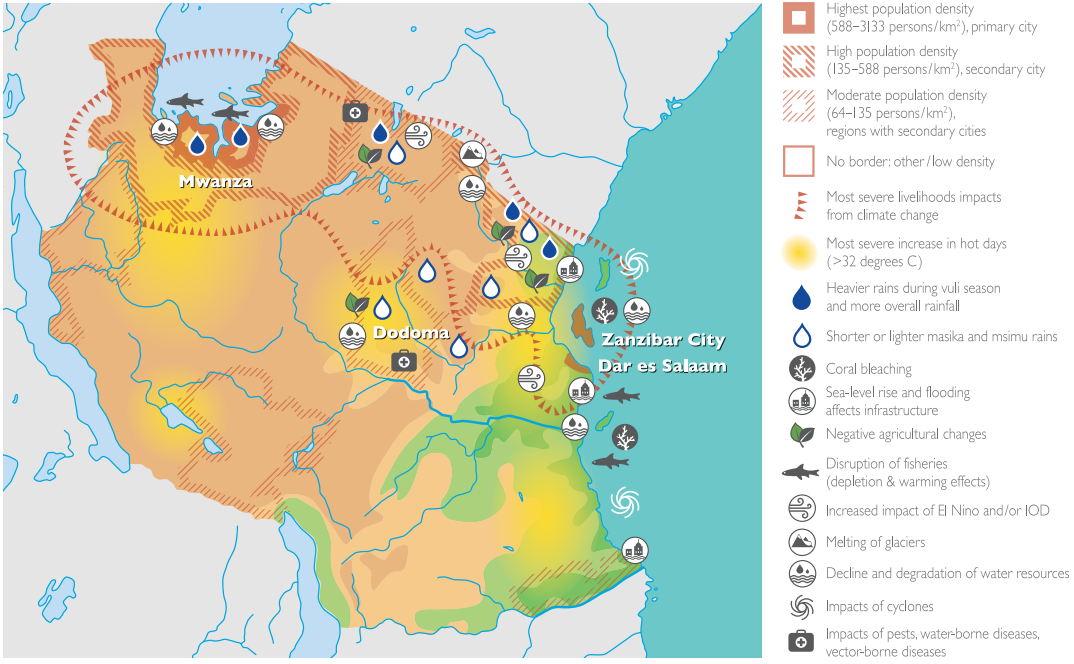
High-end climate change scenarios, such as RCP8.5, project severe impacts across the country in the second half of the century (IPCC, 2013). Without significant advances in sustainable land management, the trajectory of anthropogenic environmental degradation may make some areas logistically uninhabitable. While forced immobility remains the most likely outcome for most rural Tanzanians, a point may be reached at which outmigration for survival is the only recourse. Under high-end scenarios, there would be virtually no unaffected agricultural areas to which people can relocate (Fer et al., 2017). In such a scenario, the absorption capacity of urban and peri-urban areas would also be hampered by climate impacts and many more migrants could end up in highly exposed makeshift settlements. Coping and adaptation strategies that are currently feasible would no longer be applicable, and livelihoods would erode.

Conclusion: without significant adaptation measures, severe livelihood impacts are likely across the country.

Figure 1 brings together current knowledge of livelihood impacts of climate change discussed in this report. Areas that are the most affected by important climatic and environmental stressors are shown by icons and coloration (see legend), overlaid on top of topographical information. Moreover, the most populated regions and cities are bordered in red marks in the figure because population density is one of the key parameters for assessing the magnitude of population exposed to risk. The convergence of densely populated areas with known environmental and climatic stressors – in particular, in the northern and coastal zones – indicates these populations' livelihoods are among the most likely to be adversely affected by climate change. These areas are circled with opaque red arrows.

Important limitations to data and research influence our analysis of climate change impacts, as well as of the subsequent movements of people that may have environmental or climatic factors among the reasons for moving. As described in the respective chapters of this report, the bodies of literature on climate data and on migration are generally concentrated in the more densely populated northern and coastal areas of the country.

Figure 1. Map of known projected future climate change impacts and related environmental degradation in the United Republic of Tanzania



Source: Conceived by Julia M. Blocher and produced by webreform GmbH, 2020.

Note: This map is for illustration purposes only. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the International Organization for Migration.

10 RECOMMENDATIONS

Against this background, this report provides the following recommendations for governing the nexus between climate change and human mobility in the United Republic of Tanzania and for addressing key research and data gaps:

Implement forward-looking climate- and migration-sensitive development strategies.

The United Republic of Tanzania, like many other developing nations, needs to find climate-proof development solutions. A number of policy frameworks and plans already exist to adapt to climate change, reduce poverty and vulnerability in urban areas, conserve ecosystem services, manage urbanization, and prepare public institutions and services for inevitable population pressures. Based on the present-day evidence on climate change and migration, we suggest the Government of the United Republic of Tanzania and its partners pursue a multi-tier approach to help prepare for different degrees of severity of climate impacts at multiple time horizons and foster sustainable human development:

1. **Beat the heat.** Continue to support infrastructural development, provision of services, improvements to water access and provision, and development of diversified livelihoods options for Tanzanian populations. This will enhance their capacities to "beat the heat" (cope in the short term) and ultimately build resilience in the longer term.
2. **Combine tradition with technology.** Implement strategies to address medium-term problems like low agricultural productivity and poor agronomic management.
3. **Grow and regrow forests for resilient communities.** An investment in long-term, nationwide measures to protect the populations from severe climate impacts in the future is needed.
4. **Take different vulnerabilities of livelihood groups into account.** Climate change has variable impacts on different regions, groups, households and individuals, and subsequently impacts on migration decisions will differ. Policies should consider and develop climate change response plans for these populations separately.

Improve the development potential of migration.

A number of important policy steps can be taken to improve migration management in the country:

5. **Develop a policy on internal migration management that includes an evidence-based approach to climate-related migration.**
6. **Enhance the development potential of migration by reducing the cost of remittances.**

Improve data quality for both climate change and migration to understand current and future trends.

Gaps in data exist that can be addressed to help policy actors better understand and address climate change and migration, including:

7. **Enhancements to the weather station infrastructure, improvements to data collection methods, and more systematic and regular central processing of the data;**
8. **Modifications to the census questionnaire, which can allow for a better understanding of migration and of climate change impacts on people;**
9. **Improvements to migration data and research, which can help policy actors to better understand and address migration;**
10. **Evidence is key to policymaking on migration as well as to climate change adaptation, and each should inform the other.**

Massai man, wearing traditional blankets, overlooks Serengetti in the United Republic of Tanzania. © Shutterstock/Jo CREBBIN

CHAPTER 1.
INTRODUCTION

With its vast savannahs, deep lakes and tropical coastlines, the diverse natural resources of the United Republic of Tanzania offer livelihoods to a multitude of farmers, pastoralists, fishers and traders. Through long periods of political stability, it was possible to achieve significant socioeconomic advancements. Over the past three decades, the economy of the United Republic of Tanzania grew by over 460 per cent and a number of human development indicators have improved. For example, post-neonatal mortality and child mortality rates were halved between 2004 and 2016. However, poverty remains widespread and development gains are at risk of being undone by future climate impacts. Migration has been one strategy to avoid unfavourable weather conditions and may become a crucial strategy for adapting to climate change.

Events in 2020 underscored the critical importance of understanding climate risks and adaptation strategies as the country and wider world face an evolving risk landscape. The COVID-19 pandemic has already had a wide-reaching impact on economies and the fabric of societies in ways that cannot be fully understood: the SARS-CoV-2 virus directly took the lives of a significant number of people from the African continent, undid development gains, and undermined the mobility and migration of Africans in innumerable ways. The pandemic shines a light on a number of inequalities already facing Tanzanians. Importantly, the pandemic magnified insecurities presented by non-wage and non-contractual employment, informal housing, lack of savings, lack of credit inclusion, weak health infrastructure and health services, informal remittances channels and dependence on migrant workers, and much more. In the same year, unprecedented invasions of billions of desert locusts devastated agricultural production without regard to international borders, affecting the food security of millions of people. While the United Republic of Tanzania was spared the worst of the swarms, the episode is a visceral and unsettling reminder of the fragility of the resource-dependent livelihoods, agrarian economies and agricultural markets that span across the region. While the linkages between these plagues and climate change is not always immediately visible, climate culprits and climate analogues can be found. Concretely, in the case of this season's locust infestations, successive cyclones of heightened intensity in the southern Arabian Peninsula contributed to ideal breeding conditions for

locusts on both sides of the Red Sea (Deutsche Welle, 2020). In the future, the role of climate change in exacerbating risks will inevitably grow as impacts become more severe.[7]

Today, the majority (66%) of Tanzanians live in rural areas and are dependent on rain-fed smallholder farms and pasture. Without meaningful improvements to agronomic management, population growth and unsustainable land-use practices will continue to deplete the country's rich natural resources. Degradation of land and forest resources is already a serious impediment to rural livelihoods in many parts of the country. In recent decades, farmers and pastoralists are shifting from their ancestral land towards areas with better weather conditions, adequate health services for themselves and their livestock, and easier market access. A significant number move to informal settlements in urban and peri-urban areas, joining the irregular economy and mixing with the urban poor. Such areas are disproportionately populated by migrants and are in general highly exposed to natural hazards. In the case of coastal cities, sea-level rise will exacerbate the risks. Vulnerability to climate change is high among large parts of the population. While sustained government efforts to improve living conditions have resulted in overall income gains with respect to a low baseline, a significant proportion of Tanzanians is still clustered around the poverty line. As a consequence, many people risk being pushed into outright poverty by even minor economic shocks as triggered, with increasing probability, by climate change.

7 Recent climate models have used four scenarios to cover possible future emissions, the so-called representative concentration pathways (RCPs). RCP8.5 assumes the highest emission concentration without serious policy interventions, leading to a likely mean global surface temperature increase of 2.6–4.8°C for the end of the twenty-first century relative to 1850–1900 (pre-industrial times). For RCP6.0 and RCP4.5, likely ranges are 1.4–3.1°C and 1.1–to 2.6°C. Only RCP2.6, which requires strong mitigation, shows global temperatures staying below the 2° C target in the Paris Agreement (0.3–1.7°C). Local changes precipitated by these global averages can be even more severe. This report considers RCP2.6 as a low-emissions or "optimistic" scenario and RCP8.5 as a high or "business as usual" emissions pathway or climate change scenario.

Under these conditions, the challenges posed by global warming and regional environmental change are dire. While traditional and novel adaptation measures could provide relief from less severe climate impacts, larger changes that are likely to occur at higher warming levels could induce a massive shift in the regional climate and its adverse impacts on ecosystem services. This could lead to a largely unmanageable situation. Unfortunately, even the consistent implementation of current pledges in countries' nationally determined contributions[8] under the Paris Agreement may result in global mean temperatures rising between 2.9°C and 3.4°C above pre-industrial levels by 2100. In a business-as-usual scenario, the globe warms by 4°C or more by 2100, a development that would inflict severe climate impacts on the United Republic of Tanzania.

Such a worst-case scenario would leave little room for communities to adapt, either in situ or through internal migration. Extreme heat could drastically reduce the possibility of working outside, while erratic rainfall and recurrent droughts would severely affect rain-fed agriculture, pasture and water resources.

Overall, the interactions between climate change and migration in the United Republic of Tanzania still need to be better elucidated. As in other parts of the African continent, the lack of good data in both respects makes quantitative assessments difficult. Few data sets allow for an analysis of short-term, short-distance migration between rural areas that is known to be the most important migration flow so far. Moreover, few international research projects have focused on the links between climate change and migration in this country. Incidentally, some small-scale studies have confirmed findings of research conducted outside of the United Republic of Tanzania, which took place in similar development settings. Therefore, it is plausible to apply some of the conclusions from the evolving climate–migration literature to complement current knowledge of the trends in the Tanzanian context.

In this spirit, our report provides an analysis of the existing research on both climate change and migration in the country and draws from results of the wider climate and migration work. The main findings, as outlined in the Executive Summary, establish a first evidence base for future policymaking and investigation.

8 Nationally determined contributions refer to the individual pledges made by signatories of the 2015 Paris Agreement to mitigate climate change.

ABOUT THIS REPORT

The concept of risk

This report attempts to comprehensively address climate change impacts in the United Republic of Tanzania, the current mobility patterns and trends, and the possible linkages between them. To structure the discussion around climate change impacts on patterns of migration, displacement, planned relocation and non-mobility, this report draws on the concept of "risk". Risk is defined as the potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time. This risk is related to the hazard[9] they face and how physically exposed they are to it, as well to a number of conditions that determine how well they are able to face it (UNDRR, 2020). Hazards are of varying intensity, while exposure, vulnerability, and capacity are very much related to societal and structural conditions. The levels of risk individuals, communities and societies face is not pre-determined but depends on the actions they take to reduce exposure and vulnerability, and to build capacities to anticipate, cope with and recover from hazards, strengthening the ability of people, organizations and systems to use available skills and resources to manage adverse conditions (UNDRR, 2020). An assessment of risk and people's perceptions of risk form an important basis to develop adaptive and mitigating actions.

Text box 1. Technical definition of risk used in this report

Risk is a function of the hazards faced by a system or society and their levels of exposure, vulnerability and capacity (UNDRR, 2020).

Natural climate variability and anthropogenic climate change influence all of the three key components of risk: hazards, exposure and vulnerability. For example, harmful outcomes of climate change in the United Republic of Tanzania include more frequent and more intense slow- and sudden-onset hazards. Exposure and vulnerability also depend highly on socioeconomic processes, which influence development, demography, inequality and governance. Moreover, options for adaptation as well as risk-averse behaviour are heavily influenced by sociocultural context – norms, values and attitudes – which tend to impose different expectations based on status, sex and age. A hazard is distinct from a disaster, which is defined here as a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of

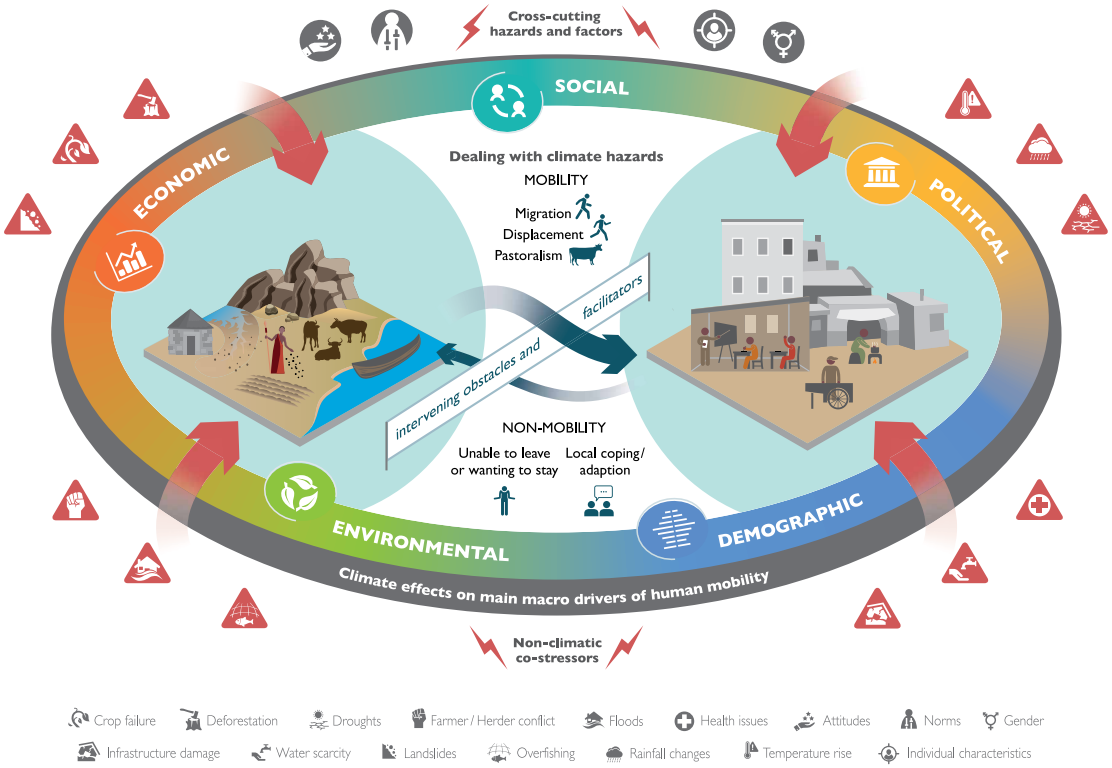
9 The United Nations Office for Disaster Risk Reduction defines a "hazard" as: "[a] process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation" (UNDRR, 2020).

exposure, vulnerability and capacity, leading to losses and impacts. This topic further discussed in a later section on internal displacement (section on disaster displacement and farmer–herder conflicts). Because humans can act and take decisions to reduce the impacts and the levels of loss and damage associated with them – also reducing the likelihood of displacement – disasters are understood by many as a primarily social, rather than natural, phenomenon.

Migration and mobility can also be a voluntary, anticipatory strategy to confront perceived hazards and to respond to hazards after they occur (United Kingdom, The Government Office for Science, 2011). Moreover, people may choose to stay and adopt other livelihood strategies. Climate change impacts affect the most important drivers of mobility, namely economic (for example, crop prices and availability of employment), environmental (for example, food security), political (for example, conflict and insecurity) and demographic drivers (such as disease prevalence).

Figure 2 illustrates these conceptual links in the Tanzanian context. It shows how the five main drivers of mobility (social, economic, political, demographic and environmental) are related to environmental change and must be considered together, as identified by previous research (United Kingdom, The Government Office for Science, 2011). These main drivers are influenced by the sociocultural environment, the climatic stressors and co-stressors, as well as the cross-cutting stressors and factors, influence in complex and non-exclusive ways. We include the climate change-related hazards (like floods, droughts, rainfall changes, temperature rise); the non-climatic or indirectly affected co-stressors (including farmer–herder conflicts, threats to sustainable fisheries and forests, poor health services, and risks to infrastructure); and the cross-cutting hazards and factors (including social factors like attitudes towards migration, social norms and culture, gender roles, and more). It is difficult, if not impossible, to visualize how all of these dynamic interactions related to different forms of mobility (such as migration, displacement and seasonal mobility, depicted here as the most prevalent forms in the United Republic of Tanzania) and non-mobility (voluntary or forced immobility).

Figure 2. Schema demonstrating conceptual links for migration, environment and climate change



Source: This figure was adapted by Julia M. Blocher based on graphic conceptualized by Jonas Bergmann (Bergmann et al., 2021) and produced by webreform GmbH.

A number of climate risks face the population of the United Republic of Tanzania. Chapters 2 and 3 of this report serve as a foundation to a subsequent exploration of how climate change impacts may influence displacement – as a potentially life-saving reaction to imminent risks – as well how they may affect migration and other forms of mobility which may serve as adaptive or anticipatory responses to present or future risks. Chapter 2 (Country Context and Human Development Trends) is dedicated to establishing the country context by presenting the geography, political structure, demographic trends and economy of the United Republic of Tanzania. Chapter 3 (Analysis of Risks Related to Climate Change and Exacerbating Factors) gives an overview of climate change trends, projections and related hazards in the United Republic of Tanzania, as well as rainfall, weather events and monsoon, and the impacts of the El Niño–Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD), sometimes called the "Indian Niño" (section on rainfall). Key hazards include extreme temperatures, precipitation changes, droughts, intensive rainfall and flooding, and sea-level rise. Water resources are considered (section on water resources in the United Republic of Tanzania), followed by a section that examines impacts on agriculture and food security, a sector of the country highly exposed to climate variability. The bulk of the analysis of this report is presented in Chapter 4, which first examines the overall migration and displacement trends in the United Republic of Tanzania and then offers a summary of available research on the environment, climate change and migration linkages. Chapter 5 deepens current knowledge of these linkages, offering possible impacts in the future under different climate warming scenarios. It concludes with recommendations for policy actors and for future paths for research.

Methods

This report is primarily based on desk review of available literature, guided by local, national and international experts named in the Acknowledgements section. For the section on climate change and mobility linkages, boolean searches in specialized databases and complementary search formed the basis of the body of literature reviewed.[10]

10 The Climig Database (www.unine.ch/geographie/climig_database), a database of literature focused on climate and migration phenomena, was the primary source for Boolean searches of English language terms such as "Tanzania", "East Africa" and "Horn of Africa". The database is compiled at the University of Neuchâtel, Institute of Geography.

The disappearing snow cap of Mount Kilimanjaro is clear to see.
© IOM 2009/Jemini PANDYA

CHAPTER 2.
COUNTRY CONTEXT AND HUMAN DEVELOPMENT TRENDS

GEOGRAPHIC MAKEUP OF THE UNITED REPUBLIC OF TANZANIA

The United Republic of Tanzania is one of the largest nations of equatorial sub-Saharan Africa. The northern border of the United Republic of Tanzania, shared with Kenya, lies just below the equator. Approximately 1,424 km of coastline along the Indian Ocean provides the eastern border, while the African Great Lakes line, including Lake Victoria, is part of the western border. The United Republic of Tanzania shares land borders with seven countries: Kenya to the north and north-east; Uganda, Rwanda and Burundi to the north-west; Zambia and Malawi to the south-west; and Mozambique to the south. A lake border through Lake Tanganyika separates the United Republic of Tanzania from the Democratic Republic of the Congo. Figure 3 demonstrates the geophysical features of the country.

Figure 3. Geophysical map of the United Republic of Tanzania

Source: Wikimedia Commons/Sémhur, 2014. This map is licensed under the Creative Commons Attribution-ShareAlike 4.0 International, 3.0 Unported, 2.5 Generic, 2.0 Generic and 1.0 Generic licences.

Note: This map is for illustration purposes only. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the International Organization for Migration.

The United Republic of Tanzania is a land of natural grandeur and geographic extremes. It is a mountainous country and home to Africa's highest point, Mount Kilimanjaro, nestled in the Eastern Rift Mountains. The African Great Lakes forged by the East African continental rift form the other dominant geographical feature of eastern Africa. Lake Victoria, Africa's largest lake by surface area and the world's second largest freshwater lake, supports livelihoods in the three surrounding countries. Five islands in Lake Victoria belong to the United Republic of Tanzania, including the highly populated Ukerewe. Further south-west is Lake Tanganyika, Africa's deepest lake, and the second deepest lake in the world. There are 22 United Republic of Tanzania islands in the Indian Ocean, including those that form the Zanzibar Archipelago. The main islands of Zanzibar Archipelago – which are Unguja and Pemba – lie a mere 25–50 km off the coast of mainland United Republic of Tanzania.

The United Republic of Tanzania is divided into several clearly defined ecosystems. Most of the country is savannah, from the lush grasslands and high-plateau brush of the Maasai Steppe in the central and northern regions to the lush grasslands and temperate woodlands that occupy the western portion of the country. Areas along the coast and islands of Zanzibar are covered with tropical rainforest, coastal plains and mangroves.

POLITICAL AND ADMINISTRATIVE MAKEUP

Politically, the United Republic of Tanzania comprises two broad constituencies, mainland United Republic of Tanzania (Tanganyika) and the semi-autonomous archipelagic region of Zanzibar. In the 1900s, the main islands of the Zanzibar archipelago (excluding Mafia Island) formed a British protectorate, and Tanganyika was part of German East Africa. After Germany's defeat in the First World War, Tanganyika was mandated to Great Britain by the League of Nations. Following the Second World War, the mandate became a United Nations trusteeship. Tanganyika became independent in September 1961, and Zanzibar followed in December 1963 (CIA, n.d.; *BBC News*, 2018).

The birth of the nation in its current form came in April 1964, when Tanganyika (referred to throughout this report as mainland United Republic of Tanzania) and Zanzibar merged to form the United Republic of Tanzania.[11] Today, the two form a union government but have separate presidential and parliamentary systems. Multiparty democratic elections have existed in both governments since 1995. There are 31 administrative regions

11 The name was originally United Republic of Tanganyika and Zanzibar and was shortened to United Republic of Tanzania in October 1964.

(see Figure 4).[12] The United Republic of Tanzania is widely recognized as one of the most politically stable countries in Africa, as it has enjoyed peace and relatively rapid development since it emerged from its colonialist past.

Figure 4. United Republic of Tanzania administrative regions

Source: Wikimedia Commons, 2012. This map is licensed under Creative Commons Attribution-Sharing under Equal Conditions 3.0 Unported.

Note: This map is for illustration purposes only. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the International Organization for Migration.

The post-independence politics of the United Republic of Tanzania are important to understanding the makeup of the population, the economy and the culture, all of which influence migration patterns. Julius Nyerere, a top leader in Tanganyika in the pre-and post-colonial years and the first President of the Union from 1963 until 1985, established the concept of *ujamaa* (occasionally translated from Swahili as "extended familyhood") to reform the economic and political approach of the country. *Ujamaa* is often described as African socialism, as the concept was heavily influenced by contemporary socialist ideas but sought to retain the African spirit of community. The Arusha Declaration of 1967 concretized the development ideals and policies of this period.[13]

12 Most regions are unchanged since the 1970s, allowing for comparable census information on those populations carried out in 1988 and 2002. Geita, Katavi, Njombe and Simiyu regions were created in March 2012, before the 2012 census was carried out in August of the same year. Songwe region was separate from Mbeya in 2016. These changes create challenges for comparing interregional migration trends over time.

13 For a review of the *ujamaa* and villagization policies and their mixed impacts on rural development and agricultural production, see: Haapanen, 2011; Ponte, 2002.

The socialist period in the United Republic of Tanzania (1961–1985) had a major impact on the trajectory of the country. *Ujamaa* promoted the formation of rural villages as the primary building blocks for development in Tanzanian society (Hansen, 2012). The Government sought to increase agricultural and industrial production to spur social and economic transformation, and to do so, it relied on communal living in rural areas. Nyerere's Second National Five Year Plan for 1969–1974 supported national villagization programmes (Kironde, 1993). Villagization, implemented between 1967 and 1977, brought about shifts in the composition of the population, both homogenizing the country overall and diversifying rural areas (Hansen, 2012). The promotion of civil service and the deployment of government officials to peripheral regions also served to link the population. International travel and migration during his time was restricted. The country liberalized in the mid-1980s, and since then population growth, trade liberalization and market expansion have added to the development trajectory of the country.

Today, the structure of governance of the United Republic of Tanzania is based on the principles of decentralization and de-concentration. The so-called "decentralization by devolution" (D by D) approach was introduced in the 1990s (Mollel and Tollenaar, 2013), and involves the transfer of functions, power and authority from the central government to the local government authorities. This design is in part a reaction to its recent past of centralized policymaking. Dependency on central authority is thought to inhibit the delivery of public goods and services, including health services, and lead to contradictions in the local distribution and use of resources, like communal grazing land. Local communities are involved in developing strategies and plans at the village, for example, for land use. Despite this government infrastructure, central preferences tend to dominate the direction of the policies that local governments are expected to downscale and implement locally (Mollel and Tollenaar, 2013).

Tanzanian politics on the mainland take place in a framework of a unitary presidential democratic republic, whereby the President is both head of State and head of a multiparty government. The Government exercises executive power, while legislative power is vested in both the government and parliament. Judiciary power is independent of both the executive and legislative branches. President John Pombe Magufuli assumed office in November 2015, succeeding Jakaya Mrisho Kikwete, who served two five-year terms from 2005 to 2015. President Magufuli is the elected Chairman of the Chama Cha Mapinduzi (Revolutionary State Party), or CCM, the dominant party in recent history (*BBC News*, 2015). The proportion of seats held by women in the national parliament is 36.9 per cent. This value has risen in the past two decades (IPU, 2017). Simultaneous presidential, parliamentary and councillor elections took place

in 2020. Local elections took place in November 2019, amid cries of electoral manipulation and boycotts from opposition parties (Paget, 2019). While claims of censorship are made, a once small and largely State-controlled media industry has grown overall following the advent of the multiparty era (*BBC News*, 2018).

The Magufuli administration is known for its focus on infrastructural development, anti-corruption measures, and economic expansion. The administration inherited the Tanzania Development Vision 2025, the country's pro-development and pro-liberalization policy approach launched in the year 2000 (Government of the United Republic of Tanzania, 2000). The Government intends to bring the country to middle-income nation status by 2025, largely through industrialization (Penresa, 2019; Government of the United Republic of Tanzania, 2000). Around 30 infrastructure projects are ongoing (*The Economist*, 2019), including a USD 14.2 billion project to build 2,561 km of railways connecting Dar es Salaam port to neighbouring countries (Penresa, 2019).

A main undertaking of the Magufuli administration is the gradual transfer of government functions from Dar es Salaam to Dodoma between 2016 and 2020. The plan to relocate the nation's capital was initiated by founding President Julius Nyerere, and was part of his administration's larger plans for *ujamaa* through the Second National Five Year Plan for 1969–1974 (Kironde, 1993). Security considerations for a coastal capital, reducing urban congestion and moving the capital to a more geographically central location are among the other reasons given for the move (Robi, 2018). The initial relocation – spearheaded by the Ministry of Capital Development and the Capital Development Authority (CDA) – did not materialize for a number of reasons, including insufficient infrastructure and services in Dodoma to accommodate the incoming population, mismanagement of over TZS 4.9 billion spent on the project (over USD 4.8 million in 2003) and unwillingness on the part of government officials to move (Kironde, 1993). Early in his first term, President Magufuli issued executive orders dissolving the CDA (Mramba, 2017) and declaring February 2017 as the deadline for all ministers and their deputies, permanent secretaries, and some department heads to officially set up permanent offices and residences in Dodoma region (Robi, 2018). Dodoma witnessed rapid and massive upgrades to roads, and telecommunications, water, and energy infrastructure, in part thanks to partnerships with international corporations (Gbenga, 2019). While the Government bestowed land and building permissions to foreign missions and international organizations, the Government-appointed National Housing Corporation acquired 236 acres of land to construct residential and commercial buildings (Robi, 2018). While it is too early to fully understand the impacts of the relocation of the nation's capital and government functions to Dodoma, the impacts are already visible in terms of the en masse migration of government officials and foreign-born residents. The

reduced population pressure in Dar es Salaam is visible in some districts, as is the immigration to urban Dodoma from surrounding areas.

The region of Zanzibar maintains partial autonomy and its recent historical and political path lies parallel to Tanganyika's. President Nyerere's passion for pan-Africanism partly motivated the unity of the two countries, which already shared common services, currency, language and cultural ties. The Revolutionary Government of Zanzibar comprised the Revolutionary Council and House of Representatives. The ruling political party for many decades had been the CCM. Political opposition on the isles, especially lead by the Civil United Front (CUF), led to four contentious elections since 1995 (1995, 2000, 2005 and 2015) (CIA, n.d.). Zanzibar has also recently been a place of political change, independently of the mainland government as well as in relations with it. Political tensions on the islands and disenfranchisement of youth have co-occurred with a rise in Islamist influence in recent two decades.

LEGAL AND POLICY FRAMEWORKS

Climate change action in the United Republic of Tanzania is focused on adaptation within development plans more generally, as the latter remain the main priority for the Government. Outside of international discussions and agreements, a number of strategies and plans have been developed with partners that provide directives to government departments and other stakeholders on issues related to climate change. Table 1 provides a number of frameworks, plans, strategies and guidelines relevant to climate change action developed by the Government and its main implementing partners.

Table 1. Frameworks, plans, strategies and guidelines on climate change from the United Republic of Tanzania and main implementing partners

Year enacted or years of application	Name of act/policy/ strategy*	Purpose or impact
2007	National Adaptation Programme of Action (NAPA)	Establishes the country's approach to climate change, with focus on structural improvements and overall economic growth
2016/17–2020/21	Tanzania National Development Plan	Environmental factors and climate change are noted as a potential risk in economic growth and development for communities; migration and pastoralist mobility in the context of climate change are acknowledged

Year enacted or years of application	Name of act/policy/ strategy*	Purpose or impact
2012	Tanzania National Climate Change Strategy	Provides a road map for a sustainable emissions trajectory and for climate action; migration and mobility in the context of climate change are acknowledged
2014	Zanzibar Climate Change Strategy	Provides a road map for subsequent climate action
2015	Intended Nationally Determined Contribution	Commits to the principles of the Paris Agreement and commits to adopting a climate resilient development pathway, providing sector-specific areas for action.
n.d.	National Guidelines for Mainstreaming Gender into Climate Change Related Policies, Plans, Strategies (developed by the Ministry of Community Development, Gender and Children)	Provides principles and guidelines for mainstreaming gender into climate action
2011	Tanzania Climate Change Gender Action Plan (developed by IUCN with the Vice President's Office (VPO))	Provides a toolkit for mainstreaming gender into climate action
2014–2019	Tanzania Agriculture Climate Resilience Plan	Provides principles and guidelines for climate-resilient agriculture sectors, including specific targets and areas for action
2012–2017	National Climate Change Communication Strategy	Provides a toolkit for awareness-raising around climate change and its impacts
2013	Guidelines for Integrating Climate Change into National Sector Policies, Plans and Guidelines	Provides a road map for downscaling larger climate action goals for specific sectors
1990	The Disaster Relief Coordination Act	Establishes the legal basis for disaster risk reduction and management
2004	National Disaster Management Policy	Adds to amends the 1990 Disaster Management Act with targets for disaster management and response
2015	The Disaster Management Act	Update to the 1990 Disaster Management Act

Note: * Names of developing organizations were provided if the Government of the United Republic of Tanzania was not leading.

The focal point for climate change is the Division of Environment in the VPO, which has a very wide portfolio. Climate change and environmental issues more generally are not formally mainstreamed into migration and displacement policies and plans, and vice versa. However, the issue is recognized in the NAPA of 2007 and the Tanzania National Climate Change Strategy of 2012. Notably, the 2012 Strategy addresses some of the complexity of the issue:

> *Drought, floods and other natural disasters reduce opportunities for employment due to disruption of livelihood systems. Those who are expected to provide for their family have to migrate elsewhere to look for work or sometimes the whole family has to migrate away from areas where education is provided… for the pastoralists and peasantry societies, drought often force them to migrate into areas with better weather conditions which support pastoral and agricultural activities. This means that the family will migrate with all their children, which disrupts the continuity of children education and in some cases they miss it completely (United Republic of Tanzania, VPO Division of Environment, 2012).*

Migration and displacement policies

Currently, there is no department or division at the ministerial level explicitly mandated to coordinate internal migration. Freedom of movement is enshrined in Article 17 of the country's Constitution (1997): "*Every citizen of the United Republic has the right to freedom of movement in the United Republic of Tanzania and the right to live in any part of the United Republic of Tanzania, to leave and enter the country, and the right not to be forced to leave or be expelled from the United Republic*". The Ministry of Livestock and Fisheries Development established the Department of Pastoral Systems Development in 2006, specifically tasked to oversee pastoralists' movements, which was dissolved after a decade (Kileli Leyani, 2014). Today, all districts instead have Livestock and Fisheries Extension Officers with other related functions to support a decentralized approach to village land-use planning.

Governance of migration in the United Republic of Tanzania is generally focused on the arrival and transit of international migrants. The Immigration Act of 1998, revised in 2016, provides the framework for immigration into the United Republic of Tanzania and related matters. Migration in the United Republic of Tanzania is largely viewed as a question of national sovereignty and security, with its matters overseen by the Ministry of Home Affairs under the Immigration Services Department (ISD). The ISD leads in providing immigration services, working closely with the President's Office, including in the implementation of the Comprehensive Migration Management Strategy (COMMIST I covered 2014–2019 and its successor, COMMIST II, covers 2019–2021). IOM is one of the Government's main partners in the implementation of migration strategies, including through research and policy development activities.

Land tenure and use

Roughly 44 per cent of land was used for agricultural purposes in 2011, including 37.3 per cent forest, 27.1 per cent permanent pasture, 14.3 per cent arable farmland and 2.3 per cent permanent crops (CIA, n.d.). As further explained in the "Agriculture and Food security" section, most farming is low-input, unmechanized, smallholder farming done with limited social safety nets, and thus are vulnerable to climate changes. Pastoralist livelihoods are also vulnerable to climate variability and the overall health of the rangelands. Of the estimated 50 million hectares of rangelands, only around half are suitable for livestock due to tsetse infestation. Livestock numbers surpass normal carrying capacity in many areas. According to a livestock sector analysis for 2016–2017, the United Republic of Tanzania has about 28.8 million cattle, 16.7 million goats, 5.0 million sheep, 2.0 million pigs, 33.3 million local chickens and 38.1 million improved chickens (United Republic of Tanzania, Ministry of Livestock and Fisheries Development, 2017).

National land policies enacted since the 1990s seek to reform land tenure and management of rural and urban land towards gradual liberalization. The Government maintained many of the colonial-era policies and practices, with only minor reforms until the National Land Policy in 1995 (United Republic of Tanzania, Ministry of Lands and Human Settlements, 1995).[14] While the previous system was based on customary titles held by tribes, land without a documented individual title[15] was formally vested in the President, who is meant to function as a trustee (Sundet, 1997). Land Act No. 4 and Village Land Act No. 5 (in effect from May 2001) incorporated the principles of the 1995 National Land Policy by allowing local authorities to manage and administer land in villages. Among other things, Land Act No. 4 and Village Land Act No. 5 formalized tenure in many rural and urban settings, changed land-use arrangements for community land and facilitated private–public partnerships for agricultural development. As compared to the schemes in other countries in sub-Saharan Africa, the Tanzanian framework transfers the administration of village land to the Village Councils and thereby can allow for the co-existence of customary systems. Overall, the laws are intended to provide equal rights for all citizens regardless of their gender and ethnicity to own or have access to the land. In practice, however, internal migrants and non-citizens face barriers to obtaining land-use titles from villages (see the sections on internal migration and the section on agriculture and food security,

14 For a more detailed review of the history of the National Land Policy and the history of the process leading to its approval, see: Sundet, 1997.

15 Commissions set up by the German imperial government allocated ownerless "crown land" (*herrenlos kronland*) to applicants, a regime essentially adopted by the British colonial government. By the time Germany ceded the United Republic of Tanzania to Great Britain as a mandate under the League of Nations in 1922, an estimated 1,300,000 acres of agricultural land were alienated as freehold land (James, 1971). Under the 1923 Land Ordinance, German freehold titles were recognized and converted into the English fees simple, which placed the land under the control of the governor. The governor was empowered to allocate rights of occupancy of this land in the public interest.

respectively). Moreover, women have less secure land tenure than men in general, as the Policy does not clarify a women's right to inheritance in the case of either death or separation. In fact, the Policy states that "inheritance of clan and family land will continue to be governed by custom and tradition" and "[o]wnership of land between husband and wife shall not be the subject of legislation" (United Republic of Tanzania, Ministry of Lands and Human Settlements, 1995).

Land management also affects the settlements on and the use of reserve and protected lands, which hold over 30 per cent of the total Tanzanian land surface. Biodiversity conservation principles have led to the creation of protected areas such as national parks, game-controlled areas for hunting, game reserves for conservation, wetland sites and community wildlife conservation areas (Kileli Leyani et al., 2017). Settlement of people in these areas is highly restricted and incurs serious penalties. The resulting restrictions on customary land use and subsequent erosion of semi-nomadic livelihoods of Maasai pastoralist groups in northern regions has been the subject of international scholarship (Blocher, 2018; Goldman, 2011; Nelson, 2000). Moreover, as mentioned in the section on climate change and human mobility, the boundaries of these areas are also sometimes the focus of land disputes between mobile pastoralists and sedentary communities.

Table 2. Major land management policies

Year enacted/ implemented	Policy	Implication or status
1923	Land Ordinance	Land Ordinance institutionalized two parallel land tenure systems: one with proof of occupancy and the other without and prone to land disputes and conflicts; restrictions for non-nationals from acquiring land changed under the 1997 Land Investment Act. Natives are accorded customary land tenure and non-natives are granted right of occupancy up to 99 years.
1926	Native Authorities Ordinance	Traditional chiefs (land-allocating authorities) were replaced by Native Authorities, who managed land use using by-laws.
1963	Freehold titles and the Government Act of 1963 (Land Act)	The Act converted colonial freeholds into government leaseholds, affecting mainly large-scale landowners.
1964/66	1964 Range Development and Management Act	The Act aimed at regulating grazing and water use in range areas.

Year enacted/ implemented	Policy	Implication or status
1967	Arusha Declaration	The Declaration established land and all other means of production as State-owned and puts in place the basis for villagization programmes, implemented until 1977. These policies were subsequently abandoned in favour of economic liberalization (see the 1992 Land Tenure Act).
1973	Rural Farmland Act	The Act enabled the Government to seize any land and declare it as a specific planning area for use as deemed appropriate by the Government.
1975	Ujamaa Villagization Act	The Act provided for a villagization in which settlement and land-use patterns were altered and resources are redistributed among households. In areas where villagization programmes were implemented, customary land tenure effectively became State-run.
1982	Local Government Act	With the enactment of the Local Government Act, villages became part of local governments, districts and urban councils, but issues of land tenure were not addressed.
1983	Agriculture Policy reform	The reform was never implemented and the Policy was replaced by other land polices, in particular, the 1995 National Land Policy.
1991	Presidential Commission formed to look into land tenure problem	A comprehensive report was published (Coldham, 1995), which informed subsequent reforms.
1992	Land Tenure Act	Under the Land Tenure Act, customary land tenure was abolished in *ujamaa* villages.
1995	National Land Policy	Stated goals are to provide security of tenure to smallholders and pastoralists, maximize land-use efficiency, streamline land administration and facilitate implementation of development programmes, among others.
1997	Tanzania Investment Act	Under the Act, exceptions for non-nationals from acquiring land are allowed if acquisitions are connected to investments that have approval from Tanzania Investment Corporation.

Year enacted/ implemented	Policy	Implication or status
1999	Village Land Act	Land matters were decentralized and land was fairly distributed between pastoralists and agriculturalists. Men's and women's rights were upheld. Village councillors became land managers. The Village Land Act recognizes the rights of villages to land held collectively by village residents under customary law.
2001	Rural Development Strategy	The Strategy improved rural livelihoods by meeting the basic needs.
2002	Courts (Land Dispute Settlement) Act	The Courts Act provides for different stages when dealing with land disputes – the Village Land Council, the Ward Tribunal, the District Land and Housing Tribunal, and the High Court and the Court of Appeal.
2004	Land (Amendment) Act	Amendments to the 1999 Land Act (sections 79A–79D) affected the registration of land tribunals and the management of administrative affairs of these tribunals.
2006	Livestock Policy	The Livestock Policy Intends to modernize the livestock sector, with limited emphasis on securing land for pastoralists.
2007	National Land Use Planning Act	The Act provided an avenue for local communities to participate in land-use planning and governance.
2010	Grazing-Land and Animal Feed Resources Act (No. 13)	Act No. 13 was not fully implemented and has been criticized, in part, as difficult to enforce. Written Laws (Miscellaneous Amendments) (No. 1) Bill 2020 was presented to the Tanzanian Parliament in January 2020 with proposed changes to the Grazing Land and Animal Feed Resources Act.
2016	National Land Policy (draft)	This draft is a revision of the 1995 policy, aiming to address gaps in coordination, implementation and treatment of foreign landholders. At the time of writing, the draft was circulated to stakeholders and under discussion.

Agricultural development policies

The Tanzania Development Vision 2025 aims to move the country from low- to middle-income status through economic growth and agricultural transformation (Government of the United Republic of Tanzania, 2000). To achieve its vision, the Government seeks to transform the economy by building a favourable environment for commercial activities and for improving transport and trade, all while encouraging private investments (Fold and Prowse, 2013). The Government has also invested in the agriculture sector.

Two parallel policy directions dominate agricultural development plans in the United Republic of Tanzania. One is focused on supporting smallholder farmers, through the Agricultural Sector Development Programme launched by the Government in 2005/2006). The Programme aims to support a number of activities to improve agronomic management, for example, by subsidizing inputs, promoting drought-resistant seeds and providing technical expertise for irrigation. The other is aimed at building small- and large-scale farming, through market- and business-led development, such as through the Kilimo Kwanza ("Agriculture First") initiative and the Southern Agricultural Growth Corridor of Tanzania (SAGCOT). Kilimo Kwanza, which was developed by the Tanzania Business Council (a non-government entity), is intended to promote agricultural transformation led by large-scale commercial agriculture involving foreign investors (Fold and Prowse, 2013). The SAGCOT programme is a public–private partnership funded as a collaboration between private companies, the Government and other donors to increase crop production, improve livestock husbandry and undertake fish farming. It is intended to be implemented from 2010 until 2030 (SAGCOT, 2017). SAGCOT covers approximately a third of the country, which has been called the "bread basket" of the United Republic of Tanzania. It follows the same overall objective as Kilimo Kwanza for economic transformation, namely to foster agribusinesses to also benefit small-scale farmers, and in so doing, reduce poverty, combat food insecurity, and stimulate growth through market-oriented and large-scale private-sector agricultural development (Mkonda and He, 2016). The set of policies ushered in by Kilimo Kwanza and SAGCOT have been linked to migration, as many areas previously used communally by smallholder farmers and livestock herders are today used by medium- and large-scale agriculture enterprises (Kileli Leyani, 2014). In the process, untitled occupants of land have migrated or been removed (Mwakipesile, 2015).

The Tanzania Investment Act of 2007 provides an opportunity for non-citizens to have land-use rights, but it does not necessarily encourage permanent residence. The Land Act states that non-citizens are not allowed to own land permanently or for personal use. The Tanzania Investment Act establishes the Tanzania Investment Centre (TIC) to register/zone land holdings explicitly for investment purposes, for investment by foreigners as well as for citizens. Foreigners can also acquire land-use rights from either individuals or local entities, but it must be from a TIC holding or a land title reissued as a derivative use title for investment purposes under the name of the TIC (Kasanda et al., 2019). This system simultaneously limits international migrants from establishing themselves permanently in the country and encourages the establishment of foreign investing companies.

PEOPLE OF THE UNITED REPUBLIC OF TANZANIA

Population composition

The majority of people in the United Republic of Tanzania live on the mainland (95%) (CIA, n.d.). The culture and society of the country is partly shaped by the variable topography and ecology, as well as the vast difference between well-connected and highly isolated areas. There are as many as 126 different languages spoken in the country (CIA, n.d.), and Swahili remains the official and most widely spoken language, spoken by roughly 90 per cent of the population (Russon, 2020). In 2012, about 15 million people spoke Swahili as their native tongue (Government of the United Republic of Tanzania, 2012). The population of the mainland is overwhelmingly of Bantu origin (95%), consisting of more than 130 kabila (tribes). The Sukuma are the largest population group, estimated at 13 per cent of the total, and the remaining larger groups represent roughly 5 per cent each. Official counts of indigenous populations are not kept, because it is the official position of the Government that all Tanzanians of African descent are indigenous to the United Republic of Tanzania (United Nations, 2016). At least four groups in the country are recognized in the region as indigenous, the hunter-gatherer Akie and Hadzabe and the pastoralist Barabaig and Maasai (IFAD, 2012).[16] Census information suggests around 10 per cent of the population practices pastoralism, including mixed agropastoralist livelihoods, including from the Sukuma (traditionally agropastoralist) population and the fast-growing Maasai population (OECD, 2013).

16 These groups are recognized by the African Commission on Human and Peoples' Rights.

The island of Unguja, colloquially referred to as Zanzibar, is the main island of the Zanzibar archipelago. The historic centre of Zanzibar City, is located on the western coast of the Mjini Magharibi region. The makeup of the population is influenced by the Persian, Indian and Arab traders who settled in the eleventh century CE and built on top of the fishing and agricultural settlements formed by Bantu-speaking peoples by the sixth century CE. The Swahili fishing town of Shangani, founded in the eleventh century CE, ultimately developed into Stone Town through the influences of Gulf and Portuguese traders between the fifteenth and the end of the seventeenth century. The period of the Omani Sultanate (late seventeenth century to mid-nineteenth century) was accompanied by the migration of many Omanis to Zanzibar. While the trafficking of slaves across the Indian Ocean to colonial plantations owned by Europeans slowed in the nineteenth century, under pressure by the Great Britain, the Persian Gulf nations continued the East African slave trade largely uninhibited into the twentieth century, although it was formally abolished in 1897 (Cave 1909). In the meantime, Zanzibar City flourished. The archipelago's history of migration is evident in today's inhabitants, who are of Bantu (Hadimu and Tumbatu), Arab, Persian, Indian and European origins. Many languages are spoken, the most common being Swahili, English and Arabic (reliable percentages are unavailable). The population is more than 99 per cent Muslim (CIA, n.d.).

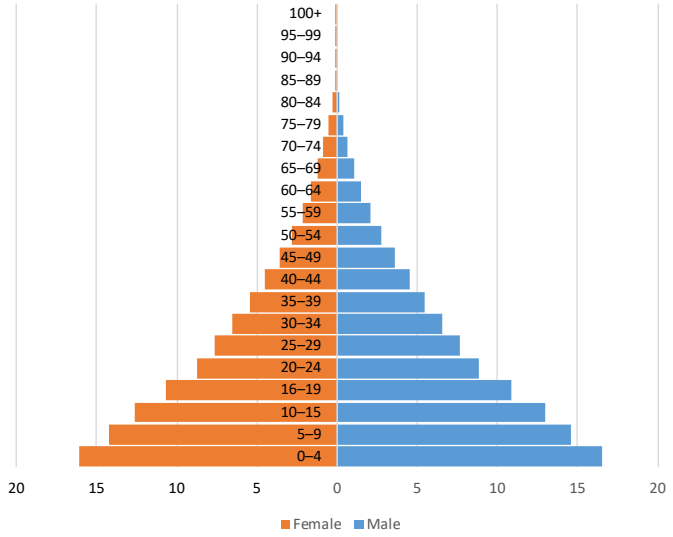
While the peoples of Tanganyika and of Zanzibar have exchanged and developed interdependencies throughout history, the cultural, demographic, economic, and political makeup of the two regions are disparate. The distinctions in terms of the people and their practices are important to explaining very different migration patterns presented in the succeeding sections. Importantly, the two areas diverge in terms of important human development indicators. Due to data limitations, many figures presented in this report are averages for the United Republic of Tanzania and obscure important regional differences.

Population growth

The current population of the United Republic of Tanzania is estimated to be over 59 million (based on data from the World Bank, 2019a; UN DESA Population Division, 2019c). This is a similar size to the populations of Spain or the Republic of Korea. The country is therefore more populous than nearly all of its bordering neighbours, including Burundi (11.2 million), Kenya (51.4 million), Malawi (18.1 million), Mozambique (29.5 million), Rwanda (12.3 million), Uganda (42.7 million) and Zambia (17.5) (World Bank, 2019a). It remains significantly smaller in terms of population than regional giants Democratic Republic of the Congo (84.1 million) and Ethiopia (109.2 million) but close to South Africa (nearly 59 million).

Like its neighbours in the region, the United Republic of Tanzania is projected to experience a significant growth in the population of working-age adults in the next two decades (IOM, 2020b). While the next census – expected in the early 2020s – will revise current estimates, the latest available information shows a broad youth base (46% of the population is under 15) and a small proportion of the population over 60 (United Republic of Tanzania, MoHCDGEC et al., 2016b). In 2018, 53 per cent of the population were of working age (15–64 years old) (World Bank, 2019a). The working-age population doubled between 1990 and 2020 and will do so again by the middle of the century. Low life expectancy, reduced (but still high) infant mortality and high fertility account for the country's expansive population pyramid (see Figure 5). The HIV epidemic and high maternal mortality rates also contribute to the low median age.

Figure 5. Percentage distribution of the Tanzanian household population (age pyramid) estimated for 2020



Source: Reproduced using data from United Nations Department of Economic and Social Affairs (UN DESA), Population Division (2019c), 2021.

Despite contributions to mortality rates discussed in this section, if current trends continue, the population will be 80 million by 2035 and over 129 million by 2050 (UN DESA Population Division, 2019c). At 3 per cent, the country's population growth rate is among the 20 highest in the world (World Bank, 2019a). High birth rates determine these figures.

Fertility

Fertility varies by residence, wealth, and education. These factors indicate cultural and socioeconomic factors that underlie a woman's ability to plan the timing and number of children she bears. Women living in rural areas of the mainland have an average of 6.0 children, compared to 3.8 children among women in urban areas. Women in Zanzibar have an average of 5.1 children. Women living in the poorest households have an average of 7.5 children, compared to 3.1 children among women living in the wealthiest households (United Republic of Tanzania, MoHCDGEC et al., 2016a). Among the primary reasons for high fertility are early marriage (median age is 19.2 for women, 24.3 for men), low median age of first birth (19.2 for women) and teenage fertility (27% of women 15–19 are mothers or pregnant). Education, wealth and residence are important factors in teenage fertility. Teenage pregnancy or motherhood (of the first child) is approximately 13 per cent among women in the wealthiest households, as compared to 42 per cent among those in the poorest households. Teenage girls with no education are five times more likely as those with secondary or higher education to have begun childbearing (52% versus 10%). Place of residence and remoteness are also associated with the regional differences in teenage childbearing, which ranges from the lowest value of 5 per cent in Mjini Magharibi (Zanzibar City) to 45 per cent in Katavi region (United Republic of Tanzania, MoHCDGEC et al., 2016b).

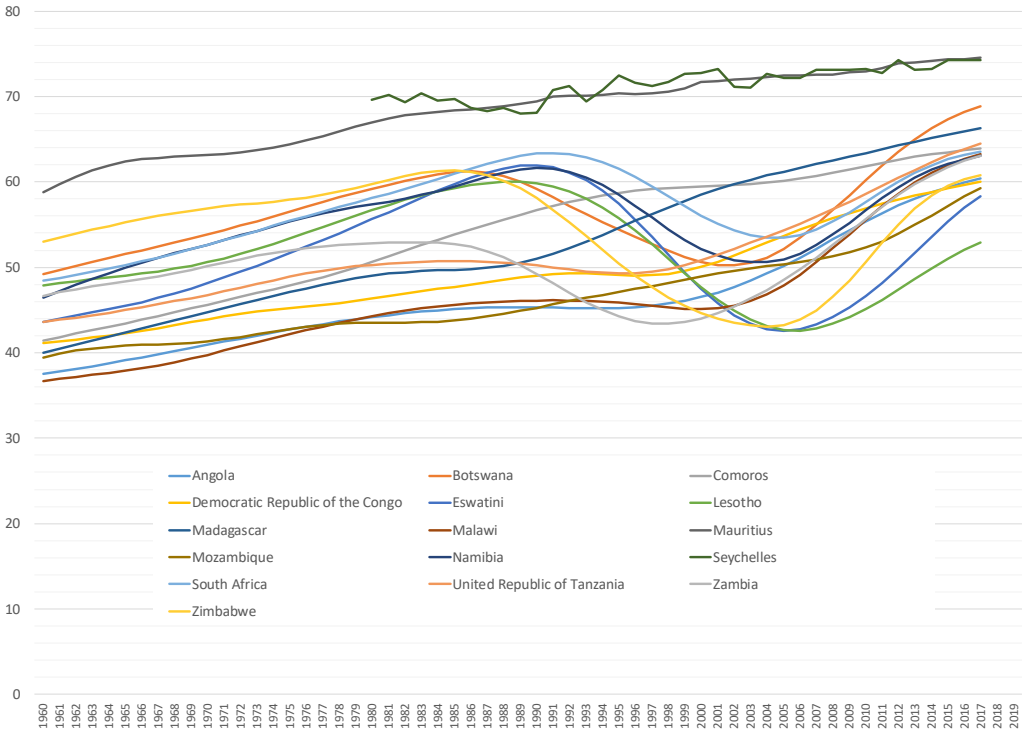
Life expectancy

Life expectancy surged in the United Republic of Tanzania between 2000 and mid-2010, likewise in other sub-Saharan African countries. Figure 6 illustrates this by showing life expectancy for Southern African Development Community (SADC) countries. Average life expectancy rose from 50.8 in 2000 to 64.5 years in 2017 (World Bank, 2019a).[17] This period followed a hiatus in the rise of life expectancy in the late 1980s and 1990s, linked to HIV/AIDS deaths in the working-age population. HIV caused a sharp decline in life expectancy across sub-Saharan Africa, in countries like Botswana, the Central African Republic, the Democratic Republic of the Congo, Kenya, Namibia and Zimbabwe. Other countries, including the United Republic of Tanzania, saw minor dips in life expectancy or minor improvements. The losses due to the HIV/AIDS epidemic

17 In 2017, life expectancy was 62.6 years for men and 66.3 years for women.

were offset by improvements in other areas of health, due in part to rises in income, government spending on health care, improvements to medicine and better planning. The United Republic of Tanzania, for example, saw a 55 per cent reduction in infant mortality rate between 1985 and 2010 (World Bank, 2019a). Infant mortality was 15 points below the average for sub-Saharan Africa, at 37.6 per cent in 2018 (World Bank, 2019a).

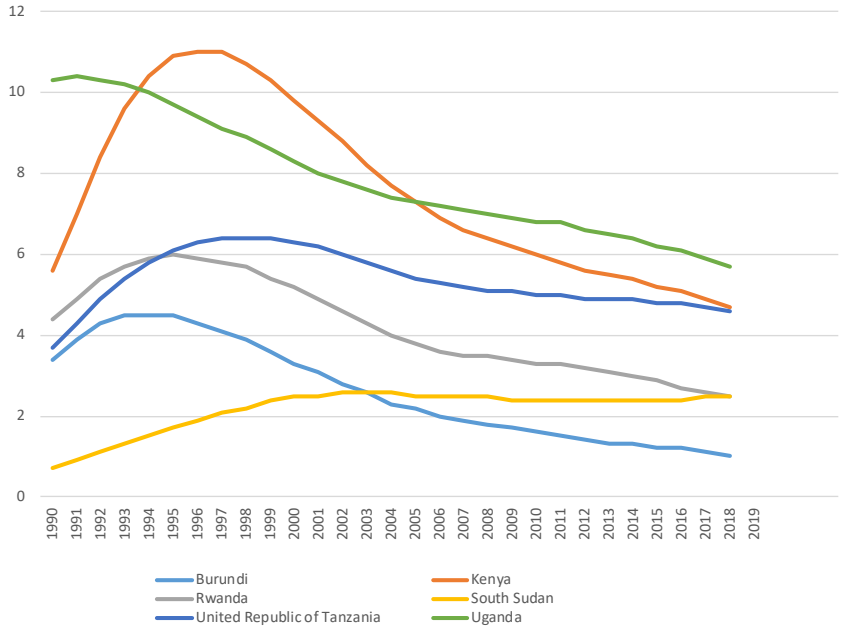
Figure 6. Life expectancy at birth in Southern African Development Community countries, 1960–2019



Source: Reproduced with data from the World Bank (2019a).

The current generalized HIV epidemic may affect life expectancy, and thereby the population distribution and growth, for decades to come. Figure 7 demonstrates that the prevalence of people living with HIV was 5.1 per cent of the total population in 2018, although that figure is over 15.4 per cent among women in some areas (World Bank, 2019a; UNAIDS, 2018). Tanzanian women are disproportionately affected, accounting for 60.3 per cent of over 1,500,000 people age 15 or over living with HIV (World Bank, 2019a). The number of new HIV infections among young women is nearly double that of young men (UNAIDS, 2018). While there is limited evidence that people living with HIV/AIDS are disproportionately affected by climate change, this group of people may suffer specific impacts in the face of natural hazards and conflicts, because such crises disrupt access to medicines and health-care services (UNAIDS, 2019).

Figure 7. Prevalence of HIV among populations aged 15–49 in East African Community countries, 1990–2019 (%)

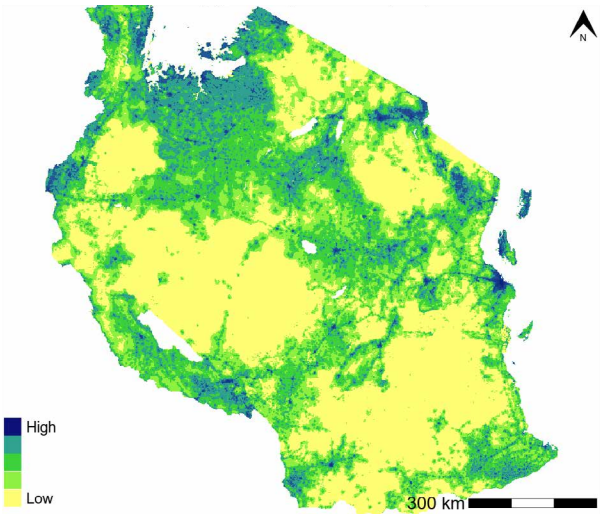


Source: Reproduced with data from the World Bank (2019a).

Population density and distribution

Population density varies significantly by region and is low overall. Figure 8 shows the distribution of people around the country, indicating higher density around major urban areas and roads. Across the mainland and Zanzibar, the average is 63.6 people per square kilometre (World Bank, 2019a). The majority of Tanzanians (65.7%) are in rural areas and employed in agriculture. The rural population was 83 per cent in 1985 and roughly 71 per cent in 2015, or an estimated 41.3 million people by today's population (World Bank, 2019a). In some sparsely populated arid regions, livestock far outnumber people, and density may be as low as 1 person per square kilometre. By comparison, Dar es Salaam and the islands of Zanzibar are among the most densely populated areas in East Africa, with up to 3,100 people per square kilometre for the former and 530 people for the latter (estimations based on the 2012 census (United Republic of Tanzania, NBS, 2013)).

Figure 8. United Republic of Tanzania human population density



Source: WoldPop (University of Southampton, University of Louisville, and Université de Namur) and Columbia University, 2018. This map is licensed under a Creative Commons Attribution-ShareAlike 4.0 International licence.

Note: This map is for illustration purposes only. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the International Organization for Migration.

The largest city in the country is Dar es Salaam, with a current estimated population of over 6 million (Rosen, 2019). Dar es Salaam's population has grown by more than six times since 1978. As the second fastest-growing city in the world, the United Nations projections forecast Dar es Salaam will reach the megacity status (10 million people) by 2030 (Rosen, 2019). Other cities over 250,000 (according to the latest census) include Mwanza, Arusha, Dodoma, Mbeya, Morogoro and Tanga (Government of the United Republic of Tanzania, 2012; United Republic of Tanzania, NBS, 2013).

Informal settlements are common. According to the latest information, over 50 per cent of the urban population is living in slums (World Bank, 2019a). The figure is highest in Dar es Salaam, where the proportion of the population living in informal settlements is over 70 per cent (Limbumba and Ngware, 2016; Sheuya, 2010).

Household size and composition

The size and composition of households have important consequences for the well-being of families and individuals. The average Tanzanian household has 4.9 members, close to the median of 4.8 for the sub-Saharan Africa region (UN DESA Population Division, 2019b). Most households in the country are typically either nuclear or joint family, the latter type involving polygynous marriages. Polygynous unions account for 18 per cent of all women and 9 per cent of men in 2015/2016, with important regional differences. Thirty per cent or more of married women in Kusini Pemba, Mara and Tabora regions are in polygynous unions, compared to less than 7 per cent of women in Kilimanjaro, Dar es Salaam and Morogoro regions United Republic of Tanzania, MoHCDGEC et al., 2016b). In part due to the prevalence of polygynous unions, women head roughly one in four households, which is close to the median for the region. Multigenerational households are common. Skip-generation households, in which a grandparent head of household co-resides with his or her grandchildren and none of the parents, are relatively high at 6 per cent (UN DESA Population Division, 2019b). These figures have interesting implications because the size and composition of households are highly linked with resources available to its members and therefore to migration propensities (discussed further in the section on internal migration). They may also give insights into the drivers of migration, for example, in the case that a migrant parent leaves his or her children with their grandparents.

Education

Improvements to education has been one of the major components of human development improvements in the United Republic of Tanzania in the past 50 years, impelling human capacities and larger community transformations. Education is one of the main factors positively associated with the probability of migration in the United Republic of Tanzania (Beegle et al., 2010 and 2011). Some standard indicators are presented in the following sections, although they do not fully encompass issues of education quality and the implications on human development.

Literacy in the United Republic of Tanzania is relatively high, at 75 per cent in 2015, yet it is below the global average. The average for the sub-Saharan Africa region in 2018 was 65.6 per cent, while the global average is close to 85 per cent (World Bank, 2019b). While data for the United Republic of Tanzania is incomplete and inconsistent, rates of primary school completion have generally followed a progressive upward trend (the global average for completion of primary school has risen slowly from 80% in 1980 to 91% in 2018). Roughly 69 per cent of adults in the United Republic of Tanzania had completed primary school in 2018 (72% of women and 65% of men), matching the average for sub-Saharan Africa (World Bank, 2019b). According to data from the 2012 Population and Housing Census, the expected years of schooling for mainland United Republic of Tanzania and Zanzibar are 8.9 years and 10.8 years, respectively (Government of the United Republic of Tanzania, 2012).

There are significant spatial inequalities in terms of education attainment among regions as well as between rural and urban areas. The gap in access to secondary education by residence is more marked. Children in urban areas are four to five times more likely to have finished secondary school. For example, 15 per cent of females in urban areas have completed secondary school compared with 4 per cent of females in rural areas. According to data from the 2012 Population and Housing Census, the proportion of the mainland population with at least some secondary education is generally highest among more northern regions and in Dar es Salaam, and lowest in some south-central and south-eastern regions.[18] This finding is consistent with the distribution of the population by wealth quintiles (see the section on household wealth, poverty and inequality). This pattern is unfortunately likely to continue, as the education of the household head – namely, if he or she is illiterate – is a factor that is highly linked with the likelihood of his or her children attending school (UNESCO, 2012).

18 Dar es Salaam was the region with the highest rate, at 33 per cent. Arusha, Kilimanjaro, Mwanza (all central-north and northwestern) and Iringa (central) were ranked in the top five regions in the country. Singida, Lindi, Mtwara and Ruvuma regions were the other regions ranked in the bottom five. The lowest rate was found in Simiyu, where only 7 per cent of the population had at least some secondary education or higher.

Educational attainment is a function of family circumstance. Barriers to education include the distance to school, expenses related to schooling, illness, disabilities and impairments, and domestic work responsibilities (this point affects the education of girls more than of boys). Studies show that distance to school of more than 5 km significantly increase the likelihood that the child will not attend school. In other words, remoteness is an important issue. Based on the most recent national household budget survey, 11 per cent of rural respondents raised the problem of schools being too distant from homes, compared to only 1 per cent or urban dwellers (UNESCO, 2012).

Important disparities in accessing education – and therefore opportunities – exist between women and men, especially in rural households (Government of the United Republic of Tanzania, 2012; United Republic of Tanzania, MoHCDGEC et al., 2016a). According to the 2016 Demographic and Health Survey, the number of women and girls over the age of 25 with no formal education at all is significantly higher than the same measure for boys and men, at 15 per cent compared to just 8 per cent (United Republic of Tanzania, MoHCDGEC et al., 2016a).[19] The difference in education levels between women and men relates to differing norms, customs, domestic labour demands and marriage practices, which are more limiting for women.

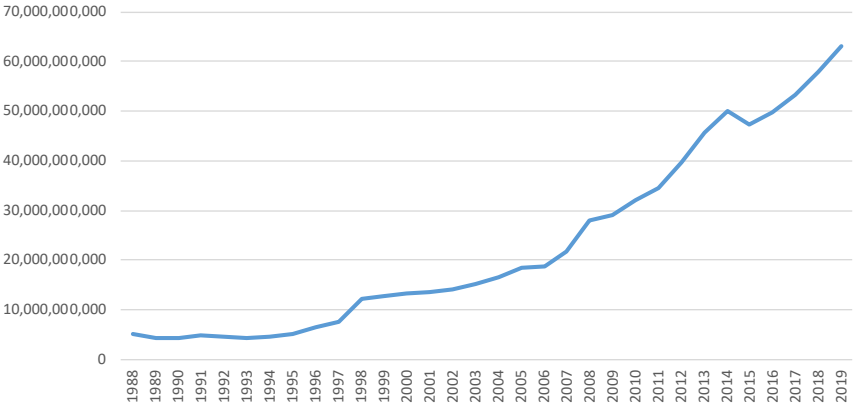
ECONOMY, EMPLOYMENT AND WEALTH

Economic growth

According to the latest information, the GDP of the United Republic of Tanzania was USD 67.24 billion in 2019 (IMF, 2019). The country is classified as low-income and is currently implementing a plan to reach middle-income status by 2025 (United Republic of Tanzania, Ministry of Finance and Planning, 2016a; Government of the United Republic of Tanzania, 2000). The country's annual GDP is roughly comparable to neighbours Democratic Republic of the Congo and Kenya (USD 47.2 billion and USD 87.9 billion, respectively) and nearly 15 per cent of South Africa's (USD 368.3 billion) (World Bank, 2019a). Despite challenges to the agriculture sector (see more in the section on agriculture and food security), annual GDP growth rate is among the highest in the sub-Saharan region that is stable at between 5.2–7 per cent since 2015 (World Bank, 2019a). According to available information, nominal GDP per capita expressed in current US dollars was approximately USD 1,100 in 2019 (IMF, 2019). GDP per capita purchasing power parity (PPP) in current US dollars was last recorded at USD 3,227 (IMF, 2019).

19 These numbers on people with no formal education cannot be compared with the World Bank figures for primary school completion in the preceding above due to methodological differences.

Figure 9. United Republic of Tanzania GDP, 1988–2019 (current USD)



Source: Reproduced with data from the World Bank (2019a).

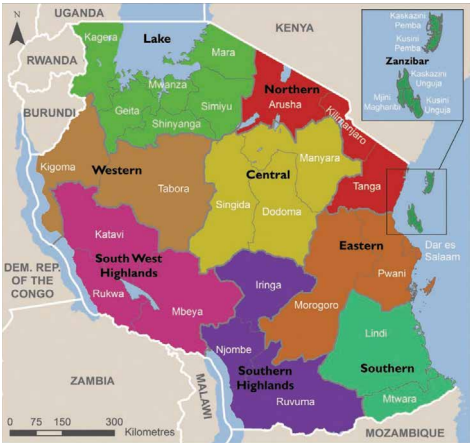
While the country has a mixed economy, agriculture – comprising crop growth, animal husbandry, forestry, fishery and hunting – remains the dominant occupation (United Republic of Tanzania MoHCDGEC et al., 2016b; World Bank, 2019a). The majority of employment is in agriculture (65.7% in 2019), as compared to services (26.95%) and industry (7.3%) (World Bank, 2019a). Contributions to GDP, however, came primarily from services (37.9% of GDP in 2017), as compared to agriculture (28.7%) and industry (25.1% of GDP). The official unemployment rate is 1.98 per cent according to the International Labour Organization, primarily affecting youth (latest figures suggest 14.9% of the youth population was inactive in 2014) (World Bank, 2019b). The disparity between the majority, who are in agriculture, and the relative few in lucrative industries contributes to inequality in the country. The main driver of inequality, however, remains the disparity between urban and rural populations – inequality of opportunity for social and economic mobility that is often out of the individual's control.

Household wealth, poverty and inequality

GDP and wealth are expected to continue to rise over time. New information from the next census will provide an insightful picture thereof. The most comprehensive information on wealth trends in the country is available from the Demographic and Health Survey and Malaria Indicator Survey (TDHS-MIS), a nationally representative survey conducted in six waves between 1991/1992 and 2015/2016 (United Republic of Tanzania, MoHCDGEC et al., 2016a and 2016b). Key population estimates can be constructed at the national level for nine zones: for all mainland regions and Zanzibar, plus urban and rural

"zones". The 2015/2016 wave of the TDHS-MIS found that roughly 61 per cent of households had access to an improved drinking water source,[20] 19 per cent had an improved (unshared) sanitation facility, 78 per cent had one or more mobile phones, and roughly 23 per cent had access to electricity (United Republic of Tanzania, MoHCDGEC et al., 2016b). According to the latest figures, in 2017, 32.8 per cent of the population had access to electricity (World Bank, 2019b). Although government-reported rates for mobile phone and internet penetration are high – 94 per cent and 43 per cent, respectively (Xinhua, 2018) – these figures obscure the actual number of users, as many people have multiple mobile phones, have a limited capacity to charge phones via neighbours and businesses, and/or share subscriptions with extended family members and friends. Ownership of other consumer goods is less common, as few in 2016 owned a motorized vehicle (4%), a bicycle (40%), a radio (50%) or a television (2%) (United Republic of Tanzania, MoHCDGEC et al., 2016a). Possession of these goods is substantially higher among households in urban mainland areas and in the region of Zanzibar than among rural mainland areas. In contrast, rural households on the mainland are more likely to own agricultural land (80%) or farm animals (69%) as compared to mainland urban households (30% each) and Zanzibari households (29% and 48%, respectively) (United Republic of Tanzania MoHCDGEC et al., 2016b).

Figure 10. Zones of the United Republic of Tanzania



Source: United Republic of Tanzania MoHCDGEC et al., 2016a.

Note: This map is for illustration purposes only. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the International Organization for Migration.

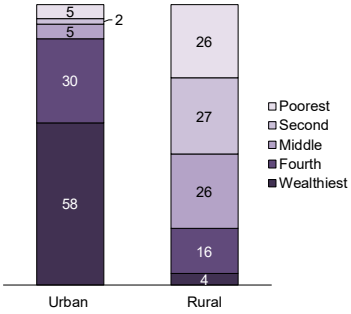
20 The classification of "improved drinking water sources" is a standard set by the World Health Organization that includes sources that are constructed with protections from contamination, such as from faecal matter. This includes piper water. Unimproved drinking water sources include unprotected dug wells, surface water, and water from a small tank or drum.

The population of the region of Zanzibar fares significantly better on nearly all indicator of household wealth than most of the mainland population. Almost 80 per cent of the population is in the two highest wealth quintiles. Some 47 per cent of households in Zanzibar have access to electricity, 59 per cent have an improved hygiene facility, 60 per cent have cement flooring and 98 per cent have access to an improved source of drinking water (United Republic of Tanzania, MoHCDGEC et al., 2016b).

The urban mainland population is generally wealthier than the rural population, and remoteness is inversely related to wealth. Wealth quintiles are constructed by looking at household assets such as type of flooring, source of drinking water, availability of electricity and possession of durable consumer goods. Because more than 95 per cent of the population lives on the mainland, the mainland population is quite evenly distributed among the five wealth quintiles.[21] Approximately 88 per cent of the total urban population (according to the zones illustrated in Figure 10) is in the two highest wealth quintiles, while 8 in 10 people in rural areas are in the three lowest wealth quintiles. Roughly 75 per cent of households in the eastern zone are in the two highest wealth quintiles. Some 80 per cent of households in the western zone are in the three lowest quintiles. Conversely, more than half of people in the northern zone (55%). For some human development indicators, the difference between wealth groups is stark. For example, the median number of years of schooling increases by about one or two years for each wealth quintile, from a low of one or two years to seven years among the highest wealth quintile (United Republic of Tanzania, MoHCDGEC et al., 2016b). As discussed in the chapter "Human Mobility in the United Republic of Tanzania: Current Trends", disparities between rural and urban areas tend to influence migration outcomes. However, while one would intuitively expect the pull of urban wealth and services to draw migrants, most migration in the country occurs within rural areas and people remain in similar employment and living conditions. Regional specificities and capacities are therefore paramount in the trajectory of human development in the country. This report suggests that migration to small villages and towns as well as the growth of these agglomerations – which are growing relatively faster than the country's primary cities – are more important to human development levels than migration to large cities (see section on internal migration).

21 The distribution is a function of how the quintiles are constructed, and the percentage of the population that lives in the region of Zanzibar is too small to skew the mainland distribution significantly.

Figure 11. Percentage distribution of residents in the United Republic of Tanzania by wealth quintiles in rural and urban areas



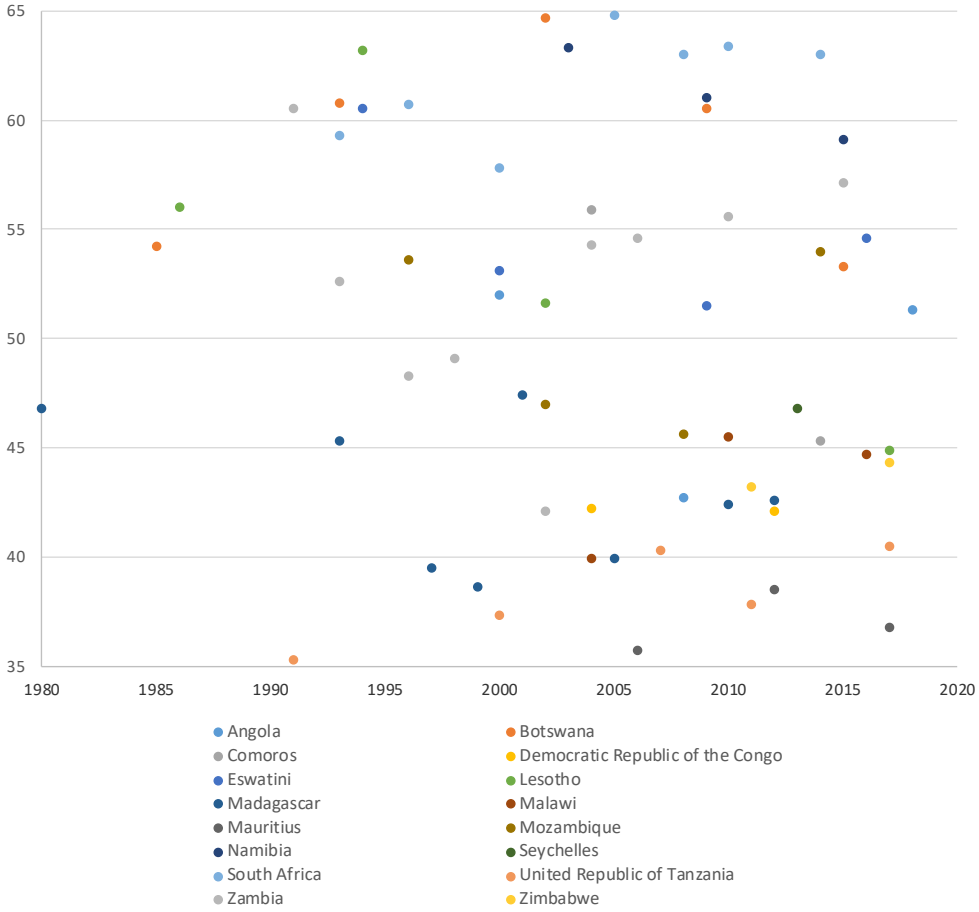
Source: United Republic of Tanzania MoHCDGEC et al., 2016b.

Despite remarkable reductions in poverty in recent decades, many people are clustered around the poverty line. A large population of people at or below the poverty line (49.1% live below the income poverty line of USD 1.90 per day PPP; see: UNDP, 2019). Between 2010 and 2015, 13 per cent of non-poor respondents to the Tanzania National Panel Survey (TZNPS) fell into poverty, while 16 per cent of poor households exited poverty (World Bank, 2019d). This indicates that the poverty status of roughly 30 per cent of the population changes in five years. Moreover, a significant proportion of Tanzanians who live just above the poverty line remain at risk of being pushed into poverty by shocks. On the other hand, raising the consumption of poor households by just TZS 350 per adult equivalent per day would lift about half of the poor out of poverty (World Bank, 2019d). In addition, 55.4 per cent of the population is in "multidimensional poverty" (UNDP, 2019). The measure Multidimensional Poverty Index goes beyond economic indicators to include measures of health, education, empowerment, quality of work, and the threat of violence and living in environmentally hazardous areas, inter alia.

Income inequality is relatively low for the sub-Saharan Africa region, as represented by a Gini coefficient of .378 in 2015. The Gini coefficient compares cumulative proportions of the population against cumulative proportions of income they receive and is intended to represent the income or wealth distribution of a nation's residents. A hypothetical coefficient of 0 would hypothetically represent perfect wealth distribution and thus perfect equality, but in reality, few countries have a coefficient value lower than .30. Given the low income and high agricultural dependence of most of the mainland population, as described above, a coefficient of .378 for the United Republic of Tanzania indicates that there is a very broad base of people with similarly low income

and the wealthy minority do not have as outsized a concentration of wealth as in other countries. This relatively even distribution of wealth can help explain overall low migration patterns, as discussed in the sections that follow, because the population may have low expected wage differentials between regions.

Figure 12. Gini index for the United Republic of Tanzania, 1991–2017

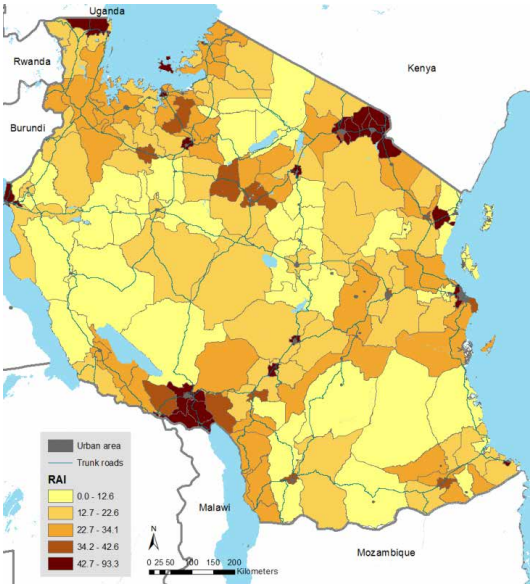


Source: Reproduced with data from the World Bank (2019a). Available at https://data.worldbank.org/indicator/SI.POV.GINI?locations=TZ.

Note: Available data is up to 2019 only.

Transport infrastructure is related to remoteness, as lack of access to roads for economic and social purposes corresponds to poverty and inequality, in part because it restricts agricultural production to subsistence levels and dampens migration propensities (Purie et al., 2016). Although improving, road infrastructure and access in the country is low. The proportion of people who are close to a main road is low, in many places less than 20 per cent. Figure 13 shows the United Republic of Tanzania's Rural Access Index (RAI), a measure of the ratio of people who have access to an all-season road within 2 km for each region (prior to the creation of Songwe region). In 2015, approximately 33 million rural residents in the United Republic of Tanzania were not connected to good roads (Purie et al., 2016).

Figure 13. United Republic of Tanzania Rural Access Index by region, plus main road infrastructure



Source: Purie et al., 2016, citing RAI 2014.

Note: This map is for illustration purposes only. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the International Organization for Migration.

Findings presented in the section on internal migration demonstrate that people in the poorest households have fewer financial and social resources required to migrate. In general, people from the relatively poorer, more remote areas identified in this section benefit less from the development potential of migration.

Sisal plantations in Morogoro region. © 2020/Julia BLOCHER

CHAPTER 3.
ANALYSIS OF RISKS RELATED TO CLIMATE CHANGE AND EXACERBATING FACTORS

CURRENT CLIMATE AND FUTURE PROJECTIONS

The climate of the United Republic of Tanzania is related to its geographical location and complex topography. The following section considers first the current climate of the United Republic of Tanzania before providing an overview of likely future patterns in the context of different climate change scenarios. This adds to the current state of knowledge in the country by adding new analysis to existing knowledge on temperature and rainfall trends.

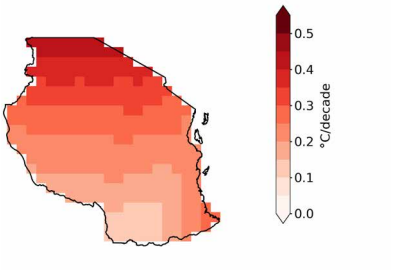
This section comes with and important caveat: there are major data limitations for past and current weather conditions in the United Republic of Tanzania, which add to uncertainties in climate modeling. Currently, there are 51 automatic weather stations in the country, 2 radars and 28 synoptic weather stations from which data is recorded by hand. For fewer than 10 of them, data is available for an average of around 60 years (Mikova and Msafiri, 2019). Forecasters have been using satellite data for comprehensive monitoring and estimates of rainfall and temperature since 1979. However, because of the low number of weather stations and availability of past observations, interpretations of climate trends at the local level and of climate extremes are limited. On a day-to-day basis, Tanzanians rely on the Tanzania Meteorological Agency (TMA) for weather forecasts and advisories, which are typically provided at the level of resolution of a region (TMA) (United Republic of Tanzania, TMA, 2020). Seasonal forecasts, in particular, are provided for the main rain seasons. Efforts to scale up forecasts an early warning are underway in the East African region. While the United Republic of Tanzania is not an official member of the Intergovernmental Authority on Development (IGAD), the IGAD Climate Prediction and Applications Centre (ICPAC) provides climate services for East Africa relevant to the United Republic of Tanzania, including seasonal rainfall forecasts (IGAD, 2020). In general, the analysis that follows depends on global satellite data to produce estimates of rainfall and temperatures.

Temperature

Temperatures across the United Republic of Tanzania are relatively homogenous. The coastal regions experience the highest temperatures in the country, with averages of over 25°C. In the summer months (December to February), the daily average from 1981 to 2016 reached 30°C. Inland, temperature distribution mainly follows topography. In central United Republic of Tanzania, up to 100 days per year reached temperatures of more than 32°C, which puts heat stress on the population and some crops. The area surrounding the Dodoma urban district experiences around 80 days over 32°C per year (based on WATCH-Forcing-Data-ERA-Interim reanalysis data (WFDEI)).

Since the 1980s, average temperatures have been rising continuously throughout all of the United Republic of Tanzania between 0.1°C and 0.5°C per decade (Figure 14). The northern regions warmed more than the south, and the strongest trends are observed in the austral summer (based on WFDEI). There is evidence that daily minimum temperatures increase at a stronger rate than daily maximum temperatures, but there is generally only little agreement between datasets (Christy et al., 2009). There is low to medium confidence in observed trends of daily temperature extremes in Africa due to the scarcity of observations, as well as a general lack of literature about changes in heat wave occurrence in the continent (Christensen et al., 2013).

Figure 14. Mean surface temperature trend in the United Republic of Tanzania, 1981–2016



Source: Produced by Stephanie Gleixner, based on WFDEI, 2020.

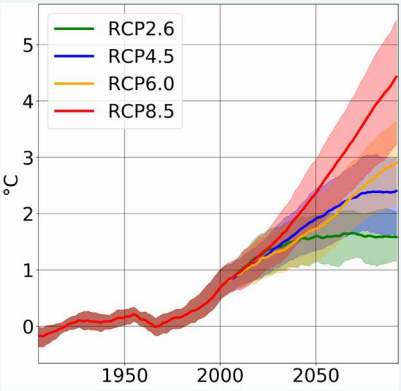
Note: This map is for illustration purposes only. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the International Organization for Migration.

Text box 2. Projected global climate change for the twenty-first century

We mainly use global climate models to estimate future climate conditions. While the development of climate models has made vast improvements in recent decades, it still faces many challenges, in particular the simulation of small-scale features. Uncertainties in climate simulations arise mainly from model uncertainties, emission uncertainties and natural variability. In order to account for these difficulties and avoid results to be dominated by model bias, the text presented in this section is based on a consideration and comparison of different climate model outputs.

Recent climate models use four scenarios to cover possible future emissions (so-called representative concentration pathways (RCPs)). Figure 15 shows the four RCPs against projected mean global surface temperature, with uncertainty bars, based on the four Inter-Sectoral Impact Model Inter-comparison Project (ISIMIP) models. RCP2.6 is the most optimistic scenario that demands strong emissions mitigation (van Vuuren et al., 2011), and the only emissions scenario for which the global temperature trend is projected to stay below the 2°C target outlined in the Paris Agreement within the United Nations Framework Convention on Climate Change. The other scenarios indicate global average surface temperatures will warm by between 2.5°C and 4.5°C by the end of the twenty-first century compared to pre-industrial levels (Figure 19) (Frieler et al., 2017; Potsdam Institute for Climate Impact Research (PIK), 2020).

Figure 15. 11-year running mean global surface temperature anomalies in reference to pre-industrial conditions (1901–1950) under the four representative concentration pathways



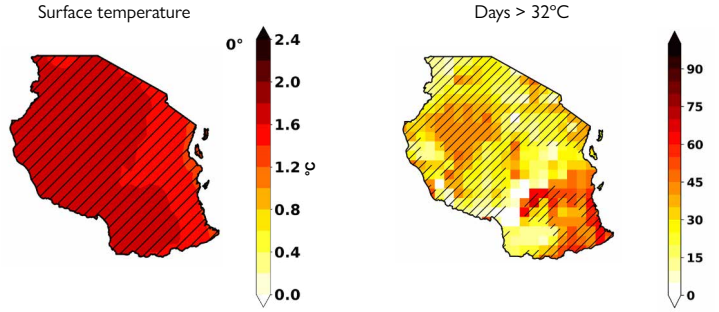
Source: Figure produced by Stephanie Gleixner based on the four ISIMIP models (PIK, 2020).

Note: The figures presented here use global climate models. Uncertainties in climate simulations arise mainly from natural variability.

Climate change in the United Republic of Tanzania: Temperature projections

Temperatures will rise in the United Republic of Tanzania throughout the twenty-first century, even under optimistic scenarios. This trend is a robust result among climate models and greenhouse gas emissions scenarios (Collins et al., 2013). Under the most optimistic emissions scenario RCP2.6,[22] we can expect average temperatures to rise 1°C in the country by the middle of the century (2030–2050). Under the business-as-usual scenario represented by RCP8.5, temperatures may rise as much as 5.2°C. Figure 16 shows RCP2.6 results until mid-century, indicating both the annual mean surface temperatures (figure on the left) and the mean number of very hot days (figure on the right) – defined as days for which temperatures exceed 32°C – are likely to increase across the country. Moreover, the number of very hot days can be expected to increase significantly in some areas. The semi-arid Dodoma region may be among the worst affected, as even under the RCP2.6 scenario, climate models show an increase of more than 40 very hot days. As many as 60 more very hot days can be expected in other areas by the middle of the century.

Figure 16. Heating by mid-century for RCP2.6, scaled to 2.4 degrees warming and 95 extreme heat days



Source: Produced by Stephanie Gleixner based on ISIMIP simulations (PIK, 2020).

Note: These maps are for illustration purposes only. The boundaries and names shown and the designations used on these maps do not imply official endorsement or acceptance by the International Organization for Migration.

22 See Box 2 for an explanation of the four greenhouse gas emissions trajectories used in this report, the so-called representative concentration pathways (RCPs).

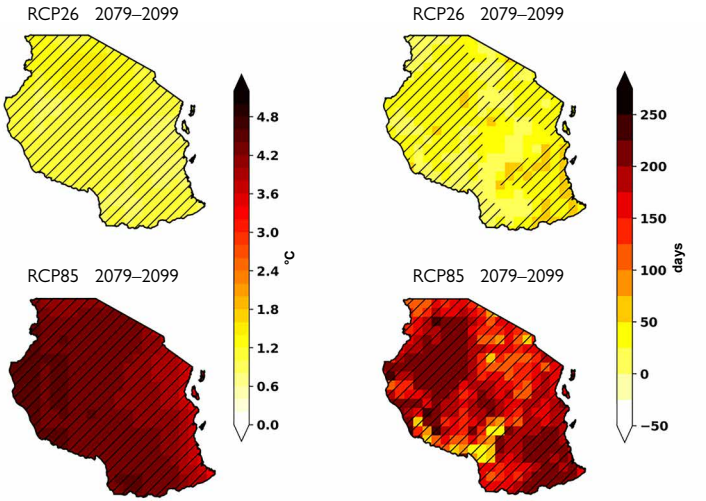
By the middle of the twenty-first century, the impacts of climate change on temperature may already be significant. Under the pessimistic, business-as-usual emissions scenario represented by RCP8.5, temperatures may rise 2–2.5°C by the middle of this century (Collins et al., 2013). Under RCP8.5, some parts of the country may see 70–90 more days for which temperatures exceed 32°C per year. Dodoma region may see 70 more very hot days per year by mid-century under RCP8.5.

By the end of the century, temperatures may be severe. Temperatures can be expected to rise between 2.3°C (RCP2.6) and 5.2°C (RCP8.5) by the end of the century. The number of very hot days rise may increase by over 100 across almost all of the country and up to 250 in some areas. Aside from the damage to crop yields and food security, the thermal thresholds for the human body may be surpassed in some hot and humid areas, especially in the well-populated coastal regions. When air temperature exceeds 35°C together with high humidity, the human body is unable to rely on sweating to keep core temperatures at a safe level (the "wet bulb" temperature). Children, people with illnesses and the elderly tend to be the most sensitive groups. In other words, human habitation may become logistically intolerable in some areas for some people.

The emissions scenario followed globally is of grave significance to the United Republic of Tanzania and has major implications on government planning. Figure 17 shows the projected future rise in surface temperature (left) and increase in number of days above 32°C (right) by the end of the twenty-first century (2079–2099 average) under both RCP2.6 (top left and top right) and RCP8.5 (bottom left and bottom right) scenarios, as simulated by ISIMIP models (note: the figures are on a higher scale than Figure 16, which shows only projections to the middle of the century; the baseline is the 1985–2005 average).

While scientists believe that the current trajectory of global emissions is more likely to be between these two scenarios, these projections nevertheless demonstrate the importance of climate mitigation for the United Republic of Tanzania. While temperatures will rise in any scenario, the business-as-usual scenario is likely to have negative impacts on human habitation in large sections of the United Republic of Tanzania.

Figure 17. Warming by end of century (2079–2099), scaled to 5 degrees and 250 extreme heat days



Source: Produced by Stephanie Gleixner based on ISIMIP simulations (PIK, 2020).

Note: These maps are for illustration purposes only. The boundaries and names shown and the designations used on these maps do not imply official endorsement or acceptance by the International Organization for Migration.

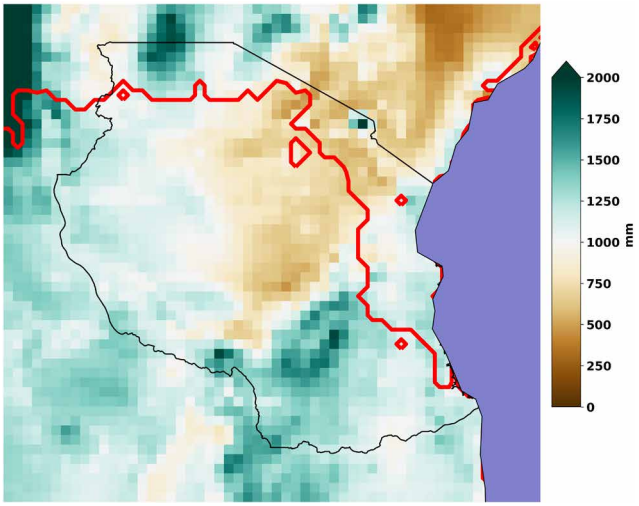
Rainfall

Rainfall amounts, variability and extremes vary strongly between Tanzanian regions, seasons, and years (Arce and Caballero, 2015). Rainfall distribution is shaped by topography and the north-south spread of a band of low pressure called the Inter-Tropical Convergence Zone (ITCZ). The position of the ITCZ changes over the course of the year, determining two different seasonal regimes in the country (Ogallo, 1989; Ogallo et al., 1988). Because of the ITCZ, the northern regions typically experience two rainy seasons – the *masika*, the season of long rains (March–May), and the *vuli*, the short rains season (October–December). Most of the rest of the United Republic of Tanzania has one rainy season, *msimu* (October–April). Based on Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS),[23] Figure 18 shows the approximate separation between the unimodal and bimodal rainfall regimes, demarcated by the red line (see also Noel, 2011). The intensity, location and orientation of

23 Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS) is a daily, gridded rainfall product that combines information from satellites and stations data. CHIRPS captures variability and rainfall amounts well but has shown a tendency to overestimate dry days. WFDEI is daily, bias-corrected reanalysis data specifically produced for impact modelling. WFDEI temperature is based on the European Centre for Medium-Range Weather Forecasts re-analysis (ERA-interim) corrected with the Climate Research Unit.

the monsoonal wind systems; subtropical air circulation (anticyclones); tropical cyclones; and jet streams control the spatial and temporal characteristics of the climate (Hastenrath, 2000; Kabanda and Jury, 1999; Mutai and Ward, 2000; Ogallo, 1989; Schreck and Semazzi, 2004; Sumner, 1983). Overall, the years in which the rainy season has a later onset and an earlier withdrawal tend to also be the years with less-than-average rainfall (Mapande and Reason, 2005). In years of above-normal rainfall, the westerly winds are weaker than normal and thus reduce the export of moisture out of equatorial East Africa. In addition, anticyclones over the southern tropics increase the moisture convergence over southern United Republic of Tanzania, intensifying rainfall (Mapande and Reason, 2005).

Figure 18. Annual mean rainfall in the United Republic of Tanzania, 1981–2016



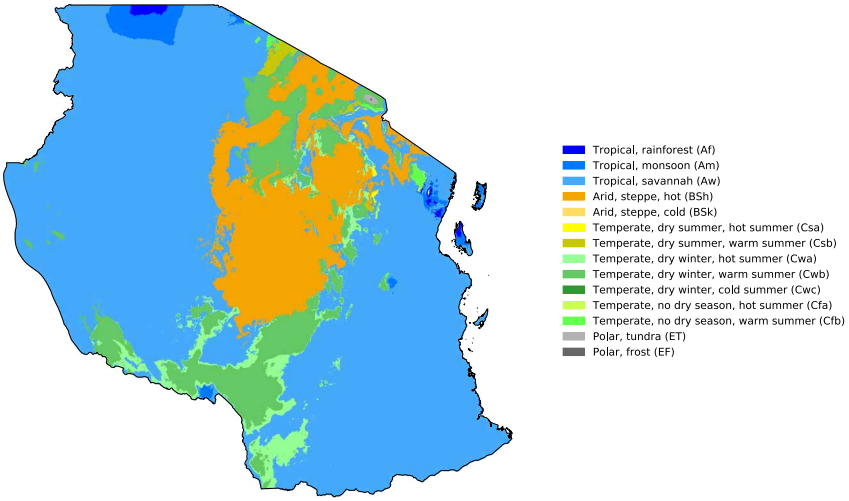
Source: Produced by Stefanie Gleixner, based on CHIRPS, 2020.

Note: The red line denotes the border between regions of one rainy season (unimodal, to the south) and regions of two rainy seasons (bimodal, to the north).

Due to differences in rainfall and geography, the United Republic of Tanzania has a few different climate zones, but it is relatively homogenous. The Köppen-Geiger climate zone classifications are presented in Figure 19 to illustrate the different climates in the country. Most of the country is tropical savannah and receives an average annual rainfall of between 800 mm and 1,600 mm. The East African plateau that crosses central United Republic of Tanzania is an arid steppe and receives little rainfall, usually 500–600 mm or below. At higher elevations, the climate is temperate with moderate precipitation, 1,100 mm on average (see Figure 18; Beck et al., 2018). The Central Zambezian Miombo woodlands, which occupy the western portion of the country between Lakes Victoria, Tanganyika

and Malawi, receive moderate rainfall. The coast is relatively humid, with varying annual averages. Dar es Salaam, for example, receives an average of 1,150 mm of rainfall per year. The 22 islands in the Indian Ocean, including the Zanzibar archipelago, have a similar climate to that of the mainland coastline, but they receive more rain: about 1,600 mm (63 in) per year in Zanzibar, and up to 1,900 mm (75 in) on the northern island of Pemba.

Figure 19. Köppen-Geiger climate zones in the United Republic of Tanzania, 1980–2016

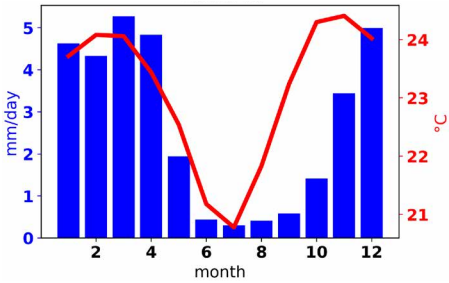


Source: Beck et al., 2018.

Note: This map is for illustration purposes only. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the International Organization for Migration.

In an average year, the dry central regions do not see any rainfall for more than 200 consecutive days. One of the few weather stations in the United Republic of Tanzania that recorded the weather of the past four decades is located in Dodoma, in the arid centre of the United Republic of Tanzania. Dodoma only receives rainfall in the austral summer. Figure 20 shows low average millimeters per day of rainfall between May and October for the country as a whole, when it almost never rains across the central plateau (see the blue bars, which relate to the primary y-axis). On the plateau, December and January are the rainiest months, with an average rainfall of around 5 mm per day. Total annual rainfall lies around 550 mm, but in some dry years, the station records more than 300 dry days (based on data received from the TMA) (United Republic of Tanzania, TMA, 2020).

Figure 20. Monthly average rainfall and temperature in the United Republic of Tanzania, 1981–2016



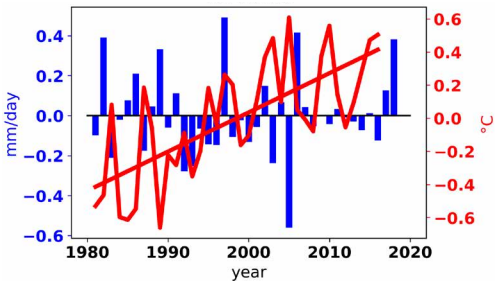
Source: Produced by Stephanie Gleixner, based on CHIRPS, 2020.

Note: The blue bars and the primary y-axis show the average rainfall, while the red line and the secondary y-axis show the average temperature.

There has been no statistically significant long-term change in average annual rainfall over four decades of data. This is despite the variability by region, season and year, noted previously. Figure 22 shows limited positive or negative changes in annual mean rainfall trend by decade (1981–2016). In the rainier, unimodal southern regions, observations show a non-significant drying trend with highest drying rates exceeding 70 mm per decade. Studies have shown a decrease of 6 per cent of annual mean rainfall in the southwest region of the United Republic of Tanzania (Matari et al., 2008; Mwandosya, Nyenzi and Lubanga, 1998). A non-significant wetting trend has been observed in the north-west, in particular in the area around Lake Victoria. Here annual rainfall increased by up to 70 mm per decade. The semi-arid regions in central United Republic of Tanzania show no linear trend in annual mean rainfall over the past four decades.

Figure 21 shows temperature (red) and rainfall (blue) anomalies over the long-term average (1981–2016). A clear upward linear trend in temperature is observable. No clear trend is observable in rainfall observations averaged over the country, but the picture is complicated; while the United Republic of Tanzania as a whole may not have a clear trend in rainfall over this period, different regions may show trends. Figure 21 presents the nuances, as a minor wetting trend per decade for the north-western and central plateau regions differs from a minor drying trend in some of the north-eastern, coastal and southern parts of the country. The linear trends are non-significant.

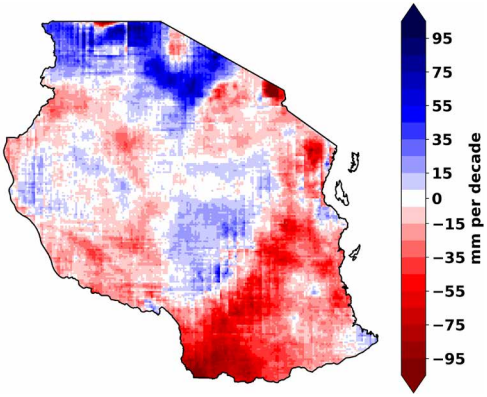
Figure 21. Averaged rainfall and temperature anomalies in the United Republic of Tanzania



Source: Produced by Stephanie Gleixner, based on WFDEI, 2020.

Note: The blue bars and the primary y-axis show the rainfall anomalies, while the red line and the secondary y-axis show the temperature anomalies.

Figure 22. Linear annual mean rainfall trend in the United Republic of Tanzania, 1981–2016



Source: Produced by Stephanie Gleixner, based on CHIRPS, 2020.

Note: This map is for illustration purposes only. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the International Organization for Migration.

Although long-term averages are stable, a rapid warming of the Indian Ocean and the Pacific Ocean has impacted the seasonal "normal". The long rains in north-eastern coastal regions, occurring roughly between March and June, have declined over the last four decades. These changes in ocean surface temperature cause a change in large-scale atmospheric circulation and consequently sinking air over East Africa (Lyon and DeWitt, 2012; Nicholson et al., 2018; Rowell et al., 2015; Williams and Funk, 2011). Sinking air (atmospheric

subsidence) suppresses convection and therefore rainfall and can contribute to high-pressure systems that are typically associated with clear skies, low wind circulation and higher concentrations of urban air pollution.

Moreover, extreme weather events such as droughts and heavy rainfall have been experienced more frequently during the last 30–60 years (Lyon and DeWitt, 2012; Nicholson et al., 2018; Shongwe et al., 2011). Warming waters in the eastern Indian Ocean and western Pacific Ocean (known as the "Indo-Pacific Warm Pool" or "Tropical Warm Pool") has been shown to contribute to more frequent East African droughts over the past 30 years, during the austral spring and summer seasons (Williams and Funk, 2011). Some scholars note that these changes may be due to a natural variability over a longer time period (Lyon et al., 2014; Lyon and DeWitt, 2012). At the same time, the coastal regions show an increase in the precipitation amount on rainy days in the last decades. This indicates a shift towards fewer rainy days but with more intense rainfall (Funk et al., 2014).

Text box 3. El Niño–Southern Oscillation in the past and present

Paleo-climatic reconstructions based on fossil corals show a large range in the natural ENSO variability in the past 7,000 years (Cobb et al., 2013). The twentieth century ENSO variance is significantly higher than the preindustrial average, however, not unprecedented (ibid.). Also, multi-proxies show that the observed ENSO variance of the last decades was significantly higher than in the previous centuries (McGregor et al., 2013).

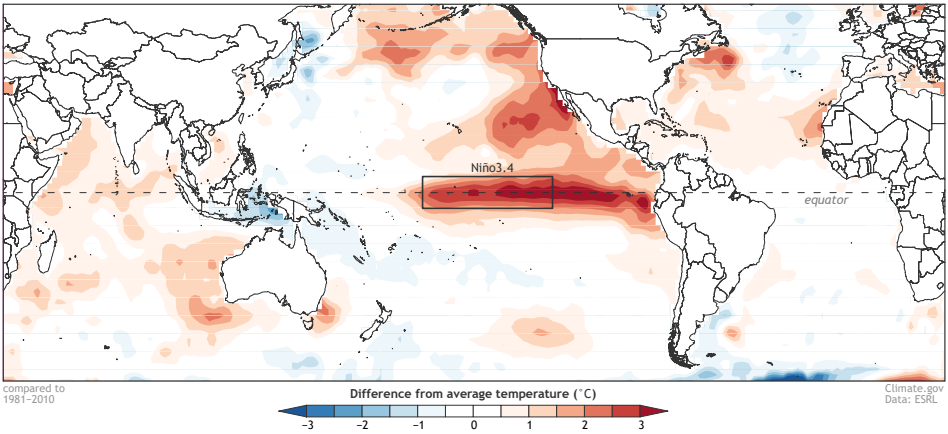
Climate change will likely alter ENSO patterns. A majority of climate models project that the sea surface temperature variability will increase, leading to an increase in the number of strong eastern Pacific El Niño events, although model projections do not completely agree (Cai et al., 2018). For example, Cai et al. (2018) find an increase of strong eastern Pacific El Niño events for the average of a selected set of models from about six in the twentieth century to about nine in the twenty-first century. For central Pacific El Niño and extreme La Niña events, models also project increased frequencies under greenhouse warming, however, with a weaker intermodel consensus (Cai et al., 2015b; Cai et al., 2018). The Intergovernmental Panel on Climate Change (IPCC) (2019) has medium confidence that extreme El Niño events will occur about as twice as often under both low and high emissions pathways in this century as compared to the last one. These increases could imply that the frequency of extreme precipitation associated with strong ENSO events like the ones of 1982–1983 and 1997–1998 could also increase, but not all strong El Niño events have the same impact. The impact in the Tanzanian context is not as variable as in other countries which experience severe extremes.

More extreme El Niño and La Niña events could also affect the United Republic of Tanzania; however, the relationship between ENSO and the precipitation in the United Republic of Tanzania may also weaken, as explained in the section on El Niño–Southern Oscillation, covering impacts.

El Niño–Southern Oscillation

The strongest remote influence on Tanzanian rainfall is surface temperature in the Pacific, controlled by ENSO (Indeje et al., 2000; Ogallo, 1989; Ogallo et al., 1988). ENSO is the most important and consequential driver of natural climate variability on Earth. It is characterized by episodes of irregular warming of sea surface temperatures in the equatorial Pacific during El Niño years and unusual cooling of these waters during La Niña years. El Niño events occur irregularly every few years (every one to five years in recent decades) and are usually followed by La Niña events. These warming and cooling events are accompanied by atmospheric circulation changes in the Pacific and affect not only the local weather, but it can influence the weather conditions of distant locations.

Figure 23. Sea surface temperature anomalies during the last major El Niño in the United Republic of Tanzania, 2015/2016



Source: United States National Oceanic and Atmospheric Administration, climate.gov, 2019.

Note: This map is for illustration purposes only. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the International Organization for Migration.

Up to 40 per cent of the seasonal variance in the rainfall of coastal East Africa can be explained by global sea surface temperatures, with ENSO being the most important driver of the sea surface temperatures (Ogallo et al., 1988). The influence of El Niño on the climate of the United Republic of Tanzania is well documented (Indeje et al., 2000; Ogallo et al.,

1988), as well as its impacts on vegetation and local hydrology (Fer et al., 2017). El Niño appears to be associated with above-average rainfall, generally due to an earlier-onset and longer-than-normal short rains season (*vuli*). During La Niña years, there is below-average rainfall over the northern Tanzanian coast due to a late-onset and thus a shorter than average rainfall season (Kijazi and Reason, 2005; Noel, 2011; Rourke, 2011). The long rain season (*masika*) of the northern coastal region is influenced to a lesser extent by the ENSO cycle (Kijazi and Reason, 2005). Moreover, the influence of the ENSO cycle on the southern coastal area is less clear, since this area appears to be a transition zone between the opposite ENSO impacts over equatorial east and southern Africa.

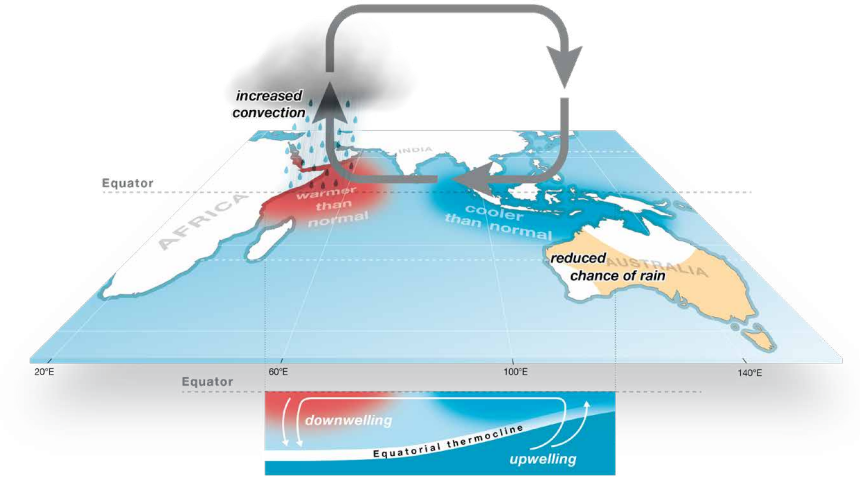
Because of the occurrences of heavy rainfall and flooding, El Niño episodes have impacts on the population of the United Republic of Tanzania. El Niño-related rainfall events can also damage crops, overload energy production and affect water sources. A secondary impact is the increased risk of waterborne and vector-borne diseases. For example, El Niño increases the risk of cholera outbreaks in the country (Moore et al., 2017). The United Republic of Tanzania experienced its largest recorded cholera epidemics during the 1997/1998 and 2015/2016 El Niño episodes, the latter infecting 25,482 and killing 299 between August 2015 and May 2016 (Moore et al., 2017). Conversely, reduced rainfall associated with La Niña events leads to reduced crop yields and associated food shortages (Iizumi et al., 2014). Some of these dynamics are further explored in the section on agriculture and food security.

Indian Ocean Dipole

Surface temperature in the Indian Ocean – influenced by the IOD, sometimes called the Indian Niño – also affects precipitation variability in the United Republic of Tanzania (Marchant et al., 2007; Saji et al., 1999; Endris et al., 2013). The IOD is an irregular oscillation of sea surface temperatures that produces similar effects as the ENSO cycle. The western Indian Ocean sea surface temperatures are unusually warm in the positive IOD phase, producing above-average rainfall (similar effect to the El Niño phase). In a negative IOD phase, the western Indian Ocean becomes colder than the eastern part of the ocean with reduced rainfall (similar to the La Niña phase). The IOD especially influences rainfall in the northern regions during the short rain (*vuli*) season.

As with El Niño episodes, positive IOD phases increase the risk of heavy rainfall, flooding and epidemics in the United Republic of Tanzania (Moore et al., 2017). For example, the extreme conditions experienced during the 2006 short rains season (*vuli*) over northern United Republic of Tanzania were related to warm sea surface temperatures in the western Indian Ocean, associated with a positive phase IOD and El Niño (Kijazi and Reason, 2009). Four northern and north-western regions of the United Republic of Tanzania were affected by severe flooding in 2006, corresponding with a resurgence of the dangerous Rift Valley fever (RVF1) (IFRC, n.d.).

Figure 24. Positive Indian Ocean Dipole phase



Source: Reproduced with the permission of the Commonwealth of Australia, Bureau of Meteorology, 2013.

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Climate change in the United Republic of Tanzania: Rainfall projections

It is unclear how climate change will affect total average rainfall in the whole of the country in the future. There is no clear wetting or drying trend for the whole of the United Republic of Tanzania in any of the RCPs (FCFA, 2017). Current climate models do not agree whether total annual rainfall will increase or decrease overall, as models poorly simulate the rainfall of the long rains season (*masika* in bimodal rainfall areas and *msimu* in unimodal areas) (Conway et al., 2007; Cook and Vizy, 2013; Christensen et al., 2013; Shongwe et al., 2011).

On the other hand, most climate models show total rainfall during the short rains season (*vuli*) will increase throughout the twenty-first century (Conway et al., 2007; Mtongori et al., 2016; Shongwe et al., 2011). This is linked to the likelihood that the *vuli* season lengthens overall (Niang et al., 2014). This season is impacted by surface temperatures of the Indian Ocean and the warming pattern of the Indian Ocean, which is robust among models, suggesting higher temperatures and increased precipitation (Christensen et al., 2013). These conditions replicate a positive IOD-like pattern (see Figure 24). Due to this increased surface temperatures, some analyses of global climate models show future total rainfall increase in the upper Pangani River basin may be between 16 per cent and 18 per cent by mid-century under moderate RCPs, relative to 1980–1999 periods (Kishiwa et al., 2018). However, the IPCC cautions that predictions based on average rainfall does not adequately capture variability that positively or negatively affects surface water runoff (Niang et al., 2014). In the United Republic of Tanzania, communities dependent on rain-fed agriculture would still be negatively affected by more erratic and less frequent wet days during the key growing seasons.

The connection between Tanzanian rainfall and ENSO is projected to become weaker in the future. Using a high emissions scenario (RCP8.5), some climate models show a weakening of the relationship between ENSO and the short rains (*vuli*) for the end of this century (Endris et al., 2019). However, ENSO and IOD phases continue to affect drought conditions and heavy rainfall, with negative consequences for populations.

The vast majority of recent climate models show rainfall will become more erratic by the end of the twenty-first century. Figure 25 shows an ensemble of model outputs for rainfall (each bar represents one global climate model's output of per cent change in annual mean rainfall per rainy day) from the current period (1976–2005 average) up to the mid-century (2021–2050) for all of the United Republic of Tanzania. Overall, we observe a projected increase in the total amount of rainfall on a given rainy day, in tandem with a decrease of the total number of rainy days and an increase in the number of dry days (FCFA, 2017; Vizy

and Cook, 2012). Because there is no corresponding projected increase in total rainfall, this indicates rainfall events will be heavier and less frequent, leading to negative impacts on crop yields and populations.

The impact of climate change on rainfall has a modest impact on water scarcity relative to population growth, unsustainable agriculture, urbanization and land-use change (Niang et al., 2014). The IPCC concludes that other drivers are more consequential for water shortages than the projected total average rainfall increase.

Figure 25. Ensemble of global climate model outputs for change in annual mean rainfall per rainy day

Source: FCFA, 2017.

Note: Rainy days here are defined as days with rainfall more than 0.1mm. Each bar on the x-axis represents one [global climate model] (ibid.).

Other climate impacts

Sea levels are expected to rise in East Africa by between 0.43 (RCP2.6) and 0.84 meters (RCP8.5) above the 1990 level by the end of the century (Christensen et al., 2013). A number of scenarios (B1, A1B, A2) of both population and sea-level rise are used to assess risk (Rahmstorf, 2007). The low-end scenario of sea-level rise of 43 cm (1.4 ft) in the period 1995–2100 would require ambitious mitigation scenario leading to 2°Celsius increase in temperature by 2100 compared with preindustrial levels. For the entire coast (3461 km) of the United Republic of Tanzania, a total area of 3,579–7,624 sq km could be lost by 2030 under the low-range scenario (B1), mainly through inundation, with around 234,000 to 1.6 million people per year who could potentially experience flooding (Niang et al., 2014). Decreasing sediment inputs to the coast beach sand mining contribute to coastal erosion, factors linked to population growth and construction along the shoreline (IPCC, 2019). If major adaptation measures are not taken, annual damages are estimated between USD 26 million and USD 55 million per year (Kebede and Nicholls, 2011), and the United Republic

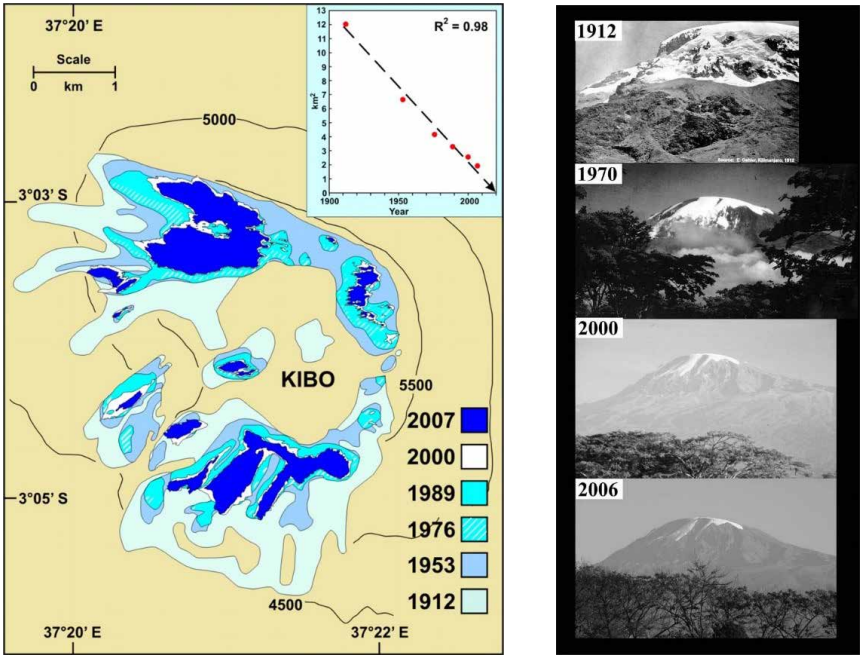
of Tanzania will remain in the top 10 African coastal countries with absolute numbers of people flooded per year (Hinkel et al., 2012).

The disappearance of the Mount Kilimanjaro glaciers is a prominent observed trend that is likely to continue. Between 1912 and 2000, the total surface areas of the ice fields and glaciers shrank by around 85 per cent (Mote and Kaser, 2007; Thompson et al., 2009). In just two decades since, the remaining surface area shrunk another 26 per cent, while the total volume decreased by 32 per cent (*Live Science*, 2012). In 2012, the largest remaining ice field on the northern summit shrank and separated into two pieces. However, the drivers of the glacier melting and the additional impact of climate change are not clearly understood (Cullen et al., 2006; Mote and Kaser, 2007; Thompson et al., 2009; Said et al., 2019). A recent review of a large number of studies concluded there are still limited long-term, good-quality, and high-resolution data on altitudinal precipitation and temperature on the slopes of Mount Kilimanjaro, as well as on groundwater recharge areas and their stability (Said et al., 2019). It is therefore not clear how climate change has interacted with other causes of decline of the ice fields and glaciers, notably, the effects of irrigation, vegetation and river discharges on the groundwater recharge process.

In any case, most scientists expect that the permanent snow cap on Mount Kilimanjaro will disappear by the middle of the twenty-first century (Oskin, 2013; Said et al., 2019). Reduced catchment of rainfall on the summit (10% of local rainfall) and the forest belt (90% of local rainfall) is linked to an overall decline in water output and evaporation to the atmosphere, eventually returning as precipitation (Agrawala et al., 2003). Forest loss – especially through land-use change in the lower altitudes and anthropogenic fires in the upper montane areas – and related ecosystem changes are the main threats to Kilimanjaro (Hemp, 2009; Agrawala et al., 2003). Wildfires on the mountain slopes also have an impact on deforestation and thus on the water cycle (Hemp, 2009). Temperature increases and rainfall changes related to climate change may exacerbate wild fires, contributing to human-made causes of deforestation (Niang et al., 2014).

While the loss of the snow cap of Mount Kilimanjaro would be a never-before-seen and striking impact of environmental degradation, the impact is more likely to be symbolic than of consequence to livelihoods. The melting of glaciers per se has a negligible impact on the population in the lowland areas because the two streams emerging from the meltwater are not significant contributors to the Pangani River basin (Said et al., 2019). The actual water reservoir is the forest belt, and the contribution of the glaciers to water output is estimated to be less than 0.07 per cent of the annual total (Agrawala et al., 2003).

Figure 26. Approximate glacier and ice field loss on Mount Kilimanjaro summit (1912, 1953, 1976, 1989, 2000 and 2007) and photographic evidence glacier retreat on the summit (1912, 1970, 2000 and 2006)



Source: Mote and Kaser, 2007 (left) and Thompson, 2010 (right).

Water resources of the United Republic of Tanzania

Water consumption and degradation

In the United Republic of Tanzania, river flows feed the agriculture sector (which consumes almost 90 per cent of the total withdrawn water), generate half of the country's electricity through dams and support the rich wetlands ecosystem of the country as well as the tourism sector (Noel, 2011). There are nine major river basins on the territory of the United Republic of Tanzania. The river discharge is characterized by moderate seasonality, with high flows from March to April and low flows from June to September. Around 6 per cent of the country is covered with lakes and wetlands. The total renewable water resources availability in the country is 1,800 cu m/year per capita, estimated for the year 2015, or approximately 96,000 million cu m/year, including shared waters, water stored in lakes and in groundwater aquifers (FAO, 2016).

The United Republic of Tanzania is not currently classified as a water-scarce country. This assessment is based on the Water Stress Index for 2014, for which the ratio of total withdrawals to total renewable water resources is 7 per cent (FAO, 2016). However, the situation is likely to be different in the future due to continuing and rapid population growth and further economic development (see section on people of the United Republic of Tanzania). In the United Republic of Tanzania, agriculture consumes almost 6,000 million cu m/year, accounting for around 90 per cent of all withdrawals. The second largest water consumer is the municipal water supply, accounting for around 10 per cent of withdrawals. The largest municipal and industrial water consumer is the Dar es Salaam area and the industries that surround it. The current Tanzania National Development Plan aims to expand its irrigation schemes and areas substantially. Given the abundant water resources and different agroecological zones in the country, there is a large potential for increasing agricultural production. However, rain-fed subsistence farmers currently dominate the agriculture sector (Afifi et al., 2014), and expansion of large-scale agriculture is largely hampered by the limited financial resources available (see section on agriculture and food security).

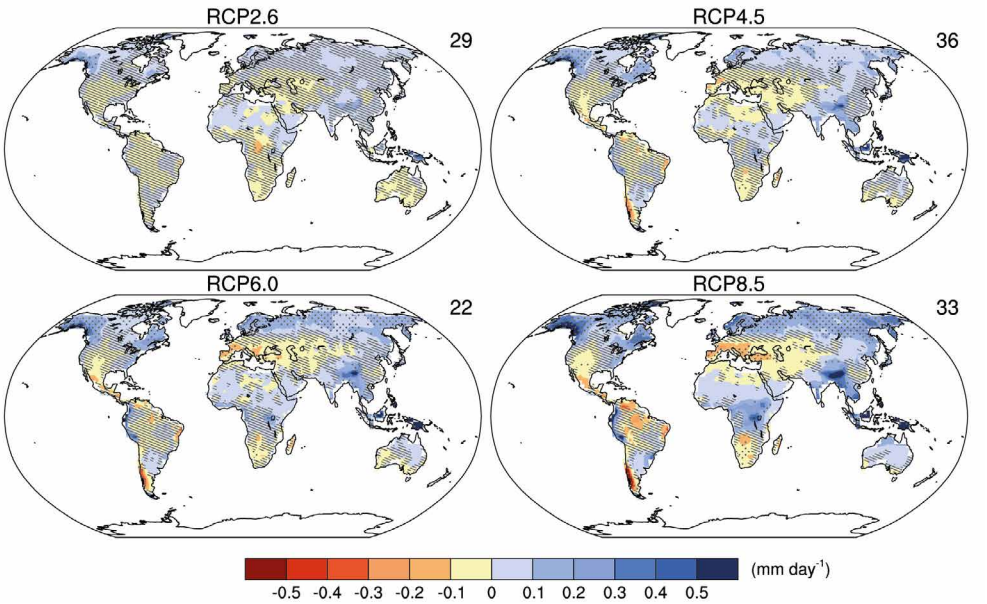
River discharge is variably decreasing and increasing across the country. In the past two decades (relative to the 1961–1990 annual average), there has been a reported decrease of the Ruvu River basin annual discharge by between 6 per cent and 10 per cent (United Republic of Tanzania, VPO, Division of Environment, 2014), a decrease of the Pangani River basin discharge by up to 9 per cent, and an increase in the Rufiji River basin by 11 per cent (Noel, 2011). These overall changes mask seasonal differences in river flow rates, which may be unimodal or bimodal, corresponding to the rainfall regime of the river basin (see the section on rainfall, above). Seasonal reliability and availability of surface water is limited for the locations and productivity of rain-fed agriculture.

Water resources degradation is a major issue. Much of the deterioration in water quality in the open waterbodies is due to anthropogenic activities. For example, the absence of wastewater treatment plants, both municipal and industrial, as well as dumping of garbage (Mohammed, 2002) into open streams deteriorate water quality so significantly that it cannot be used for water supply or for irrigation. Due to the low quality of the water in surface sources, many areas use groundwater as a safer source for municipal water supply. Degradation of surface water – as well as of coastal and maritime resources – is addressed in the national development plan (United Republic of Tanzania, Ministry of Finance and Planning, 2016). This effect will be exacerbated by effects of coral reef damage, warmer waters acidification (due to increasing uptake of carbon dioxide) and decreased consistency of river flows (Ramin and McMichael, 2009).

Climate change impacts on water resources in the United Republic of Tanzania

The impacts of climate change on the hydrological regimes of the Tanzanian rivers are projected to be non-uniform across the country. In the IPCC Working Group I report (IPCC, 2013), as presented in Figure 25, the median of the multi-model ensemble is projecting a slight increase in the runoff under high-end climate change scenarios by the end of the century (65% of Climate Model Intercomparison Project 5 (CMIP5) models agreed on trend). Under the more optimistic RCP2.6, a slight increase in runoff is expected in the northern regions of the country and a decrease is expected the southern regions. The number of studies addressing the hydrological regimes of the rivers under climate change in the United Republic of Tanzania is low as compared to the number of studies conducted for other countries. Scholars are therefore hesitant to draw solid conclusions on the likely changes in water availability in the region, as well as to propose specific adaptation measures.

Figure 27. Global average annual mean runoff change by the end of the century under four climate change scenarios (representative concentration pathways)



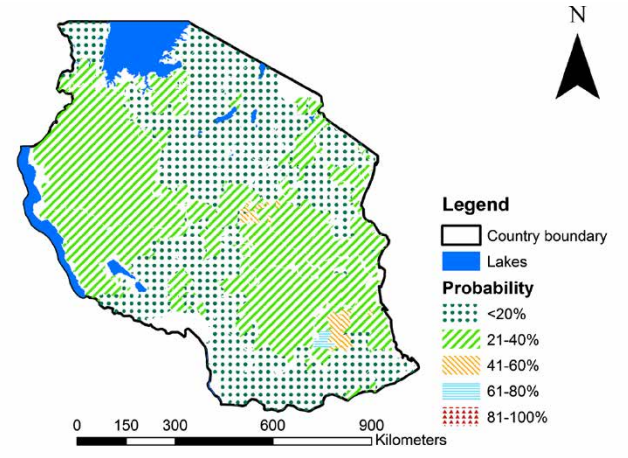
Source: IPCC, 2013.

Note: These maps are for illustration purposes only. The boundaries and names shown and the designations used on these maps do not imply official endorsement or acceptance by the International Organization for Migration.

Different studies on the impacts of climate change in the same river basins show different results, with some authors pointing to projected future increase in the discharge and others to a likely decrease. Based on the Global Climate Model projections of an increase in the future rainfall, by 16–18 per cent by the mid-century, noted above, an increased in surface water availability in the upper Pangani River is expected (Kishiwa et al., 2018; Niang et al., 2014). The authors expect an approximate increase of 10 per cent in long-term mean stream flows in the Pangani River basin, contrasting the projections by Noel (2012) and the Division of Environment of the Vice President's Office of the United Republic of Tanzania (2014). However, they also report that future peak flows are estimated to be lower than the prevailing average peak flows. These results would have negative impacts on irrigation, leading to shortages in water supply and result in 70 per cent of future irrigation demand to be unmet. Dessu and Melesse (2013) evaluated the impacts of climate change in the Mara River basin (shared with Kenya) under several climate change scenarios (Special Report on Emissions Scenarios A1B, A2 and B1). They project an increase in the water volumes until the end of the century, and changes in the discharge distribution within the year – the wet period is projected to become wetter and the dry period drier. The increased rainfall intensity and frequency may also raise peak flows, posing additional risks associated with floods. Wambura et al. (2015) assessed the changing discharge patterns of the Wami River basin under high-end climate change scenarios and reported a decrease in the base flow of the Wami River basin. However, they also conclude that the average flow during the high-flow period shows enough water for foreseen expansion of agricultural activities in the basin until 2039.

An analysis of the impact of climate change on discharge in all nine river basins in the United Republic of Tanzania using an ecohydrological SWAT model (Arnold et al., 1998) showed a potential increase in water resources in the United Republic of Tanzania during the wet season and increase in surface runoff by mid-century (Adhikari et al., 2016). Figure 28 presents the probability of declining of average surface run-off. Soil moisture is projected to increase during both wet and dry periods. Such projections may have positive effects on per capita water availability in the future and facilitate the expansion of agricultural production, but it may also result in risk of flooding, erosion of soils and nutrient loss. On the other hand, land-use changes and anthropogenic activities in the country may also outweigh or compensate the effects of climate change. Changing land use affects surface run-off and increases floods in the mountainous areas in the Ngerengere catchment, and changes in climate conditions and land use until now have had contrasting effects on the run-off generation (Natkhin et al., 2015).

Figure 28. Probability of declining average surface run-off



Source: Adhikari et al., 2016.

Note: This map is for illustration purposes only. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the International Organization for Migration.

In the future, growing population trends will raise withdrawals of groundwater, especially in the semi-arid regions of the country. Until now, the groundwater has represented the major source to meet domestic, industrial and agricultural water needs in the densely populated metropolitan area of Dar es Salaam. However, population growth, increasing urbanization, industrialization and tourism, and climatic changes have caused an intensive exploitation of groundwater resources, rendering the aquifers more vulnerable to seawater intrusion. In the dry season, water quality degrades and the percentages of samples unsuitable not only for domestic consumption, but even for irrigation, increase. The projected decrease in the Ruvu River discharge may cause additional stress to the groundwater aquifers, leading to their further depletion. Reduced river flow also reduces the dilution of contaminants and is likely to exacerbate the ongoing degradation of the water quality in the lower part of the stream where solid waste and effluents from Dar es Salaam City contaminate the river.

Taken together, the projected changes in river discharges may have positive and negative effects on agricultural livelihoods in the future. The projected changes in precipitation patterns and rainfall intensity – hence, in the river discharges – most likely will affect the growing of crops and may put farmers at risk, due to floods, soil erosion, droughts and other factors. On the other hand, increased precipitation may also increase the potential for expansion

of harvesting additional water resources for irrigation (Adhikari et al., 2016). Rain-fed agriculture remains more vulnerable to rainfall variation. The increased discharge may also raise contaminated river run-off and intensify the spread of waterborne diseases in the future (United Republic of Tanzania VPO, Division of Environment, 2014). However, drawing robust conclusions is challenging because the uncertainties in the precipitation and temperature projections for the United Republic of Tanzania hamper the assessments of the climate impacts on the river discharge in the region.

AGRICULTURE AND FOOD SECURITY

Farming, livestock and fisheries

Agriculture is the second largest sector of the economy and the main livelihood for most people in the country.[24] According to available information, the agriculture sector contributed approximately 28.74 per cent to the GDP of the United Republic of Tanzania in 2017, employing 66.9 per cent of the population (World Bank, 2019a). In general, agriculture accounts for 50 per cent of the United Republic of Tanzania's total exports – which were just under USD 8.1 billion in 2017 – but as most exporting goods are unprocessed, research suggests they have little impact on job creation and technological development in the Tanzanian economy (Yoshino et al., 2017; World Bank, 2019a).[25] Most agricultural exports are directed towards Germany, India, Poland and the Russian Federation (*Tanzania Invest*, 2019). Roughly 44 million hectares (49.7%) of the total land mass are classified as arable, but the area actually operated for agricultural production is less than 35 per cent of the total arable land, or 15 million hectares (FAO, 2020).

The majority of the population lives in rural areas and is dependent on agriculture for subsistence. Food security is not entirely a function of agricultural production, as there are many economic, political and social factors that determine the food security of the population. In regions in which agriculture is the main source of income and in which subsistence and smallholder farming systems dominate, the well-being of the population largely depends on availability, access, utilization and stability of food (Schmidhuber and Tubiello, 2007). At the national level, the latest representative survey data indicates that 8.3 per cent of all households were classified as food insecure or vulnerable to food insecurity in 2010–2011 and 1.7 per cent were considered chronically food

24 Data is available from the World Bank (2020) for the period of 1990–2017. In 2017, the services sector accounted for 37.92 per cent of the GDP of the United Republic of Tanzania, while agriculture contributed 28.74 per cent and industry contributed approximately 25.1 per cent. The relative share of the economy represented by agriculture has remained between 25 per cent and 30 per cent since 2008. Between 1990 and 2017, the minimum share was 23.25 per cent in 2007 and the maximum was 44.82 per cent in 1993.

25 Data from the World Bank suggests an outsize role of industry in the economy, the benefits of which are not shared widely among the population. While industry contributes roughly a quarter of the GDP, less than 8 per cent of Tanzanians are employed in the sector (World Bank, 2019a).

insecure (WFP, 2013). The Household Budget Survey of 2017/2018 suggest that 50 per cent of poor households ran out of food some months of the year – for some, every month – compared to 32 per cent of non-poor households.

Agriculture in the United Republic of Tanzania is characterized by small-scale subsistence farming. Yield levels in the United Republic of Tanzania show a high variability and on average are low.[26] The average farm size per household is 2 hectares, which is below the criteria used here for smallholder farmers, of 3 hectares or less. By this measure, 91 per cent of total arable land in the country is occupied by small-scale farms (Yoshino et al., 2017). Smallholder farmers, a category which includes family farms, primarily cultivate staple crops for home consumption and sell for the excess produce. Family farms are nevertheless essential for rural incomes, as documented in the United Republic of Tanzania's most recent labour force census from 2014. In total, 72.8 per cent of households have at least one member whose income[27] is dependent on agriculture, which in rural areas is up to 94.3 per cent (United Republic of Tanzania, NBS, 2015). Moreover, the lack of opportunities for non-farm labour appears to matter for rural stagnation and poverty – approximately 80 per cent of the heads of poor households in the country work on their own farms or, to a lesser extent, as unpaid family farm helpers (World Bank, 2019d).

Agriculture in the United Republic of Tanzania relies on rains. Rain-fed agriculture accounts for most of the crop production in the country. In 2016, only approximately 2 per cent of crop land was irrigated (364,000 hectares of 15,650,000 hectares of cropland) (FAO, 2019). Crop production is, therefore, particularly susceptible to weather variability. Because of high dependency on rainfall, growing seasons align with the onset of the rain. In the most productive agricultural lands of central and southern areas of the United Republic of Tanzania, the *msimu* period from November to May is the main growing season, accounting for 80 per cent of planted areas. The northern and coastal areas in the United Republic of Tanzania have a bimodal rainfall pattern and thus two growing seasons (*vuli* rains from October to December and *masika* rains from March to June).

In the agriculture sector, the main income source is crop production, followed by livestock, fishing and forestry (Yoshino et al., 2017). Among the crops produced in the United Republic of Tanzania, maize is the main staple food for most households. Of the 9,276,997 households engaged in agricultural activities (around 58%) 5,404,117 produced maize in the agricultural season 2011/2012 (United Republic of Tanzania, NBS, 2014). Within the United Republic

26 For example, mean maize yields are at 1.3 tonne per hectare (t/ha). By comparison, mean maize yields were approximately 9 t/ha in France, 12 t/ha in the United States and 5t/ha in South Africa in 2018 (www.fao.org/faostat/en/#home).

27 Wage employment, self-employment, and agriculture are specified as the three sources of 'income' in the survey.

of Tanzania, maize is mostly grown in Shinyanga, Mbeya, Iringa and Rukwa (Yoshino et al., 2017). Other crops grown by smallholder farmers are rice, sorghum, millet, cassava, sweet potatoes, pulses and wheat. Cash crops are also grown (cotton, tobacco, pyrethrum, cashew nuts and coffee) but are usually not the main sources of income. Smallholder farming also dominates fruit tree production and perennial crops, primarily bananas, coconuts, mangoes and oranges. While most large-scale farm production is of cereals (primarily maize, wheat and rice), large farms also produce sisal, sugarcane, tea, cashews, coconut, coffee, cotton and flowers.

Livestock production is the second most important agricultural activity. According to government estimates from 2012 to 2013, 42 per cent of households kept at least one type of livestock. By total livestock population, most households kept poultry, goats, cattle and/or sheep (United Republic of Tanzania, NBS, 2014). Overall, 4.6 million households kept approximately 25 million cattle, 16.7 million goats, 8 million sheep, 2.4 million pigs and 36 million chickens (United Republic of Tanzania, Ministry of Livestock and Fisheries Development, 2015b). Livestock production is dominated by smallholder farming, whose livestock population accounted for 99.6 per cent of the country's total in 2007/2008 (Yoshino et al., 2017).

Fisheries are highly important to livelihoods and food security in the country. Wild fish are primarily caught along the coast and from Lake Victoria, Africa's largest inland fishery. Reliable data on fish catch and decline is unavailable, particularly at the national level, due to limited measurement and the prevalence of illegal, unreported and unregulated fishing (Luomba et al., 2017; Moreau and Garaway, 2018). The latest available information suggests that, at the national level, the fisheries sector contributes around 1.4 per cent to the country's GDP and employs roughly 4 million people (United Republic of Tanzania, NBS, 2014). While the fisheries sector grew at pace with GDP growth up to 2008, it has been in decline since (United Republic of Tanzania, NBS, 2014; USAID, n.d.). Nevertheless, case studies of Lake Victoria (Luomba et al., 2017), Lake Tanganyika (Bulengela et al., 2020), major river basins (Moreau and Garaway, 2018), and the coastal waters off of Zanzibar (Chande et al., 2019) suggest artisanal fishing is critical for the livelihoods and food security of Tanzanians. Inland fisheries are an important source of protein for many communities, in some cases the main source of animal protein (Moreau and Garaway, 2018).

Commercial fish farming currently plays a minor role in the agriculture sector, as only 0.5 per cent of households practiced it in 2012 (United Republic of Tanzania, NBS, 2014). The industry is growing, however, as the number of fish ponds nearly doubled from 2004 to 2019. In 2019, 26,445 fish ponds produced around 18,018.6 megatons of fish, mostly tilapia and catfish (Mmanda et al., 2020; United Republic of Tanzania, Ministry of Livestock and Fisheries Development, 2019).

The decline of fish stocks in Tanzanian lakes and rivers is a major concern for local livelihoods and food security. Multiple stressors have contributed to lake and riverine ecosystem changes, including the introduction of invasive plant and fish species, unsustainable fishing practices, increased agricultural overflow (eutrophication), mineral resource extraction and water temperature increases due to anthropogenic climate change (Hecky et al., 2010; Seeteram et al., 2019; Shechonge et al., 2019). While research indicates manifest fish catch decline is related to eutrophication and climate warming, the possible interaction of the multiple stressors is difficult to establish due to time gaps and omissions in the environmental data (Hecky et al., 2010).

Forest loss in the United Republic of Tanzania has significant impacts on agriculture as well as human habitation. While baseline data makes it difficult to assess deforestation in the country, research suggests the country has lost over 20 per cent of its original forest cover in recent decades (excluding Zanzibar), largely due to clearing for agricultural activities (Lindquist et al., 2012). In addition to disrupting a carbon sink that mitigate climate change, deforestation contributes to erosion and loss of soil quality that impacts agricultural productivity. Intensified activities of growing populations in environmentally sensitive areas have numerous negative downstream effects on income sources and intercommunal cohesion for populations in mid- and lowland areas (Blocher, 2016). General low-wage employment availability in rural areas together with the prohibitive cost of migrating to urban areas are identified as primary contributors to unmanaged forest loss caused by shifting cultivation, charcoal production, timber harvesting and other extraction of forest resources (Blocher, 2016). Because the Village Act (1999), the Forest Act (2002) and the Land Planning Use Act (2007) bring legal ownership of the forests to the village level, local land-use plans address unsustainable deforestation. Local plans, along with the National Forest Policy (2008) under review, are often weakly enforced or face resistance from some community members (Blocher, 2016).

Potential impacts of climate change on agriculture

The impacts of climate change on agricultural production and food security are unevenly distributed. According to the IPCC, food yields and food security around the world will be negatively affected by climate change, especially in sub-Saharan Africa (IPCC, 2014a). Areas of the world facing both temperature increases and reduced rainfall at once are at greatest risk (Ramin and McMichael, 2009). In the United Republic of Tanzania, warming and reduced rainfall are especially concerns for northern and coastal areas, as explained above (see section on rainfall, under "Current Climate and Future Projections").

Because of the prevailing low-input management practices in the United Republic of Tanzania, agricultural production is susceptible to unfavourable weather conditions. Low and unbalanced fertilizer supply, for instance, limits yields in most parts of Africa (van der Velde et al., 2014) and is typical for sub- Saharan African farming systems (Lesk et al., 2016) (Affholder et al., 2013). Other factors that negatively impact agricultural production include: limited access to arable land, labour, credit markets and technology; and pests, weeds and diseases or fertilizer subsidies (Gornott et al., 2019). Additional risks are brought about by price volatility, in particular, for coffee and other dominant cash crops for export. The domestic price changes in these commodities are strongly linked to international price volatility. Sudden fluctuations in prices negatively affect actors in the supply chain with little capacity to manage volatility, such as farmers, who often lack access to credit markets that would help them cope with price shocks (Arce and Caballero, 2015).

Climate change impacts agriculture through various ways. A shift of agroecological zones is expected and areas with less rainfall will require more irrigation and drought-resistant plant varieties (Arce and Caballero, 2015). The occurrence of pests and diseases can also pose a threat to agriculture if temperatures and rainfall increase. The United Republic of Tanzania's NAPA concludes that additional vulnerabilities due to climate change are related to unpredictable rainfall, drought due to prolonged dry spells, increased competition between weeds and crops for moisture, light and nutrients, and ecological changes in pests and diseases (United Republic of Tanzania, VPO, Division of Environment, 2007). These conditions will vary strongly by region and will affect differently, dependent on the income categories of households, and across individual households. Adaptation planning should therefore be supported at the local level.

By creating El Niño–like conditions and affecting the short rains (vuli) harvest, climate change is likely to lead to more food shortages in the future (see also section on rainfall, under "Current Climate and Future Projections"). A recent analogue is the drought that was related to the El Niño event of 2014–2015 and 2015–2016 in eastern and southern Africa (Gornott et al., 2019). Worldwide, crop yields have already decreased in several regions due to climate change (Lobell and Field, 2007), and this trend can be expected in future as well. (Manneh et al., 2007) found that a 2°C increase in temperature could reduce maize yields by 13 per cent and rice yields by over 7 per cent. In parallel, outbreaks of crop pests and diseases hamper agriculture production, although the impact of these events is also strongly dependent on the crop and management practices in place (Arce and Caballero, 2015). While below-average food production is a primary contributor to acute famine and longer-term food insecurity in the United Republic of Tanzania, other reported factors include low affordability, unstable prices and markets, instability of supplies, low food safety and weak rural–urban food supply linkages (Wenban-Smith et al., 2016). Climate change impacts are likely to acutely impact food production and local food prices, and may also cause long-term hikes in food prices in the wider region (Jobbins and Henley, 2015). Acute food shortages are already frequent, fluctuating with the success of the harvest. A survey conducted during a widely felt food shortage in 2017 found that approximately 84 per cent of people in rural areas and 64 per cent of people in cities faced food shortages in the five months prior to formal government discussions of an acute food shortage (Makoye, 2017).

Degradation of coastal and maritime resources, exacerbated by warming waters, is a livelihood and food security concern to the United Republic of Tanzania and is addressed in its development plan (United Republic of Tanzania, Ministry of Finance and Planning, 2016). The National Fisheries Policy of 2015 recognizes the impact of environmental degradation and specifically of climate change. Climate change will exacerbate human-induced degradation and alter marine ecosystem by damaging coral reefs, warming waters, water acidification (due to increasing uptake of carbon dioxide), and decreased consistency of river flows (Ramin and McMichael, 2009). Fish populations are expected to move to higher latitudes, which will affect protein supplies and livelihoods in coastal communities. Recent research from other coastal African countries demonstrates that as fishes move away from warming waters and overfishing, local fishers migrate as well, often leaving women and elderly family members behind with limited coping capacities (Zickgraf, 2018). The National Fisheries Policy refers to several challenges to implementing and coordinating sustainable fisheries in the country, including low public awareness of sustainable practices, limited capacities to ensure compliance to environmental laws and regulations, and the risks presented by climate change (United Republic of Tanzania, NBS and

OCGS, 2015:30). The Tanzania Fisheries Research Institute (TAFIRI), a parastatal organization, monitors changes in fisheries resources. Because of a number of changes since TAFIRI was established in 1980, the current fisheries policy calls for a review of strategies to support fisheries research (ibid.:6).

Moreover, according to the IPCC, Tanzanian lake and wetland ecosystems can be expected to decline as a result of warming (Boko et al., 2007; Niang et al., 2014). The declining productivity of Lake Tanganyika due to warming, in particular, has been studied extensively (Niang et al., 2014). These ecosystems are important for food webs and biodiversity, and their decline has numerous negative consequences for communities.

The high exposure to weather and climate related hazards also stems from the fact that a great majority of farmers, fishers, herders, traders, and cooperatives lack risk management and transfer practices. Small-scale farmers are particularly vulnerable to these hazards because their livelihoods and household consumption largely depend on income from crop harvests (Arce and Caballero, 2015). In this context, crop insurance schemes have a high potential to serve as adaptation strategies against unfavourable weather conditions. Tanzanian smallholder farmers often either deal with weather-related hazards themselves or rely on community-based insurance strategies. Thus, in case an extreme weather event occurs, they lack the financial capacity to cope with yield losses and to invest in agronomic management. This keeps them in the loop of poverty and food insecurity. Farmers need support to find ways to adapt to unfavourable weather conditions and climate change, especially those from households at higher risk, namely low-income households, households with few sources of income, and households in marginal or peripheral communities. These considerations should be taken into account when developing strategies to increase agricultural productivity in the United Republic of Tanzania.

Maasai women walking in a savannah with a water canisters to fetch water from a well [in] Arusha, United Republic of Tanzania. © Shutterstock 2019/Katiekk

CHAPTER 4.
HUMAN MOBILITY IN THE UNITED REPUBLIC OF TANZANIA: CURRENT TRENDS

ABOUT THIS CHAPTER

There are three main broad types of human mobility in the United Republic of Tanzania: voluntary change of residence for work, livelihoods or other reasons (migration); the movement of herders with their livestock for water and pasture resources, often following seasonal patterns (pastoralism of varying levels of mobility/nomadism, as defined in Blocher, 2018); and the displacement of people escaping imminent threats to their safety, whether they are residents (internally displaced persons (IDPs) or displaced citizens of other countries (asylum seekers and refugees). These categories are used as crude shorthand for complex realities that are often blurry and fluid in practice. However, they are indicative of conceptual, practical and legal distinctions between different forms of population movements. As will become clear, data and research often do not distinguish these categories, even if the character and outcomes of these types of movement are highly likely to differ. An additional migration concept touched on in this chapter is that of the "immobile" households or individuals – those who do not migrate when faced with the same conditions as those who do. Like migration, immobility is understood as related to aspirations and capabilities, on a spectrum between voluntary and involuntary. A person or population may become "trapped" when they are unable to escape environmentally risky locations (United Kingdom, The Government Office for Science, 2011).

Data on migration between the regions of the United Republic of Tanzania are available from the National Bureau of Statistics (NBS) for 1988, 2002 and 2012.[28] In addition, the 2008–2015 TZNPS and the 1991–2004 Kagera Health and Development Survey (KHDS) are key sources of large-sample migration data, both available from the World Bank (2019b). The TZNPS is nationally representative, while the KHDS focuses on Kagera region.

28 Census information from 1988 to 2002 is comparable by region. Geita, Katavi, Njombe and Simiyu regions were created in the months before the 2012 census. Songwe region was separated from Mbeya in 2016. These changes create challenges for comparing interregional migration trends over time. At the time of writing, a new census was not scheduled.

Few international research projects focused on environment, climate change and migration have considered the United Republic of Tanzania. Nevertheless, some small-scale studies reflect findings of research that took place in other countries and in similar development settings. In order to provide a complete picture in the relevant sections that follow, conclusions from the evolving literature on environment and migration are in some cases plausibly applied to the United Republic of Tanzania.

Figures are for all of mainland United Republic of Tanzania and Zanzibar unless otherwise specified. Because this is an assessment of the evidence, planned relocations and resettlements – whether voluntary or involuntary – are not addressed in detail, due to a dearth of information. A notable exception is reference to how villagization schemes carried out in the 1960s and 1970s influenced subsequent migration trends.

Limitations

A dearth of data on migration as well as on household resources limits current understandings of human mobility trends in the United Republic of Tanzania. The limited number of quantitative databases appropriate for this assessment are supplemented by a handful of targeted case studies. Among the key limitations are the lack of data and research on migration prior to 1991 as well as the limited longitudinal studies on patterns of migration over time. Importantly, most databases do not capture short-term, short-distance movements. Data is especially lacking at lower administrative levels. The most recent census information (2012) allows for an assessment of interdistrict migration by allowing the household head to indicate his or her district of usual residence, of birth and during the year prior to the time of enumeration. Previous rounds collected data on these variables at the regional level and thus cannot capture movement between districts of the same region. It is therefore difficult to conduct quantitative analyses of the rural–rural internal migration that is known to be the bulk of movements in the country. Targeted surveys and qualitative research supplement current understandings.

Migration data is typically not interoperable with weather or climate data. In part because time scales and geographic scales are often different, available databases do not lend themselves to comparability. Researchers have developed models in a number of contexts to overlay information, but so far, they have seen limited application in the United Republic of Tanzania.

Data on international migration is similarly limited. While high-skilled migration to other countries is captured by global databases, this has been a small minority of Tanzanians (<0.56% in 2019) since restrictions on international movement were lifted at the end of the socialist period. Current methods fail to capture regular short-term cross-border movements to neighbouring countries.

INTERNAL MIGRATION

In general, internal migration relates to development levels. Standard economic models suggest that as a country's economy develops, relative individual earnings incentivize population shifts over time from relatively lower-wage areas to relatively higher-wage areas (Harris and Todaro, 1970; Massey et al., 1993; Lewis, 1954). These theories can broadly help to explain rural–urban migration and international migration. However, they fail to fully explain why people choose to migrate between areas where wage levels are similar, especially for cash-constrained rural households relying on family farms for subsistence. In contrast, livelihoods-based models of migration emphasize movement as a part of a more general livelihood strategy for a household as a whole, with migration as a method to diversify income sources and reduce risks to consumption (Scoones, 1998; Ellis and Mdoe, 2003; Black et al., 2008). In the United Republic of Tanzania, the majority of movements are between rural areas; both the TZNPS and KHDS suggest 70 per cent of migration is rural–rural (Hirvonen and Lilleør, 2015; Kubik, 2017). Currently, most migrants also remain employed in the agriculture sector. Movement into other sectors of the economy occasionally accompanies movement towards urban areas (Beegle et al., 2011).

Magnitude of migration and destinations

While people may be regularly on the move inside in the United Republic of Tanzania, a minority change residence. Freedom of movement and of residence are enshrined in article 17 of the country's constitution (1997), and estimates from 2016 suggest less than 25 per cent of people have a registered national identification (GSMA, 2017). While existing evidence suggests a noteworthy proportion of the Tanzanian population moves between regions or districts, the actual numbers of people moving are difficult to estimate. Moreover, if findings from the nationally representative TZNPS were scaled to the national level, it would suggest nearly 3 million people changed their residence from the enumeration area of origin between 2008 and 2009 (Kubik, 2017). The duration of these migrations vary, but Kubik uses the threshold of one year. Three million people represents close to 7 per cent of the population at that time. Comparing to definition used by the NBS, a person who moved from one administrative region to another during the intercensal period for a non-restricted period of

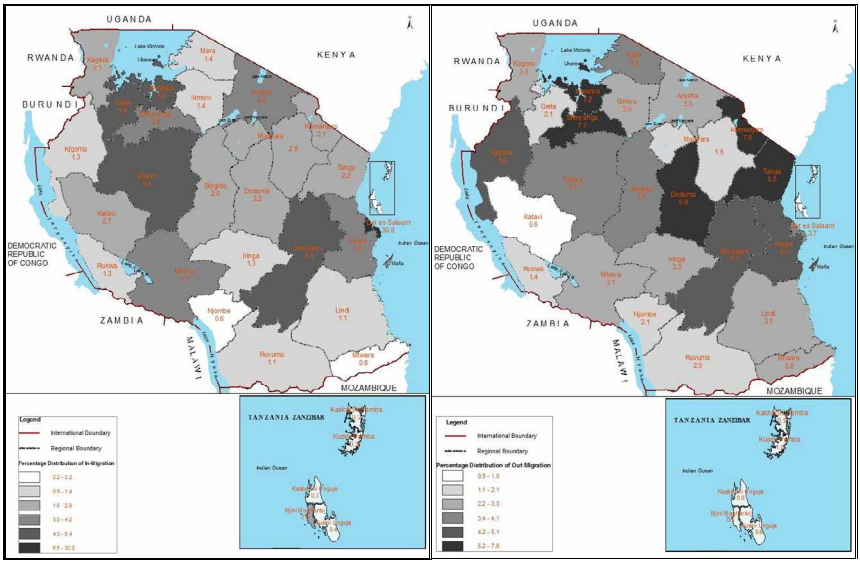
time, census information suggests that interregional migrants totaled 1.1 million in 2002 and 1.52 million in 2012 (United Republic of Tanzania, NBS and OCGS, 2015). As for so-called lifetime migration – defined by the NBS as migration that has occurred between birth of the respondent and the time of the census or survey – over 2.05 million[29] people moved outside of their regions of birth in the 2002–2012 intercensal period (ibid.). This equates to roughly 4.5 per cent of the total population at the time, or an average of 205,000 people who left their regions of birth per year. While it may appear that from the census that interregional permanent migration is increasing overall (ibid.), this should be adjusted for population growth; the proportion of residents who were living outside of their regions of birth was approximately 15 per cent[30] for both census years.

Comparing census information for 2002 and 2012 allows for a consideration of overall population shifts. Shifts in lifetime migration trends were noticeable for a handful of regions. Arusha, Dar es Salaam, Geita, Katavi, Manyara, Mbeya, Mjini Magharibi, Morogoro and Tabora had positive net migration in 2002 and 2012. Dar es Salaam and Mjini Magharibi, in particular, are larger urban centres that attract migrants to industrial and commercial activities, while the others host large-scale plantations, areas for settlement, and mining activities. Regions in the South Corridor such as Lindi, Mtwara, Ruvuma, and regions in semi-arid areas like Dodoma and Singida showed significant negative net migration for both census years (−181,468 and −151,271 in 2002 compared to −343,151 and −112,281 in 2012, respectively). The NBS considers population pressure and harsh environmental conditions as the main factors driving the simultaneously observed high lifetime in-migration and high outmigration for Dodoma, Mwanza, Kilimanjaro and Geita (United Republic of Tanzania, NBS and OCGS, 2015:17). Between 2002 and 2012, Rukwa and Kagera shifted from areas with positive net migration to areas with negative net migration because of repatriation of refugees and the creation of new regions like Katavi and Geita, which were previously part of the two regions (United Republic of Tanzania, NBS and OCGS, 2015). The trend of repatriation of refugees residing in the lake zone has partly reversed since 2012 (see section on international migration and refugee movements).

29 According to census information, 7.35 million people were living outside of their regions of birth in 2012, compared to 5.3 million in 2002. The total population in 2012 was 44.9 million.

30 There were 15 per cent in 2002 and 15.6 in 2012. The difference is within a 1 per cent margin of error (95% confidence level).

Figure 29. Share of permanent/lifetime in-migrants (left) and out-migrants (right) in the United Republic of Tanzania by region of birth



Source: Reproduced from the United Republic of Tanzania (2015a), based on the 2012 census.

Note: These maps are for illustration purposes only. The boundaries and names shown and the designations used on these maps do not imply official endorsement or acceptance by the International Organization for Migration.

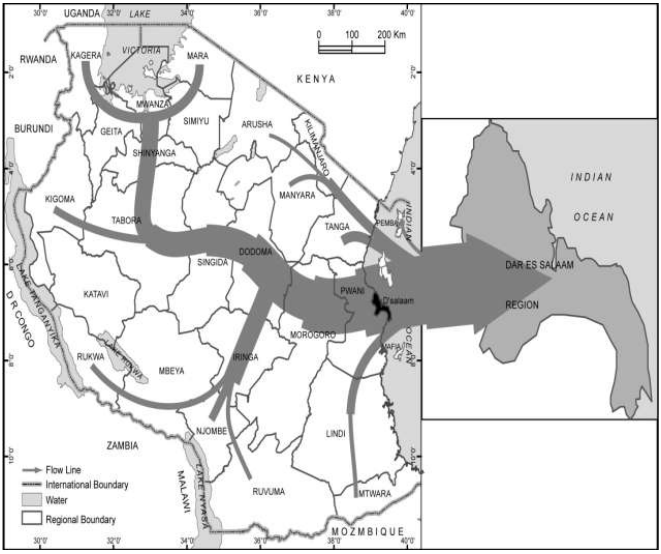
Since the 2012 census, a number of important population shifts have been observed. As noted above (see the "Political and Administrative Makeup" section), the shift of the country's capital has prompted a large-scale migration of people to Dodoma, both because government workers moved outright from Dar es Salaam and because the new commercial opportunities attracted people from neighbouring areas. Separately, in the last decade, many pastoralist groups (especially Barbaig (Datooga) from Manyara and Maasai from the Maasai Steppe) as well as agropastoralists and small-scale farmers (especially the Sukuma and Nyamwezi peoples, two related Bantu groups historically from regions near Lake Victoria) have migrated to southward and eastward in search of land and weather that is more favourable to agriculture (IFAD, 2012; Blocher, forthcoming). Anecdotally, public attention to the matter continued throughout the course of this project (2018–2021), while the movements of the traditionally pastoralist Maasai and the agropastoralist Sukuma people have been noted by scholars for decades (Birley, 1982; Charnley, 1997). The most noticeable movements have been directed towards Morogoro, Pwani and Tanga regions (Mbonile, 2005; Walwa, 2020; see the section on farmer–herder conflicts).

Rural and urban transformations

The United Republic of Tanzania is urbanizing at a rate of 5.22 per cent, with roughly 34 per cent of the population living in urban areas in 2018 (World Bank, 2018). This proportion has risen from 5 per cent in 1960. It is highly related to a high (natural) urban growth rate, which was at 5.15 per cent in 2018.[31] Dar es Salaam remains the largest city in terms of population, but it is not necessarily growing in terms of its importance relative to other urban areas; the city has steadily maintained roughly one third of the urban population in the country over at least four decades (Ørtenblad et al., 2019; Moshi et al., 2018; Christiaensen et al., 2018). Meanwhile, the spread and the composition of the urban population in the country has changed. Smaller urban settlements that serve as administrative, trade and service centres for people in rural areas grew in importance. Census information indicates that towns and smaller urban settlements grew from only 7 per cent of the urban population in 1967 to 34 per cent in 2012 (Ørtenblad et al., 2019). This census category, "other urban areas", grew faster in both number and size than Dar es Salaam and the regional capitals up to 2012 (Moshi et al., 2018; Ørtenblad et al., 2019). Moreover, in the same period, the share of the national population residing in regional capitals declined from 55 per cent to 31 per cent (United Republic of Tanzania, NBS and OCGS, 2015). Taken together, migration between small towns and agglomerations in rural regions is a major component of urbanization in the country. Smaller urban areas are more accessible to rural inhabitants than large cities, such as farmers and pastoralists establishing second homes closer to markets and services (Lazaro et al., 2019; Blocher, forthcoming). Migration to smaller towns and cities is therefore currently a more likely catalyst for increases to human development than migration to large urban areas, which accounts for a small minority of people. These insights, especially when taken together with the results of more recent surveys[32] and qualitative studies, can inform research, urban planning, public investments, and migration management – policy areas that have so far focused on Dar es Salaam.

31 The global average is 1.94 per cent, while the average for sub-Saharan Africa is 4.1 per cent.
32 At the time of writing, 2012 was the most recent national census.

Figure 30. Migration to Dar es Salaam



Source: Reproduced from the United Republic of Tanzania (2015a), based on the 2012 census.

Note: This map is for illustration purposes only. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the International Organization for Migration.

The socialist period in the United Republic of Tanzania (1961–1985) had a major impact on urban transitions and rural–urban migration. The development ideals and policies of this period, known as *ujamaa* (socialism through self-reliance, established by the Arusha Declaration in 1967),[33] promoted the formation of rural villages as the primary building blocks in Tanzanian society for development (Hansen, 2012). Importantly, *ujamaa* established the national villagization programmes implemented between 1967 and 1977, which used relocation of peoples as a development strategy (ibid.). By adding pressure to land use, villagization led both to increased migration rates overall and to the sharp increase of the population living in small cities and towns between 1978 and 1988 (Ørtenblad et al., 2019; World Bank, 2018). Since the country's trade liberalization and related economic expansion in the mid-1980s, many of the villages of resettled people grew or merged into the larger agglomerations seen today.

33 For a review of the ujamaa and villagization policies and their mixed impacts on rural development and agricultural production, see: Haapanen, 2011; Ponte, 2002.

The growth of smaller, more accessible agglomerations is driving urbanization in a process known as "rural urbanization". Many of these emerging agglomerations in rural areas are not considered urban areas under government categorization, which has impacts on leadership and land-use arrangements (Lazaro et al., 2019). Decentralization of government services through the Local Government (Urban Authorities) Act of 1982 increased the accessibility of towns and urban service centres to rural communities, leading to enhanced rural–urban linkages and more migration (Wenban-Smith, 2015). Today, the majority of Tanzanians are in rural areas and are more able to benefit from the economic growth of smaller agglomerations than big cities – and are more likely to migrate there (Christiaensen et al., 2018; Christiaensen and Todo, 2013). Movement of people to emerging urban centres deepens migration corridors, reinforces rural–urban socioeconomic linkages, and leads to the development of public services, stimulating further growth and attracting migrants (Christiaensen and Todo, 2013; Lazaro et al., 2019; Ørtenblad et al., 2019; Wisner et al., 2015). Moreover, overall flows of people, commodities, goods, and knowledge from large cities to small cities and towns are multidirectional. The impacts of rural–rural migration, therefore, also affects regional hubs and international markets. Put simply: rural urbanization benefits Tanzanians of many different backgrounds and skill levels.

Urban–rural return and "reverse" migration are non-negligible phenomena. Among the KHDS respondents who left their baseline villages between 1991–1994 and 2004, 14 per cent had returned by 2010 (Hirvonen and Lilleør, 2015). In general, the reason for return is the perceived unsuccessful outcome of the movement. Specifically, returns of internal migrants are generally related to poor integration into labour markets for men and the ending of marriages for women (Hirvonen and Lilleør, 2015). More than one in six of the original working-age (between 17 and 45 years of age) migrants tracked for the KHDS returned for such reasons (Hirvonen and Lilleør, 2015). Similarly, research in Same District indicates that respondents simultaneously fund their movement and indebt themselves through loans with the intention to survive episodes of food insecurity (Afifi et al., 2014). Some urban–rural migration in the country may be related to disillusionment in urban areas and retirement of urban dwellers to greener pastures (c.f. Lawi, 2013), but more research is needed. The phenomenon of return migration is generally not captured in survey data, in which time intervals are too short.

Who moves?

Household characteristics influence migration propensities. While migration is highly context-specific and depends on a number of individual and community attributes, available literature studying the United Republic of Tanzania points to a few generalizable trends. Consistent with statistical analyses from other contexts, Tanzanian households that ultimately send a member to migrate differ significantly in a number of areas as compared to households with no migrating member. They have a large number of household members, more economically active members as compared to elderly members (age–dependency ratio), higher relative incomes, a lower dependency on subsistence agriculture (generally described as off-farm income), more productive assets (typically farming equipment and livestock), higher levels of education, are better connected to infrastructure and markets (typically measured by proximity to roads, per the RAI discussed in the chapter on country context and human development trends), and better social bonds outside of their home communities as well as previous migration experience (counted by connections to family members who migrated previously) (Kubik and Maurel, 2016a; Liwenga et al., 2012; United Republic of Tanzania, NBS and OCGS, 2015). These are general tendencies in the country, and it is often not possible with available evidence to definitively distinguish these factors as preconditions for migration from consequences of moving. In other words, some characteristics are responsible for people "self-selecting" into migration.

Available evidence supports the conclusion that in rural areas across the country, the average migrant household tends to have more economic resources prior to migration than non-migrant households. A comparison of rural households with at least one recently migrating member and those without is possible at the national level through an analysis of migration between the 2008/2009 and the 2010/2011 data collection waves of the TZNPS. As compared to rural households without a migrating member, households from which at least one member migrated between 2008 and 2011 have different resources and endowments prior to migration: they have higher incomes, are less financially constrained (often due to better access to formal credit or participation in primary cooperatives societies) and are more involved in informal assistance groups (Kubik, 2017; Kubik and Maurel, 2016a). Interestingly, households that have a member migrating between rural areas have on average twice as many livestock units as those that do not (Kubik and Maurel, 2016a and 2016b). This reflects the fact that livestock constitute an important productive asset in the country and wider region, and may be suggestive of positive attitudes towards mobility shared by some livestock herders. For rural households, total income and off-farm income are higher on average for migrant-sending households prior to

migration, as compared to non-migrant-sending households. Taken together, these characteristics suggest that rural households need available financial resources to afford the costs of migration.

Position in the household, sex, age and wealth influence individual likelihood to migrate. In addition to economic capital, human capital is required to migrate. As noted in the section on country context and human development trends, the size and composition of Tanzanian households influence observed migration patterns in a number of ways. Households are relatively large at an average of 4.9 people, and while the working-age population has grown over time, they have a high number of child dependants. The proportion of young (aged 0–14) dependants per working-age population (age dependency ratio[34]) was 83 per cent in 2018 (World Bank, 2019b). The gender and education levels of the head of household are significant as indicators of socioeconomic status – less-educated households and women-headed households are less likely to have a migrant member (Kubik, 2017). Moreover, individual attributes and position in the household matter. Younger (under 35), better educated, unmarried Tanzanians and especially working-age men are the most likely to migrate (World Bank, 2015 and 2019d), because they have fewer care responsibilities in the household and higher earning potential than other members. Evidence at the national level demonstrates that proximity to the household head is positively related to migration propensities, suggesting the head of household invests more in his or her own children than secondary household members (World Bank, 2015). In contrast, a study of Kagera region found that the head of household, the spouse of the head or their children were less likely to move than others (Beegle et al., 2010). A possible explanation is that because higher-status members of the household take on farming and livestock-keeping responsibilities, secondary members of the household – children other than the eldest male or the offspring of secondary co-wives, for example – are more available or more compelled to migrate for livelihood opportunities (Blocher, forthcoming).

Reasons for and timing of migrating

Migration decision-making is complex and multi-causal. While not nationally representative, the KHDS conducted between 1991 and 2004 included migrant tracking methods and a high recontact rates, allowing for unique insights into the determinants of migration as well as the outcomes of different forms of migration. The survey employed migrant- and split-household tracking methods on a baseline of 6,353 individuals in Kagera region, 49 per cent of whom remained in the same village compared to 2 per cent who migrated internationally (Cockx, 2019; De Weerdt et al., 2012). The sample is considered representative of Kagera

34 Overall age dependency, estimated as the population aged 0–14 and 65+ per 100 population aged 15–64 years, was 88 per cent in 2018. Dependency of old household members is low, at just 4.88 per cent.

region for this time period and indicative of provincial United Republic of Tanzania as a whole. Some 49 per cent of recontacted respondents migrated internally over the 13-year period to a nearby village (19%), to another village in the region (20%) and outside the region, including to large cities (10%) (Beegle et al., 2010). According to the KHDS, the most common self-reported reasons for all movers were marriage (28.9%), to follow parents (10.3%), seeking work (8.7%), looking for land (8.7%), family problems (8.5%), for schooling (6%) or to begin new (split-off) households on inherited property elsewhere (5.8%).[35] Because women tend to move to a new husband's community, marriage was the primary motivation for migration cited by KHDS respondents who migrated regardless of destination, and a disproportionate number of those moved to a nearby village (41.1%) (Beegle et al., 2010). This finding is consistent with other studies demonstrating that patrilocal marriage is a primary motivation for the migration of women in the United Republic of Tanzania (Cockx, 2019; Kubik and Maurel, 2016b). Relatively recent research suggests marriages and subsequent movements may be timed to exploit favourable livelihood conditions (Kudo, 2015). Farmers are more likely to marry before the harvest to guarantee additional unpaid family workers, while pastoralists tend to invest in marriage after abundant seasons earn surplus cattle (Blocher, forthcoming).

Land tenure and use have an impact on migration. This is in part because seeking land to farm or for pasture is consistently among the top self-reported reason for migration (Beegle et al., 2010; De Weerdt et al., 2012; Hirvonen, 2016; Liwenga et al., 2012; Blocher, forthcoming). As noted previously, there is no specific regulation or government department on internal migration. Village inhabitants should technically register for housing titles and land-use permits including for stock routes. In practice, this system reinforces the distinction between people who practice [semi-]nomadic pastoralist livelihoods and people who migrate (change residence). However, research suggests that the formal procedures for land-use rights acquisition are not well respected. Analysis of the TZNPS shows a much weaker link between land titles and land tenure security than expected, as 94 per cent of households expressed holding some form of secure tenure compared to 12 per cent who hold formal titles (Mekasha et al., 2018). The low correlation suggests that the population has a poor perception of the validity and transferability of land titles. Nevertheless, perceived tenure security has a statistically significant negative impact of migration on the average working-age Tanzanians. Households with at least one secured plot are 11.3 percentage points less likely to have a migrant member as compared to households without any secured plot, on average (Mekasha et al., 2018). Case study research in Same District of Kilimanjaro region is consistent with this finding, suggesting households

35 Information on reasons for migration from the TZNPS are not presented here because only 64 per cent of rural respondents self-reported; thus, any analysis of this would be biased.

without land titles are more likely to migrate in response to weather shocks (Afifi et al., 2014). Residents may receive productive assets and land as an inheritance or after marriage, reducing their need or propensity to migrate away. Indeed, marriage is linked to a reduction in the likelihood of working-age males to migrate (Hirvonen and Lilleør, 2015). Search for land and for work are important migration motivations to consider in this report, because as compared to some other reasons (like for marriage or inheritance), these factors are generally more likely to be affected by environmental and climatic changes.

Table 3. Reasons for migrating listed in the Kagera Health and Development Survey (%)

	Moved to a nearby village	Moved farther than a nearby village or outside region	All movers
Found work	2.7	5.8	3.5
To look for a job	5.4	15.3	8.7
Posted on a job	1.2	1.6	1.0
Looking for land	7.1	6.1	8.7
Schooling	4.4	9.9	6.0
Marriage	41.4	22.8	28.9
Divorce	2.2	1.9	2.0
Parents died	4.7	3.1	3.7
To care for a sick person	0.5	0.6	0.7
To seek medical treatment	0.5	1.1	0.7
Following inheritance	5.1	2.8	5.8
Other family problems	7.6	6.4	8.5
Follow parents	8.4	12.0	10.3
Follow spouse	0.5	0.8	0.8
Follow relatives	0.7	3.2	1.8
New house	1.2	0.0	1.4
Other	6.4	5.7	7.0
No reason reported	0.5	0.7	0.7

Source: Beegle et al., 2010.

Migration outcomes

Household characteristics and destination choices also influence migration outcomes – otherwise said, the "success" of the migration project. Because the World Bank analyses of the KHDS controlled for a wide set of factors to reduce the bias introduced by the self-selection of migrants (unobserved endogeneity), we can use it to consider migration outcomes. It reveals that migrant households in Kagera region improved consumption[36] and other development indicators after migration as compared to non-migrant households (Beegle et al., 2010 and 2011). The overall similar wealth and income indicators of migrant versus non-migrant households at the KHDS baseline year contradict the findings from the TZNPS noted previously, namely, they were not statistically significant in the KHDS while the TZNPS shows significant differences. This suggests that analyses of migration trends at the national level mask important regional variations in household financial resources and their relationship to migration probabilities. However, the study supports the TZNPS findings in regard to how migration relates to education level, household size, gender, marital status and working age.

Judging by the results from the KHDS, migration from rural areas can be a path to greater consumption regardless of destination. Consumption for households who migrated to a more remote[37] or similarly remote area increased by 25 per cent and 42 per cent, respectively, while the consumption of those who remained in their communities of origin did not experience significant increases. As compared to non-moving households who remained in their baseline villages, consumption growth was highest for migrants who moved to better-connected areas (87% growth) or into non-agricultural occupations (67% growth). In the case of the former, in short, the farther one migrates from the community of origin, the bigger the gains (Beegle et al., 2010; Wineman and Jayne, 2017). In the case of the latter, controlling for a number of factors at the community and household level (for example, macrolevel shocks and initial consumption), rural–rural migrants see higher returns on consumption if they also move out of the agriculture sector (Wineman and Jayne, 2017; Cockx, 2019; Hirvonen, 2016). These findings confirm the intuition of labour migration theories that the average migrant moves into higher-waged work, including off-farm work, and sees greater returns (Beegle et al., 2010; Wineman and Jayne, 2017). Migrants also experienced higher average consumption than non-movers regardless of destination or occupational sectoral change (Beegle et al., 2010 and 2011), a finding which supports migration theories that economic migrants self-select "for labour market success" thanks to unobservable characteristics like ambition and entrepreneurship (Chiswick,

36 Consumption is an important indicator of wealth, especially for research on communities for which assets are not necessarily monetary.

37 In the context of the KHDS, areas were classified by the survey team as poorly connected in terms of infrastructure (roads, Internet and communications technologies).

1999:181). Destination choices are not random or purely based on perceived economic gain but linked to household social connections and other endowments (i.e. not all Tanzanian migrants want to go to Dar es Salaam).

Migration increases inequality, literally and figuratively leaving poor households behind. Migrants are found to be more likely to stay in their villages of origin or choose nearby destinations for rural-to-rural migration (Beegle et al., 2010; Kubik, 2017). The poorest households generally do not migrate from rural to urban areas (Cockx, 2019; de Brauw, Mueller and Lee, 2014). Importantly, this dynamic – non-migrant households have fewer resources and less access social mobility (education and social networks) than migrant households – is passed on to the next generation. Households whose heads have relatively lower education and no previous migration experience in general have low migration propensities (Beegle et al., 2010 and 2011), and their children are also less likely to migrate than their peers whose parents are better educated (Cockx, 2019). Overall, in the United Republic of Tanzania, key development indicators for non-migrant households tend to stagnate over time (like wealth, education, and children's height and weight), and for the households at the poverty line, erode when even minor shocks occur. The costs of moving longer distances are prohibitive for theses households, due to direct costs like transport and housing as well as indirect costs like re-enrolling children. Geographical distance to migration destinations, which approximates transport and communication costs, is generally found in the United Republic of Tanzania – and in migration literature in general – to have a dampening effect on migration propensities (Mueller et al., 2018). Households from more remote – usually poorer – districts are less likely to migrate than households in districts with better access to transport infrastructure. Put differently: economic, social and infrastructural connectedness matters.

Household choices about family structure and migration influence children's education and development. A recent study using the KHDS demonstrates that child development outcomes vary for children of migrants as compared to children of family members who stayed behind, depending also on a number of individual characteristics and migration circumstances.[38] Overall, however, the children of migrants who moved from rural areas to or were born in cities obtain significantly more schooling for their age (Cockx, 2019). In addition, children whose parents migrated from rural areas to cities were of higher weight, greater height and were 8.7 per cent less likely of being underweight than children from the same household in rural areas (born to their parents' siblings). Perhaps,

38 There are a number of caveats to mediate these findings, including the unobserved differences between genetic and ability predispositions of siblings, as well and many other environmental variables not shared by siblings present *before* migration that influence migration propensities. Nevertheless, the KHDS provides the rare opportunity to look at the outcomes for the children of migrants and the children of the migrant's siblings, in order to minimize the confounding influence of variables that differ across households that influence outcomes for children. A further discussion of these caveats is out of the scope of this report.

more interestingly, the difference between development outcomes of children born to the same rural–urban migrants are more positive the earlier they are in an urban environment. The effects on height and weight (as indicators of overall health) as well as for schooling are strongest for children who moved to urban areas during their early childhood (before primary education, around 3–8 years old). In contrast to the clear positive impact of rural–urban migration, children who move with their parents between rural villages are more likely to start their schooling later than non-migrants and do not experience any health advantage (Cockx, 2019).

While many rural–urban migrants and urban dwellers in general live in informal settlements (Limbumba and Ngware, 2016; Kombe, 2005), many nevertheless have better living conditions than their rural counterparts, challenging the "migrant slum" narrative (Cockx, 2019; Gollin et al., 2017). Internal migrants in urban and peri-urban areas have far better living conditions on average than rural dwellers under most standard indicators (World Bank, 2015 and 2019d; Cockx, 2019). Incomes, housing conditions and other standard indicators tend to be even higher in larger cities as compared to in secondary towns.[39] Based on the KHDS, a study of Tanzanian internal migrants who relocated to large cities found over 95 per cent of their children in urban settings live in houses with an improved floor (not earth) and 61 per cent have access to clean drinking water and electricity (Cockx, 2019). Conversely, children who migrate to urban areas to escape parental abuse or the dissolution of the household often end up homeless and vulnerable to further abuse (McAlpine et al., 2010). This conclusion is more germane to child vulnerability and urban vulnerability in general than to migration and urbanization.

Migration is not exclusively positive for migrants and their families. A holistic approach to understanding migration requires looking at impacts on those who move, those who stay, and the communities involved (Gemenne and Blocher, 2017). While migration may be positive for some groups under some circumstances, it can be a last-resort strategy or lead to erosive outcomes for others. In the United Republic of Tanzania, internal migration is be observed as a survival strategy in the face of hunger, in an overall setting of erosive coping measures which traps households in a cycle of poor living conditions (Warner and Afifi, 2014; Afifi et al., 2014). Relatively poorer households may respond to shocks by migrating to maintain household income, but they may only afford to move to nearby villages (Ocello et al., 2015), for example to engage in short-term work like charcoal production (Blocher, 2016). So-called survival or "distress" migration is prevalent among households with limited livelihood diversification

39 For the purpose of this report, this is understood as agglomerations classified as "other urban areas". Tanzanian laws and classification systems in this regard are out of the scope of this report.

options. For example, research in Same District of Kilimanjaro region identified landlessness and an overall lack of productive assets as characteristics shared by households for which migration is primarily erosive (Afifi et al., 2014). Moreover, studies from across sub-Saharan Africa demonstrate that even well-planned migration can, in many circumstances, fail to meet expectations or lead to worsening conditions for the migrant and household (van der Geest, 2010; Harris and Todaro, 1970; Geddes et al., 2012). In the United Republic of Tanzania, return migration from urban centres to rural areas of origin is usually associated with the disconnect between expectations and outcomes, and the returnees do not demonstrate higher earning potential after returning as compared to peers who did not migrate (Hirvonen and Lilleør, 2015; see above subsection on "urban-rural return and "reverse" migration"). In an urbanizing country, migrants are often as likely to be moving towards environmental hazards and risk as away from them (Geddes et al., 2012), creating further challenges. Finally, in addition to the links between migration and objective measures of development in focus in this section, the negative impacts of internal migration on a number of subjective measures of well-being have been explored in other contexts (Nowok et al., 2013). More research is needed on this topic.

Migration and health

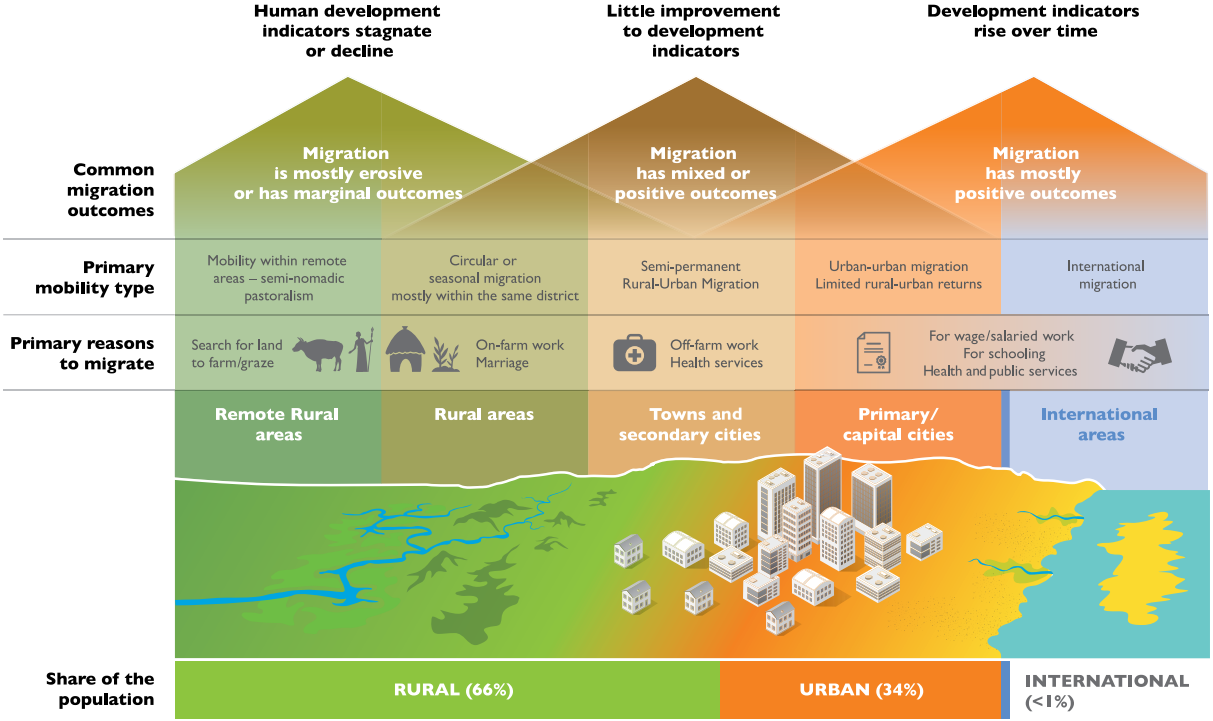
A growing area of interest in the United Republic of Tanzania is linkages between migration and health. While more research is needed in the country, a number of observations from East and Southern Africa can be applied to the Tanzanian context. A distinction must be made between health risks for populations on the move themselves and the impact of migration and displacement on the health of host communities. While the health concerns for people on the move are similar to the rest of the population, they are likely to be exposed to risks specific to the migration process. A number of health risks associated with large movements of people, especially when people are displaced, are less prevalent in individual cases of voluntary migration. In particular, overcrowding can facilitate transmission of health risks. Transmissible illnesses that are sometimes linked to migration and displacement include: food- and waterborne illnesses; measles, meningitis, and acute respiratory infections; and sexually transmitted diseases (McMichael et al., 2012). Undernutrition, maternal mortality and mental health disorders are especially associated with displacement (ibid.).

Migrants and displaced people may also have health challenges due to their relocation and lifestyle change. Tanzanian migrants who move from rural to urban areas are found to have higher risk of diabetes and cardiovascular disease than their non-migrant peers, due to diet change, reduced physical activity and other environmental factors (Unwin et al., 2010). Nevertheless, in sub-Saharan Africa in general, migration is related to poverty reduction and poverty reduction is related to health gains. Consistent with this trend, voluntary migration in the United Republic of Tanzania is overall related to positive health outcomes for the migrants themselves and for their family members (Beegle et al., 2010; De Weerdt, 2010). More targeted research is needed on the physical and mental health of migrants in the country.

The impact of migration on the health of receiving populations is complex and difficult to disentangle from other factors. Migration tends to be positively associated with broad trends of economic development and population mobility, such as road development, factors associated with positive increases in health indicators. It is difficult to isolate the impact of movement of people on the overall health of a population. The transfer of knowledge, social norms, custom, and practices accompanies movements of people, often with positive effects on health awareness and practices. On the other hand, some practices may undermine health education and sanitary practices or have negative health repercussions. In some cases, the growth of migrant communities is linked to the appearance of previously non-existent vector-borne diseases and harmful practices like female genital mutilation (FGM). Families are known to cross the porous borders between the United Republic of Tanzania, Kenya and Uganda to perform FGM (Bhalla, 2018; Thomson Reuters Foundation and 28toomany.org, 2018). FGM is contrary to domestic and regional law and is subject to penalties. Nevertheless, the prevalence rate of the practice may be as high as 57.7 per cent in central and northern regions of the United Republic of Tanzania, and communities on the northern border perceive the likelihood of facing penalties as lower there (Thomson Reuters Foundation and 28toomany.org, 2018).

The search for better health facilities is a contributing factor in the decision to migrate from rural to urban areas. Important disparities exist between rural and urban areas on a number of key health indicators, including the availability, quality and coverage of health facilities (Mtahabwa and Rao, 2010; United Republic of Tanzania, NBS, and ICF Macro, 2011). Due in part to the vast size of the country and average low income levels, health services are often difficult to access and under-equipped. For example, evidence suggests that Maasai pastoralists self-reported climate-affected movements to urban areas to seek better health services for themselves as well as for their livestock (Heaney and Winter, 2016).

Figure 31. Conceptual model for migration pathways and outcomes in the United Republic of Tanzania

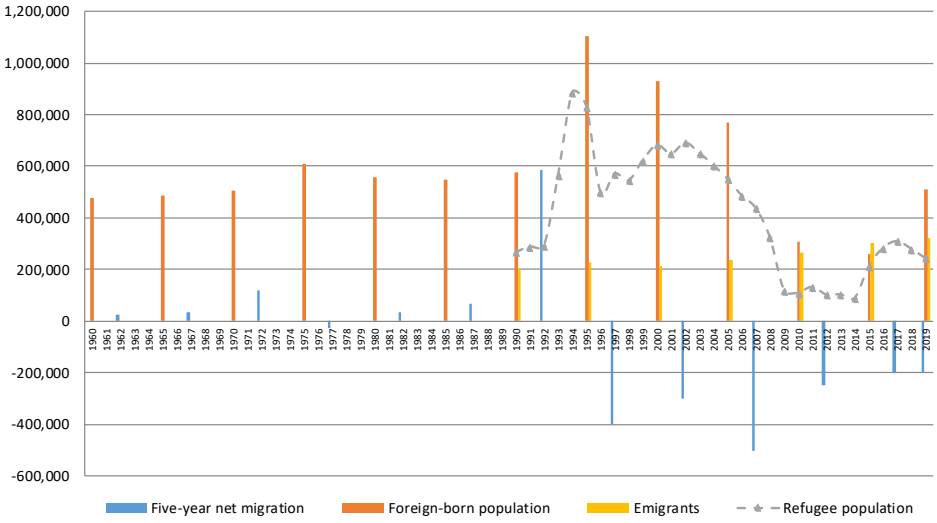


Source: Conceived by Julia M. Blocher and produced by webreform GmbH.

Note: This model is based on current empirical studies on migration in general.

Overall, the literature suggests that varying pathways for internal migration in the United Republic of Tanzania and different prior conditions of the migrant influence the outcomes of migration. Figure 31 attempts to demonstrate some of the dynamics uncovered in the literature and discussed in this section. Migrants in remote, rural areas have different motivations for migration than migrants in urban areas, and the former tends to migrate to other rural areas while the latter tend to migrate between urban areas. Because rural populations tend to have a lower baseline levels than their urban counterparts in terms of income, life expectancy, education, and many other standard of living indicators (World Bank, 2015 and 2019; Cockx, 2019), they are generally predisposed to maintaining lower levels over their lifetimes. Evidence suggests that rural-rural migration towards more remote areas tends – for example, the movements of some mobile pastoralists or farmers seeking virgin land to farm – tends to lead to a decline in human development indicators. This is due to reduced access to health services, education, and a number of amenities, as discussed above (Cockx, 2019; Gollin et al., 2017), and income levels are likely influenced by reduced access to social networks and markets (De Weerdt, 2010). Importantly, research discussed in the "migration outcomes" subsection indicate that migration from rural areas to urban areas leads to a demonstrable rise in standard human development indicators, on average. While this rise is observed for any move to a less remote area, the most significant improvements are among people who move to less remote, primary cities as compared to moving to smaller urban areas or secondary cities (Beegle et al., 2010; Wineman and Jayne, 2017). Finally, while a small minority of Tanzanians migrate abroad, as discussed in the next section, they tend to experience positive outcomes in income, health, and education; however, they are also likely have a relatively high baseline of these standards. Figure 31 attempts to visually represent these pathways with some room for blurred lines between them, to demonstrate both that migration outcomes can be vastly different for each family and that mobility "types" (mobile pastoralism, circular or seasonal migration, rural-urban migration, urban-urban migration, and international migration) are fluid and non-exclusive.

Figure 32. International migrant stock in the United Republic of Tanzania and five-year net migration, 1960–2019



Source: Reproduced based on UN DESA, Population Division (2019a).

Notes: 1. The United Republic of Tanzania began recording migration data in the 1988 census. Although the country hosted many refugees since the 1967 Protocol to the 1951 Refugee Convention came into effect, notably Burundians who fled mass violence in 1972, the United Nations' records of the number of refugees in the United Republic of Tanzania are available from 1988, as the country hosted Mozambicans fleeing guerilla warfare en masse.

2. Net migration is the total number of immigrants minus the annual number of emigrants.

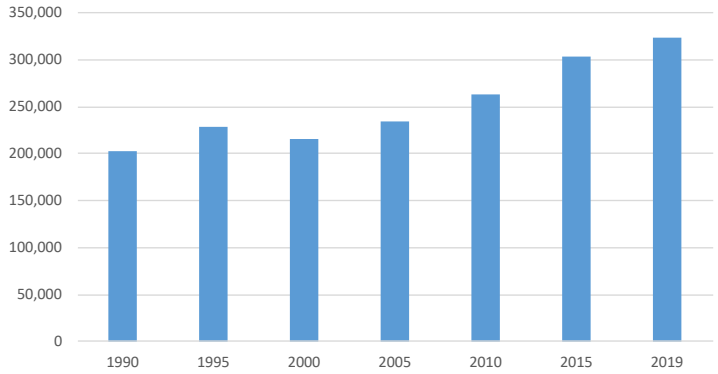
International migration

International emigration from the United Republic of Tanzania contributes little to population change in the country. International emigration rates are comparatively low among East African nations, with only 323,200 emigrants in 2019 (total stock of emigrants at mid-year) (UN DESA Population Division, 2019a). As shown in Figure 33, this is the highest number ever recorded, and the trend is overall increasing since international migration was de-restricted at the end of the country's socialist period (roughly 1961 to 1985). Estimated total net migration in the five years prior to 2020 is −200,400, or a rate of roughly −0.7 per 1,000 people,[40] even if net migration in 2019 alone was positive due

40 Net migration is the total number of immigrants minus the annual number of emigrants, and the latter category consists of both citizens and non-citizens (including return migrants, recorded returns of undocumented migrants and repatriated refugees). The rate is expressed as this total per 1,000 persons of the country's population.

to an increase in the foreign-born population. In other words, the relatively low number of recorded immigrants is outweighed by the number of emigrants over five years, keeping in mind a high number of refugee repatriations that occurred in this period. Top destination areas in 2019 for people from the United Republic of Tanzania included the United States (54,259), the United Kingdom (48,505), Rwanda (44,877), Kenya (37,027), Burundi (31,024), Uganda (21,979), Canada (21,939) and South Africa (16,769). Overall, emigration to less developed regions is currently higher than to more developed regions, at 179,664 compared to 143,509 (UN DESA Population Division, 2019a). As demonstrated in Figure 34, unlike many other sub-Saharan African countries, the rate of women migrating internationally has roughly kept pace with men.

Figure 33. Emigration from the United Republic of Tanzania, 1990–2019



Source: Reproduced based on data from UN DESA, Population Division (2019a).

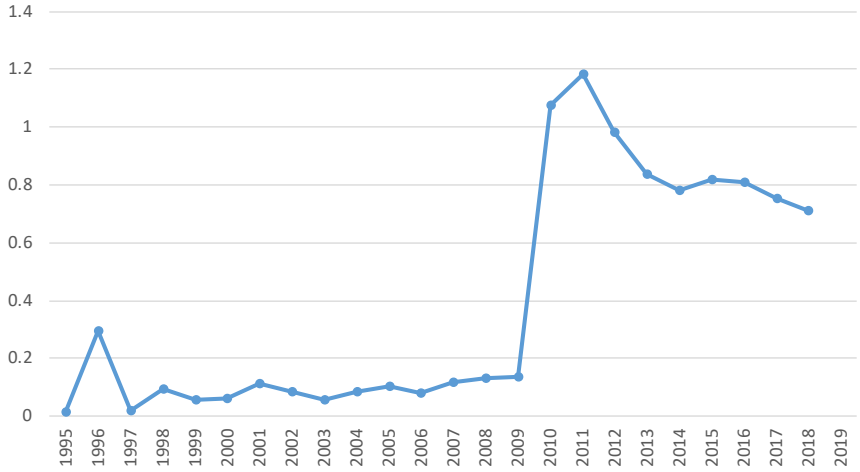
Figure 34. Comparison of men versus women international migrants from the United Republic of Tanzania, 1990–2019

Source: Reproduced based on data from UN DESA, Population Division (2019a).

The magnitude of recorded remittances received has slowly increased since 2010. In part because international migration was restricted during the country's socialist period (approximately from 1961 to 1985), the potential impact of remittances on development has only recently gained the attention of Tanzanian policy actors (Hansen, 2012). While international remittances tend to be underrecorded, the United Republic of Tanzania received USD 434.8 million in 2019 (World Bank, 2019a).[41] As shown in Figure 35, this amount is roughly ten times higher than in 2009 (USD 39.8 million). The amount of remittances is roughly equivalent to 0.8–1.2 per cent of the United Republic of Tanzania's GDP over the same period. This is in pace with population growth and international labour migration from the country. Overall, the volume of remittances is growing particularly rapidly in the region, increasing by more than 60 per cent between 2013 and 2018 in five East African countries (Burundi, Kenya, Rwanda, South Sudan, Uganda and the United Republic of Tanzania) as compared to 10 per cent in sub-Saharan Africa in general (Mixed Migration Centre, 2020). The average costs of receiving and sending international remittances in the United Republic of Tanzania are among the highest in the world, at an average of 11.2 per cent and 15.9 per cent, respectively (World Bank, 2019b). While there is no exact estimates of the magnitude of so-called domestic remittances, money transfers from internal migrants through informal and mobile phone services such as M-Pesa are significant. Some 23 per cent of households surveyed for the most recent wave of the TZNPS (2012) reported receiving remittances in the 12 previous months, mostly from major cities, and only 2 per cent of those received transfers from abroad (World Bank, 2015). Remittances are an important contribution to development as well as to rebuilding after household shocks or community crises. High transaction costs for remittances diminishes the resources that are available for the household end-users. Moreover, informal and semiformal means of remittances transfers are volatile and may break down during hazard events like epidemics and droughts – when they are needed the most.

41 These figures are based on the IMF balance of payments information and do not capture all remittances sent to households via informal means or via many money transfer intermediaries, like Western Union. Caution is recommended in interpreting these figures, as they do not perfectly represent of resources received by households from friends and family members (see https://migrationdataportal.org/themes/remittances).

Figure 35. Remittance inflows into the United Republic of Tanzania as a share of GDP, 1995–2019 (USD million)

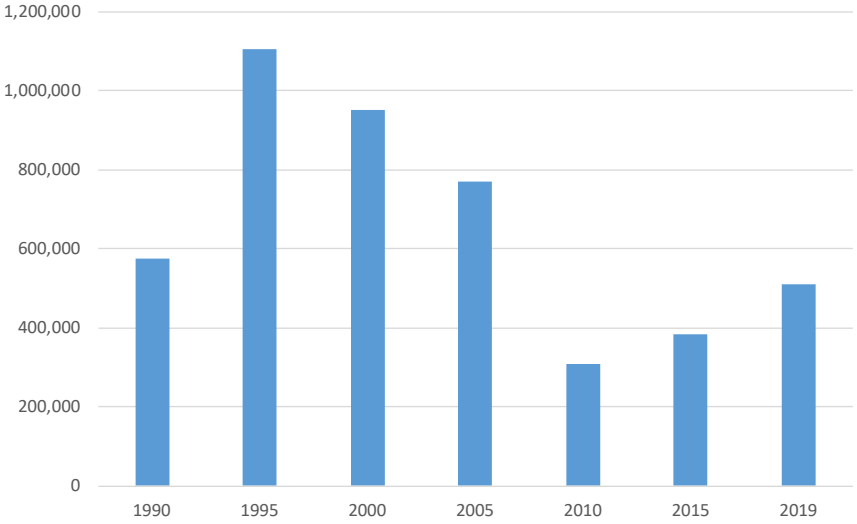


Source: Reproduced based on the World Bank (2019b).

Immigration

In 2019, there were 509,200 foreign-born residents in the country, or 0.9 per cent of the country's total population (UN DESA Population Division, 2019a). The foreign-born population has been less than 1 per cent of the total for most of the decade (United Republic of Tanzania, NBS and OCGS, 2015; Government of the United Republic of Tanzania, 2012). Figure 36 shows the trend in foreign-born in the country since 1990, including Zanzibar. In 2019, roughly 50 per cent were women. Refugees and asylum seekers in the country, discussed in the section that follows, make up a significant percentage of the foreign-born population. Figure 38 shows this relationship, as the peaks of the two types roughly correspond since refugee data is more reliably recorded since 1990.

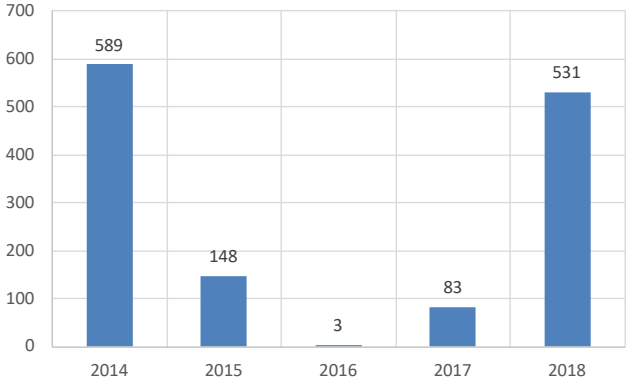
Figure 36. Foreign-born residents in the United Republic of Tanzania at mid-year, 1990–2019



Source: Reproduced based on data from UN DESA, Population Division (2019a).

The United Republic of Tanzania participates in a number of regional consultative processes on migration in Africa, in particular, to address irregular migration. As an SADC Member State, the country participates in the Migration Dialogue for Southern Africa (MIDSA), a dialogue among 20 States to enhance inter-State cooperation and migration governance (IOM, 2020a). A dedicated high-level meeting was held among Tanzanian, Ethiopian and Kenyan officials in 2019 to discuss ways to address detention conditions and alternatives to detention, prevent irregular and dangerous migration, and foster sustainable approaches to return and reintegration (IOM, 2019a; Kover, 2019). All are countries of origin and transit along the so-called Southern Route, along which many irregular migrants from the East and Horn of Africa travel with the intention to reach South Africa. Approximately 20,000 irregular migrants enter the Tanzanian territory every year (IOM, n.d.; Mixed Migration Centre, 2020).

Figure 37. IOM-assisted voluntary return and reintegration of migrants from the United Republic of Tanzania, not including refugee repatriation



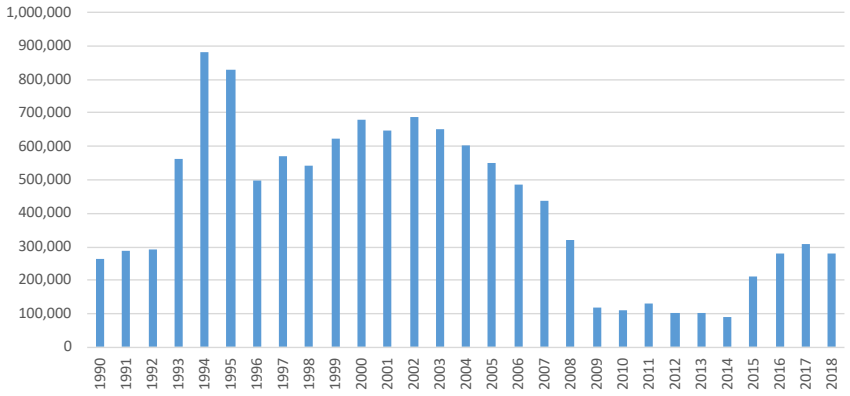
Source: Reproduced based on data from the IOM Assisted Return and Reintegration Unit (IOM, 2019a).

Refugees and persons of concern

The United Republic of Tanzania is historically among Africa's most important refugee recipient nations. The country is party to the 1951 Convention Relating to the Status of Refugees and its protocols, and its main domestic instrument is the Refugees Act of 1998 (UNHCR, 1999; Government of the United Republic of Tanzania, 1998). The Refugees Act lays out the roles and responsibilities for the reception of refugees, as well as the working and living conditions. The country was host to 330,755 refugees and asylum seekers as of 31 October 2018, mainly from Burundi (245,9641) and the Democratic Republic of the Congo (84,170), and also from 15 other nationalities (621) (UNHCR, 2018). The majority of refugees and asylum seekers live in three refugee camps – Nyarugusu, Nduta and Mtendeli – all located in north-western United Republic of Tanzania. There are approximately 19,154 Burundians in the Old Settlements of Ulyankulu, Mishamo and Katumba and a further 23,047 who are self-settled in Kigoma villages are assisted by the Office of the United Nations High Commissioner for Refugees (UNHCR, 2018). A small population of refugees of mixed nationalities (270) are hosted in urban centres, mainly in Dar es Salaam. The Government strongly supported the process towards the Global Compact on Refugees and voted favourably for the Compact at the United Nations General Assembly in December 2018 (UNHCR, 2018).

In the past decade, hundreds of thousands of refugees in the United Republic of Tanzania voluntarily returned to their home country or were granted citizenship. Hundreds of thousands of people fled to the United Republic of Tanzania in the 1990s, in the wake of Burundi's civil war, caused by the conflict between the Hutu and Tutsi ethnic groups. In response, the Government developed the Tanzania Comprehensive Solution Strategy (TANCOSS), which aimed to provide durable solutions for Burundian refugees who had been living in the United Republic of Tanzania since 1972. In 2008, over 200,000 refugees were given a choice between repatriation and naturalization, and 79 per cent opted to receive Tanzanian citizenship (Kuch, 2017). Some 162,000 Burundians had naturalized by 2014 (Kuch, 2017; Markus, 2014). Political violence and renewed insecurity in Burundi between 2015 and led to new arrivals of asylum seekers. In response to the crisis, the Government of the United Republic of Tanzania reopened previously closed refugee camps in the country.

Figure 38. Refugees and asylum seekers in the United Republic of Tanzania as reported at mid-year by the Office of the United Nations High Commissioner for Refugees, 1990–2018



Source: Reproduced based on data from UN DESA, Population Division (2019c).

Note: This figure includes data on refugees and asylum seekers in Zanzibar.

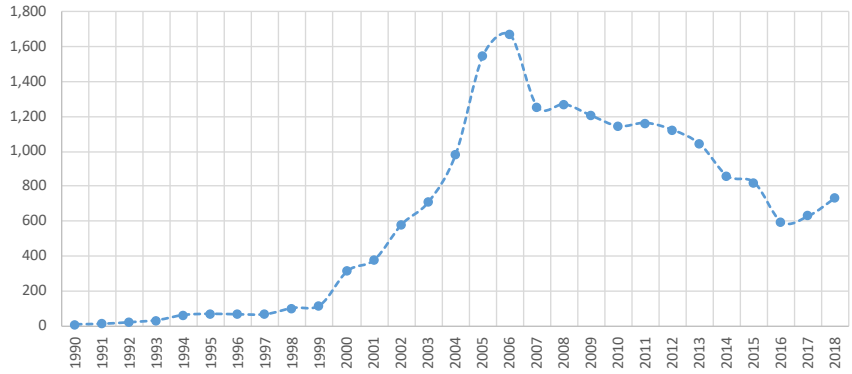
The Tanzanian approach to refugees has evolved in recent years, as restrictions on access to territory and asylum increased. Prima facie (automatic) recognition of Burundian asylum seekers was revoked in 2017 (UNHCR, 2018), meaning all asylum seekers arriving in the United Republic of Tanzania have to undergo refugee status determination. Border entry and reception points for Burundian and Congolese asylum seekers closed between March 2017 and July 2018. Since August 2017, the Government of the United Republic of Tanzania and the Government of Burundi have been implementing a voluntary repatriation plan (UNHCR, 2019). In accordance with this plan, the two

governments announced in 2019 that further naturalization programmes would not continue and urged Burundian refugees to repatriate (Namkwahe, 2019), even as international observers expressed concerns over continued risks in Burundi (*Deutsche Welle*, 2019; NRC, 2019). The Government of the United Republic of Tanzania is not formally applying the Comprehensive Refugee Response Framework, a responsibility-sharing and international cooperation scheme, citing national security concerns and the 73 per cent gap between aid requested and funds received (NRC, 2019).

The number of refugees from the United Republic of Tanzania has historically been low. Other countries have granted asylum to Tanzanians on the basis of political persecution at times of political turnover, for example, at the end of the presidencies of Julius Nyerere (1961–1985) and of Benjamin Mkapa (1995–2005). The number of Tanzanian refugees has typically restabilized after peak years, demonstrating that most people who fled after these events have returned quickly or found durable solutions in their host country. Figure 39 shows the population of Tanzanian refugees and asylum seekers outside the country between 1990 and 2018.

Government figures do not address IDPs from conflict or violence (IDMC, 2021a). As explained in the section "Disaster Displacement and Farmer–Herder Disputes", most IDPs in the country were displaced by floods, geophysical events and epidemics.

Figure 39. Persons of concern* from the United Republic of Tanzania at mid-year, as reported by the Office of the United Nations High Commissioner for Refugees, 1990–2018



Source: Reproduced based on data from UN DESA, Population Division (2019c).

Notes: This figure includes data on refugees and asylum seekers in Zanzibar.

* This includes refugees, asylum seekers, stateless persons, internally displaced persons, and some other persons not fitting these criteria.

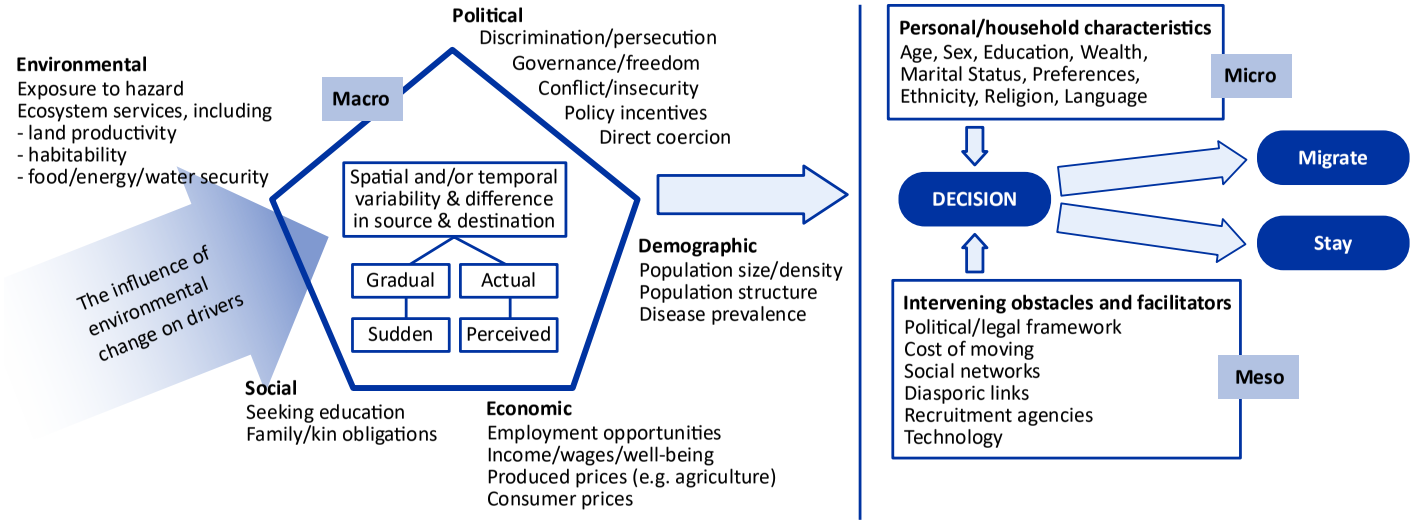
Climate change and human mobility

The linkages between climate change and human mobility are increasingly recognized and studied around the world. Importantly, the Government of the United Republic of Tanzania has recognized the issue in the Tanzania National Climate Change Strategy (2012):

> *In many rural areas faced with droughts and water shortage migrations have become a common phenomenon, with people moving with their livestock. In many instances this has been a cause for abandoning their old settlements and establishing new ones in areas with better opportunities. This has particularly been the case with the agro-pastoral communities. Even in urban settlements, there is serious water shortage that predisposes the communities to diseases such as cholera, mainly associated with drinking unsafe water. Climate change is poised to aggravate the situation (United Republic of Tanzania, VPO, Division of Environment, 2012).*

Research on climate–migration phenomena considers different drivers operating concurrently to affect individual migration decisions and population flows. The most commonly used framework for the study of environment-migration linkages (Black et al., 2011) takes a climate change framework and embeds five categories of factors affecting migration flows (Lee, 1966): economic drivers (differences in income and employment opportunities that act as determinants of migration flows), political drivers (with conflict being one of its most important materializations), demographic drivers (related to the size and composition of populations in origin regions, as well as health-related factors), social drivers (that include cultural practices), and environmental drivers (linked to ecosystem services). The interactions between environmental degradation and climate change and human mobility are complex and dynamic, varying in time and geographic space. Figure 40 attempts to visualize this relationship, highlighting the role of different macro, meso (community level) and micro (household or individual level) characteristics (Black et al., 2011). Mobility tends to be impacted through such factors in two main ways: by increasing exposure to hazards and by adding pressure to availability and reliability of natural resources needed for livelihoods.

Figure 40. Conceptual framework for drivers of migration and the influence of environmental change



Source: United Kingdom, The Government Office for Science, 2011.

As noted in the introductory section, the conceptual framework presented in Figure 2 can be adapted to the Tanzanian context and to the climate risk framework of this report by including climate change-related hazards (like floods, droughts, rainfall changes and temperature rise). We also must consider the indirectly affected non-climatic co-stressors (including farmer–herder conflicts, threats to sustainable fisheries and forests, poor health services and risk-prone infrastructure) and the cross-cutting hazards and factors (including the sociopolitical environment that determines migration policies and sociocultural factors like gender roles, attitudes towards migration, and other sociocultural norms). These climatic stressors, co-stressors, and the cross-cutting stressors and factors, influence the five main drivers of mobility (social, economic, political, demographic and environmental) in complex and non-exclusive ways. Below we consider the different forms of mobility – migration, displacement and seasonal mobility, depicted in Figure 2 as the most prevalent forms in the United Republic of Tanzania – and immobility (voluntary or forced).

Available evidence from the United Republic of Tanzania suggests a strong connection between outmigration and environmental degradation, unfavourable weather conditions and hazard events. The linkages between environmental changes, climate change and migration in the United Republic of Tanzania have been the explicit focus of a number of scientific studies (Afifi et al., 2014; Charnley, 1997; Hirvonen, 2016; Kubik, 2017; Kubik and Maurel, 2016a and 2016b; Magesa and Pauline, 2019; Mbonile, 2005; Msigwa and Mbongo, 2013; Smith, 2014; Tacoli, 2011). Studies focused on other migration topics were reviewed for this report because a holistic approach to understanding environment and migration linkages requires looking at multiple facets of migration outcomes, including for migrants, sending communities and destination communities (Gemenne and Blocher, 2017). Many have been at the national level, using panel data (Beegle et al., 2011; De Weerdt et al., 2012; De Weerdt, 2010; Kubik, 2017; Kubik and Maurel, 2016a; Kubik and Maurel, 2016b; Ocello et al., 2015); others have been at the subnational level, primarily at the regional, district and river basin levels (Hirvonen, 2016; Hirvonen and Lilleør, 2015; Magesa and Pauline, 2019; Mbonile, 2005; Paavola, 2008); and a growing number at the micro level considering specific communities and groups (Afifi et al., 2014; Charnley, 1997; Cockx, 2019; Liwenga et al., 2012; Tacoli, 2011; Warner and Afifi, 2014). Literature from non-governmental organizations, United Nations agencies, and government agencies are used in the text that follows to complement the scientific literature, when relevant.

There are important gaps in knowledge. National and international actors, including IOM and the Internal Displacement Monitoring Centre, study large-scale disaster displacements that can be linked to climate change. However, gaps remain in understanding specific vulnerabilities leading to displacement as well as the outcomes of displacement. Moreover, few studies are able to consider the influence of gradually developing climate change impacts on the short-term, short-distance migration and displacement that may be the invisible majority of climate-related movements. Accounts of these types of movement are often anecdotal, in part due to the dearth of data noted at the beginning of this chapter. A better understanding of these phenomena, building on the research presented in this section, is instrumental to developing evidence-based strategies to improve livelihoods, support community adaptation planning, adjust urbanization strategies and prepare for the specific needs of people on the move.

Table 4. Main scientific publications specifically addressing climate–migration linkages in the United Republic of Tanzania reviewed for this publication, and their coverage

Study type	Publications
National level/panel	Kubik, 2017 Kubik and Maurel, 2016a Kubik and Maurel, 2016b Ocello et al., 2015 De Weerdt et al., 2012 De Weerdt, 2010 Beegle et al., 2010 and 2011
Subnational level (regional, district, river basin level)	Hirvonen, 2016 Hirvonen and Lilleør, 2015 Paavola, 208
Microlevel case study (community/communities and groups)	Cockx, 2019 Afifi et al., 2014 Liwenga, et al., 2012 Tacoli, 2011 Warner and Afifi, 2014 Charnley, 1997

Weather and slow-onset events

Rural-to-rural migration is known to be an important response to weather-related income and consumption shocks in sub-Saharan Africa (Findley, 1994; Henry et al., 2004), a trend confirmed in the Tanzanian context (Afifi et al., 2014; Liwenga, et al., 2012; Kubik and Maurel, 2016a; Hirvonen, 2016; Kubik and Maurel, 2016b). Studies on environment–migration linkages in the Tanzanian context tend to take a two-step approach, based on the hypothesis that climate changes have impacts on agricultural households that in turn prompt a migration response. In line with this, temperature or precipitation anomalies are found to decrease agricultural yields and thereby decrease household consumption[42] for households with high as well as low endowments prior to these shocks (Hirvonen, 2016; Kubik and Maurel, 2016a). Some studies find temperature shocks to have a highly significant negative impact on crop production, while precipitation is not found to have a statistically significant effect (Hirvonen, 2016; Kubik and Maurel, 2016b). For example, in Kagera region, a one standard deviation (0.33°C) temperature during growing seasons decreases household per capita consumption by between 4.9 per cent and 5.5 per cent on average, taking into account local price effects (Hirvonen, 2016). The combined effect of temperature and precipitation shocks was found to be significant at the national level (Kubik and Maurel, 2016a; Kubik, 2017) but has no significant additional impact from temperature effects alone in Kagera (Hirvonen, 2016). As explained in the section on rainfall (under "Current Climate and Future Projections" in Chapter 3), precipitation shows much more spatial variation than temperature, and it is not well captured in available Tanzanian meteorological data. Limitations must be acknowledged in the statistical analyses presented here. While aggregating information across quite different climates should be interpreted with caution, the combined effect of temperature and precipitation anomalies is found to be statistically significant in at least some scales and regions. These studies do not capture the impact of rainfall variability on short-term migration, which case study research at more granular levels suggests is important (Afifi et al., 2014; Liwenga et al., 2012).

42 Household consumption is regarded by many researchers as a more reliable measure of well-being than other measures like income, particularly in the context of developing countries, where production and income are seasonal.

Research on migration propensities in response to environmental and climatic shocks is mixed. Quantitative analyses of the TZNPS (Kubik and Maurel, 2016b) found that a 1 per cent decrease in crop production due to climatic shocks (using both temperature and precipitation) is associated with a 13 per cent increase in the probability of migrating, on average. In the case of the KHDS (Hirvonen, 2016), a one standard deviation increase in temperature decreases the probability of migration by 0.76 per cent on average. No independent impact of rainfall is found at the national level or in Kagera, and rainfall in the previous year's growing season is not found to have an independent impact on migration (Hirvonen, 2016). While both findings on migration propensities are statistically significant, the effects are low, confirming the overall low rates of longer-term migration in the country in general. These results can be interpreted to mean that income and consumption of agricultural households are inextricably linked to weather each season – particularly in areas where credit, access to irrigation and other coping strategies are low – and while migration is among the options for households to deal with changes, the decision-making process is complex. Current migration research concludes that not all individuals have an equal ability or desire to migrate, even in the face of severe environmental shocks. Migration decision-making, including destination choice (local, internal/interregional and international), depends on individual attributes and baseline household characteristics (Gray and Bilsborrow, 2013; Warner and Afifi, 2014). Considering Tanzanian households at the national level, households that send migrant members in response to environmental and climatic shocks differ significantly from non-migrant households along the lines presented above for migration in general: they have more household members, have lower age-dependency ratios, are better educated and have more previous migration experience (Kubik and Maurel, 2016a; Kubik, 2017).

Some research finds environment and migration trends in the United Republic of Tanzania are in line with the "migration hump" theory. Environmental changes and shocks affect households of different endowments differently, and migration accordingly depends on household resources and characteristics. An inverted u-shaped relationship is demonstrated between household wealth and internal migration in response to slowly developing environmental changes in some agricultural contexts (Nawrotzki and DeWaard, 2018; Nawrotzki et al., 2017), which is consistent with the "migration hump" theory on the impact of overall development on migration (de Haas, 2010; Gemenne and Blocher, 2017). Analysis at the national level in the United Republic of Tanzania reflects this narrative, showing households with medium levels of wealth respond to environmental changes by migrating, while wealthier and poorer households are less likely to do so (Kubik and Maurel, 2016b). A possible explanation is that wealthier households may have more diversified income sources or reserves

that enable them to withstand shocks without migration, while poor households with further eroded resources are unable to invest in migration to cope. Using education as a measurement of household status, research supports the notion that the probability of migration from the most endowed Tanzanian households is not shaped by environmental stress (Ocello et al., 2015).

Some research supports the "environmental scarcity" theory and "distress" migration may occur in some circumstances. In some developing countries, a u-shaped relationship is observed between rainfall change and probability of outmigration (Nawrotzki et al., 2013). These studies posit that in times of scarcity or environmental shocks (for example, proxied by a decrease in rainfall) poor households are more likely to be displaced, due to general livelihood constraints and limited coping options (Gray and Bilsborrow, 2013). In times of resource plenty (increased rainfall), household resources increase and migration is more accessible to the poorest and the land-poor. Using the TZNPS for 2008–2009, a study from the Tanzanian context is consistent with this narrative, showing that households with low endowments are four times more likely to migrate in response to shocks such as droughts and floods than better-off households, but they are likely to stay in nearby locations (Ocello et al., 2015). Better-off households are able to migrate to farther-off destinations to seek higher returns. Medium and higher wealth groups with greater market participation may be better able to leverage previous earnings to invest in productive assets or in migration to maintain consumption, while more financially constrained households who have more limited capacities are more vulnerable to declines in the local natural resource base (Paavola, 2008; Hirvonen, 2016). Among the most disadvantaged households, temporary migration may be tantamount to survival. Case study research in the United Republic of Tanzania suggests that a number of rural inhabitants who reported climate factors among their motivations for migration described a "tipping point" event that precipitated the move, such as a particularly harsh drought (Tacoli, 2011). More research is needed to better understand distress migration and the so-called migration tipping points in the Tanzanian context.

Qualitative research adds nuance to quantitative results, suggesting migration decisions are dependent on time and context. In particular, short-term and short-distance moves of pastoralists and seasonal agricultural migrants are responsive to weather variability that reduces agricultural productivity. After controlling for important demographic and socioeconomic factors (such as age, wealth and education), a study conducted in the districts of Same and Kilimanjaro shows a positive relationship between rainfall shortage and outmigration (Afifi et al., 2014; Liwenga et al., 2012). This research reflects the statistical analysis presented previously, suggesting less diversified households tend to be more sensitive to weather shocks. Moreover, in this study, households mainly dependent on pasture-fed livestock are found to me more likely to move in response to rainfall shortages than farmers (Afifi et al., 2014).

Weather has a notable impact on rural-to-rural migration destination choice, namely people are more likely to move towards areas with more favourable weather conditions. An analysis of the TZNPS (in this case, for the 2008–2012 period) suggests that income differentials between rural origin and destination areas, which are linked methodologically with agricultural yields and favourable rain conditions, increases the probability of migrants choosing that destination (Kubik, 2017). Specifically, a 1 per cent increase in the expected income at the destination as compared to the origin area increases the probability of choosing a given destination by 9 per cent (Kubik, 2017).

Migration may not be the first or most important response to unfavorable environmental conditions. A study of Morogoro region found that farmers respond to droughts by expanding cultivations, reducing fallows or switching crops (Paavola, 2008). They may also migrate on a temporary basis to areas with more favourable conditions to work on larger farms or to engage in charcoal, timber, and brick production (Blocher, 2016). Comparatively, more people from higher-wealth groups from Morogoro region are found to engage in permanent migration to towns and cities than people from lower-wealth groups (Paavola, 2008), which is consistent with findings from larger-scale surveys (Kubik and Maurel, 2016a; Beegle et al., 2011). Overall, relatively wealthier rural Tanzanians are more likely to move from agriculture into higher-level sectors of the economy than their poorer neighbours, who may move locally or not at all.

Households are on average less able to invest in mobility when environmental changes negatively affects their resource base. Individual-level data from the TZNPS for the period 2008–2009 has been used to examine the role played by droughts, floods, crop diseases and severe water shortages as migration drivers (Ocello et al., 2015). Findings reveal that these four issues are associated with an overall decrease in the likelihood of interdistrict mobility in the longer term. Individuals with no education, which is a strong indicator of low socioeconomic status, are much less likely to migrate in general than highly educated respondents (Ocello et al., 2015). Analysis presented previously of Kagera region shows one standard deviation increase in the previous year's average monthly growing season temperature decreases the overall male migration rate by 13 per cent[43] (Hirvonen, 2016). These findings have important implications on climate–migration linkages, because as conditions worsen, destination areas where perennial surface water is available may diminish. Research supports the idea that environmental scarcity reduces households' resource base, and the poorest households may become unable to leave deteriorating conditions. Involuntary immobility – including people "trapped" and vulnerable in the face of hazard events – is a potentially important outcome of environmental and climatic changes (Zickgraf, 2019; Black et al., 2011). Immobility specifically among poor and elderly Tanzanian residents has also been observed in the context of rainfall-induced crop failure (Afifi et al., 2014), but more targeted research is needed.

The establishment of protected areas and the incorporation of village lands lead to the migration or relocation of small-scale farmers and pastoralists that previously occupied them. While the establishment of protected areas is not explicitly related to climate change, the impacts of climate change on the natural environment and on biodiversity heighten the need for government-supported environmental conservation strategies. The Wildlife Conservation Act of 2009 was enacted to enhance the conservation of wildlife and their habitats in game reserves and game controlled areas, wildlife management areas, dispersal areas, migratory route corridors and buffer zones (Kileli Leyani et al., 2017). It does so by putting in place infrastructure, personnel and equipment to patrol the areas. The livelihoods of pastoralists and farming communities living in or nearby the newly established protected areas are affected or even excluded, sometimes directly leading to outmigration. Such movements are not only from protected areas; evictions and sanctions for land encroachment are not uncommon and are often related to land policies rather than to environmental changes. The 1995 National Land Policy (United Republic of Tanzania, Ministry of Lands and Human Settlements, 1995) changed the previously customary and tenure system to a public trusteeship; thus, any land without a documented private title became formally vested in the president

43 The overall male migration rate declines from 5.8 per cent to 5.05 per cent.

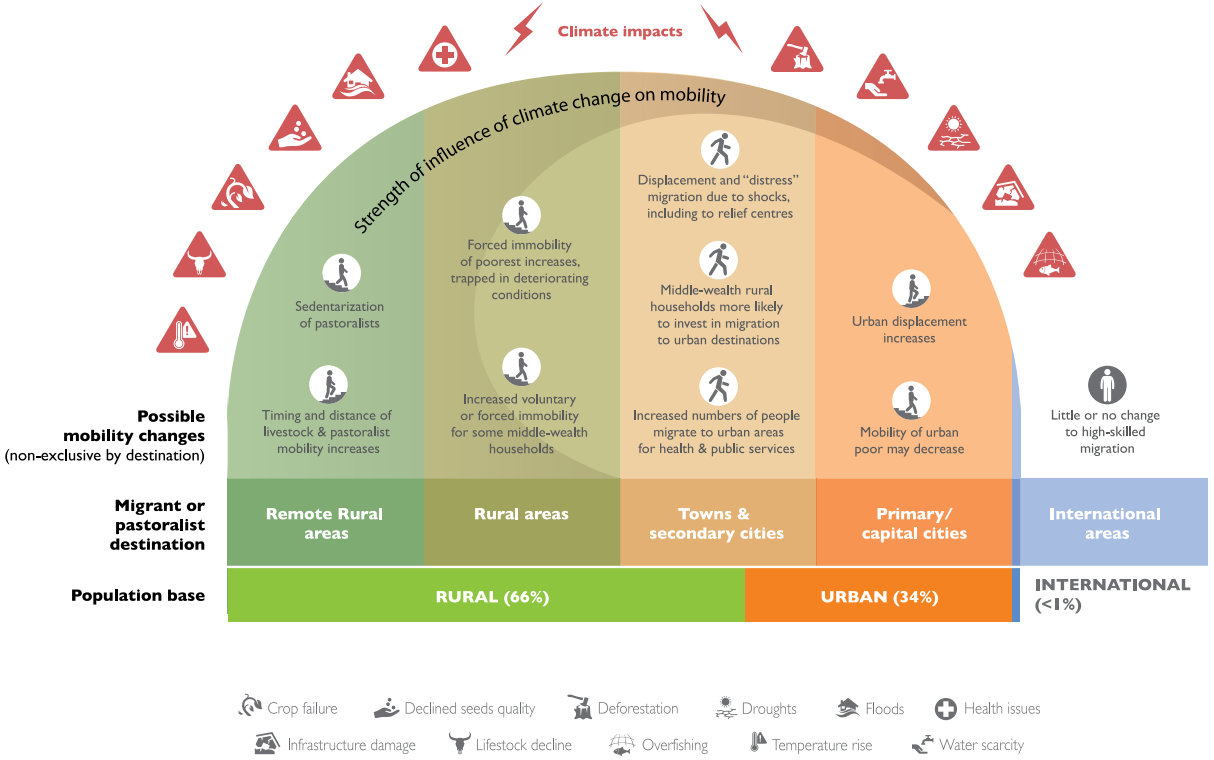
(Sundet, 1997). While the Land Act and the Village Land Act should ensure that villages determine the shared use of village land, many pastoralists and small-scale farmers may be disenfranchised because of their limited understanding of the applicable laws (Kileli Leyani et al., 2017).[44]

There is currently very limited evidence available of how environmental and climate factors currently influence international migration of Tanzanians, if at all. As noted in the "Internal Migration" section, a minority of Tanzanians migrate internationally, most of them crossing into neighbouring countries. The TZNPS does not track international migrants. Quantitative analyses of the KHDS considering environmental factors excluded international migrants due to their low numbers. For example, only 2 per cent of re-contacted respondents to the KHDS had migrated abroad over the 10-year period studied, and exclusively to Uganda (Beegle et al., 2010).

The local environmental impacts of refugee settlements in the United Republic of Tanzania, particularly in the eastern zone, is well documented and monitored. Contrary to the point above, international migration has been found to have a negative impact on local resources management in some border regions (Langer et al., 2015). This issue is not specific to the country, as refugee settlements often develop quickly in emergency scenarios and overshoot their expected capacity.

44 For a more detailed review of the history of the National Land Policy and the history of the process leading to its approval, see: Sundet, 1997.

Figure 41. Model for the impact of future climate change on migration outcomes in the United Republic of Tanzania



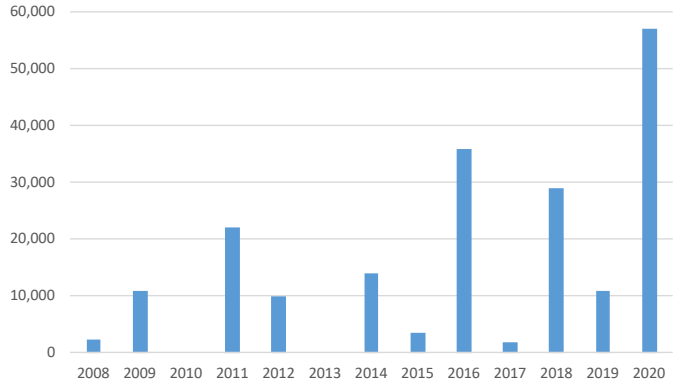
Source: Conceptualized by Julia M. Blocher and produced by webreform GmbH, 2020.

Disaster displacement and farmer–herder disputes

Internal displacement in the United Republic of Tanzania is primarily due to weather-related hazards (e.g. floods and storms), geophysical events (e.g. earthquakes) and epidemics (e.g. rift valley fever).[45] Internal displacement is understood here as when people are forced to flee their homes or place of habitual residence due to conflict, violence, human rights violations or disasters but do not cross an international border (IDMC, 2021a).[46] The magnitude, duration and causes of internal displacement in the country are difficult to estimate, as people are not systematically registered or tracked.

Disaster displacement is common but shows significant year-to-year variability, with an estimated 129,800 new disaster displacements recorded in the country recoded between 2008 and 2018 (IDMC, 2020). That makes an average of over 14,400 per year. The number of people displaced varies significantly from year to year, depending on the disaster affecting the country as displacement depends on the magnitude of the hazard as well as the exposure and vulnerability of the affected population. Figure 42 presents annual displacement numbers demonstrating this variability.

Figure 42. Annual disaster displacement in the United Republic of Tanzania, 2008–2020



Source: Based on data from the IDMC (2020, 2021a and 2021b).

45 At the time of writing, figures on the impacts of the COVID-19 were not available.

46 More information about research methodologies for internal displacement is available from the IDMC: www.internal-displacement.org/database/methodology.

While droughts, floods and storms are most frequently associated with disasters in the United Republic of Tanzania, the country also faces risks linked with geophysical, biological and technological hazards. Many of these events have led to fatalities and displacement. They may also contribute to migration in the longer term by damaging infrastructure and services provision, prompting people to move to seek better living conditions. For example, heavy rainfall contributed to an important cholera outbreak in 2015 that affected over 32,000 people in 14 regions of the country and the Nyarugusu refugee camp on the border with Burundi (CRED, 2019). Landslides in rural areas destroy homes and displace many people but are typically either unrecorded or attributed to accompanying floods (Act Alliance, 2011; IFRC, 2012). Disease epidemics – such as cholera, rift valley fever and COVID-19 – have affected tens of thousands of people in recent decades (CRED, 2019). Unfortunately, climate change is likely to increase the risk of many existing hazards due to impacts on weather events and morbidity. For example, heavy rain is related to risk of landslides as well as waterborne and vector-borne diseases, while heat waves are related to increased mortality and morbidity rates.

Risk of displacement increases with disaster risk, which is compounded by climate change. Diverse unsustainable land use and development practices compound coastal and riverine settlements in both rural and urban areas. While this issue is studied in Tanzanian communities (Ipyana, 2017; Mugasha and Katani, 2016), effective implementation of relevant polices is limited. Urban areas have heightened risks due to crowding, population growth, informal or unsafe buildings, and unplanned urbanization. Poor, vulnerable, and otherwise marginalized groups often have fewer resources to cope and are subject to inadequate service provision, insecure tenure arrangements and inadequate housing in physically exposed areas. Around 8 per cent of Dar es Salaam lies within the low-elevation coastal zone (below the 10-metre contour lines), and water drainage in the urban centre is notoriously poor (Kebede and Nicholls, 2012). Governance of rapid urbanization was weak in the twentieth century, contributing to the proliferation and densification of informal settlements in Tanzanian cities (UN-Habitat, 2010). By 2000, as many as 70 per cent of the populations of Dar es Salaam, Arusha, and Mbeya lived in unplanned or informal settlements that persist today (UN-Habitat, 2010; Lupala, 2015). Recent research on poverty and vulnerability to floods in the country found that households most at risk of flooding are poorer, are more likely female-headed and have insecure tenure arrangements, and tend to lack access to higher quality infrastructure that could withstand hazard impacts. For example, in Dar es Salaam, an estimated 39 per cent of all residents are exposed to floods, close to 50 per cent of the residents of these areas are defined as frequently exposed (Erman et al., 2019; World Bank, 2019c). In Mwanza, the second largest Tanzanian city, it is estimated that 81 per cent of households in

hazard-prone areas are also in the low-income population bracket (Hambati, 2013). Climate change compounds displacement risk by adding to vulnerability of populations while also adding to the frequency, scale, and magnitude of many hazards, as detailed in the section titled "Analysis of Risks Related to Climate Change and Exacerbating Factors". For example, if sea-level rise is kept to a low range of roughly 43 cm, which is only possible with ambitious global emissions mitigation, the United Republic of Tanzania will rank among the top 10 African coastal countries with absolute numbers of people flooded per year (Hinkel et al., 2012). Without significant emissions mitigation and adaptation measures, a significant number of people will have to relocate away from Tanzanian islands and coasts.

Migrants, asylum seekers and refugees have specific needs as well as barriers to inclusion that make them among the most vulnerable to disasters. According to a survey of Dar es Salaam's peri-urban areas, 36 per cent of residents in 2011 were first-time migrants from other regions (Andreasen and Agergaard, 2016). In general, a significant number of newly arrived migrants settle into peripheral areas of Tanzanian towns and cities (Andreasen and Agergaard, 2016; Kombe, 2005). These areas are attractive to new migrants due to pre-existing social ties, the ability to access cheap land or living space, and the possibility of engaging in the production or processing of agricultural products for sale in urban markets. Unfortunately, unmanaged movements further compound overcrowding and the expansion of informal settlements into marginal and exposed areas, which leads to increased disaster risk.

Impacts or resource-based conflicts, including displacements, are difficult to estimate. Roughly two thirds of all scholarly work in the environment and migration field have focused on West and East Africa (Piguet et al., 2018), many with a special focus on localized conflicts among pastoralist groups or between farmers and pastoralists (Blocher, 2018). Early policy interest in the topic was in part due to the identification of environmental and climatic culprits at the source of conflicts between different ethnic groups, spurred by acute resource shortage, notably in Sudan, Somalia, and around Lake Chad (Ban, 2007). In politically and economically stable nations such as the United Republic of Tanzania, resource-based disputes take on a more localized character and do not necessarily involve violent flare-ups between groups. As previously noted, no government figures for internal displacement from conflict have ever been recorded (IDMC, 2021a). However, there are strong indications from local researchers and non-governmental organizations that local disputes over land resources are relatively common, and some lead to displacement, evictions, and deaths (Saruni et al., 2018; Mwasha, 2016). There is no evidence that these events have prompted cross-border movements.

While environmental and climatic changes are often blamed, disputes are primarily about land use in general and often arise from tensions between customary and granted land-use rights (Benjaminsen et al., 2009). Lack of grazing land and cattle theft are thought to be proximate causes of disputes (Mwasha, 2016), but these are generally presented in current literature as less important than land governance and ethnic divisions. Disputes tend take three main forms: farmers versus pastoralists over village boundaries, farmers versus pastoralists over livestock routes, and farmers versus farmers over the land (Saruni, et al., 2018). The registration of pastoralists and the regulation of village land are important to the issue, as non-resident pastoralists allege boundaries are unfairly or illegally moved while other parties allege pastoralists trespass (ibid.). Legal boundaries for stock routes and water points are common points of contention. However, seasonality, coexistence of livelihoods, and cooperation between farmers and pastoralists are important to land-use planning. For example, traditional agreements during the dry season would support the moving of livestock to simultaneously feed on crop residue and clear the ground for the next season (Blocher, forthcoming). Without precautions, neighbouring irrigated farmland or late-maturing crops are then at risk of damage. When livestock damage crops or when farmers confiscate livestock, either party may seek dispute resolution and compensation through local authorities. However, the persistence of disputes points to the need for a more systematic development and implementation of detailed land-use plans. The accumulation of land in the hands of national and multinational companies is perceived to have also contributed to lower land availability for smallholder farmers and pastoralists and add pressure to the situation, as larger landholders are more likely to have formalized tenure (Blocher, forthcoming).

Disputes between smallholder farmers and livestock keepers are increasingly reported in predominantly crop-cultivating areas which had limited experience in livestock keeping (Mwamfupe, 2015). While these disputes are popularly linked to the in-migration of livestock keepers, there is limited evidence to definitively conclude there is an additional pressure of migration on top of population growth and low agronomic management. Moreover, longitudinal data is not available to suggest a positive or negative trend in farmer–herder disputes over time. Reports of land-use disputes in the country first focused on the margins between pastoral lands and protected lands, especially national parks in northern Tanzanian regions (Mwamfupe, 2015; Sirima and Backman, 2013). Farmer–herder disputes have also been reported in predominantly farming areas that either border or are adjacent to primarily pastoralist livelihood zones (Mwasha, 2016; Benjaminsen et al., 2009; Saruni et al., 2018). Sedentary farming communities, even if they have themselves arrived relatively recently, may perceive

pastoralist and agropastoralists communities as "invaders" (Charnley, 1997; Mwamfupe, 2015; Blocher, forthcoming). Political ecologists have linked anti-pastoralist sentiment in the country in recent decades to the Government's focus on agricultural modernization as well as to allegations of bribery of local officials by pastoralists (Benjaminsen et al., 2009). Overall, the studies presented here tend to point to inefficient implementation of land-use plans (Saruni et al., 2018), limited community participation (Sirima and Backman, 2013) and intergroup mistrust (Benjaminsen et al., 2009). Studies on farmer–herder disputes have focused on a handful of districts, and it would be difficult to draw wider conclusions on conflict or displacement, including with consideration to environmental factors. However, the body of research on the climate–security nexus is growing.

Sunrise in Dar es Salaam. © 2019/Julia BLOCHER

CHAPTER 5.
CONCLUSIONS AND OUTLOOK

OUTLOOK FOR THE ENVIRONMENT, CLIMATE CHANGE AND HUMAN MOBILITY TRENDS

Building on the baseline of current understandings of the nexus between climate change and human mobility in the United Republic of Tanzania, this concluding chapter aims to provide an outlook for possible changes to migration trends under future scenarios of climate change. The IPCC has recognized that, under a range of climate change scenarios, "there is low confidence in quantitative projections of changes in mobility, due to its complex, multi-causal nature" (IPCC, 2014a:20, 73 and 2014b:20). Triple uncertainty hinders estimations of future human mobility under progressing climate change: uncertainty in the global emissions trajectory that will be followed, uncertainty in localized impacts of that climate change, and uncertainty in how individuals and households will react to those impacts. Limitations to research and data are presented previously, in both the climate science and current understandings of human mobility in the United Republic of Tanzania, that pose serious constraints to any reasonable projection of climate-related migration, displacement and immobility in the country. The existing literature on climate and migration in the country tends to focus on a limited number of adaptation questions and population groups, such as urban disaster risk, but falls short on other issues, such how the degradation of fisheries will affect livelihood choices and migration.

The evidence presented in this report suggests that while climate change impacts will be felt across the United Republic of Tanzania under both optimistic (RCP2.6) and business-as-usual (RCP8.5) emissions pathways, these changes will be experienced differently in different regions and by different population groups. Not only are these groups' prevailing livelihoods or subsistence types differently affected by climate change, they tend to inhabit diverse climates and geographic regions. They also differ in connectedness, access to information, political representation and more. Among the most relevant distinctions highlighted in this report are: people in remote as compared to well-connected communities, sedentary farmers as compared to mobile pastoralists, poorer and comparatively wealthier people, women and men, working-age population and dependants, and rural as compared to urban inhabitants. These factors dictate one's ability to respond to the changes in resources around them as well as to opportunities to adapt. Although this report cannot prescribe "ideal" groupings, the distinctions

between poorer and comparatively wealthy households in both rural and urban areas appear the most relevant for climate change impacts as well as for migration decisions. It is never the poorest rural inhabitants who have available resources and are able to migrate, while comparatively wealthy households may invest in strategies like migration to diversify and adapt. In urban areas, the urban poor have fewer opportunities to withstand changes and face adversity than the urban elite, who have more buffer options to maintain their standard of living.

Distinguishing between population groups is of particular relevance to policy actors in the country at all levels, as any effective policy and forward-looking planning will have to distinguish between people with different vulnerabilities and capacities to face climate change impacts. By combining insights from a much wider range of literature on different subsistence types, their occurrence and location in the United Republic of Tanzania with the available evidence on expected regional climate impacts and existing migration patterns, we attempt to derive plausible scenarios of climate impacts on human mobility in the country. We present these by zone as a way to approximate different subsistence types, and attempt to represent the dominant population groups for each.

Higher temperatures and erratic rainfall will affect the northern and central zones. Pastoralist and agropastoralist livelihoods dominate and are particularly sensitive to these changes. Increased mobility with herds, forced immobility and outmigration are possible changes to population dynamics.

The central and northern regions will be particularly affected by heating, very hot days, a decline in the *masika* long rains season, and a more intense and erratic vuli short rains season, affecting pasture and land productivity (see the section "Climate Change in the United Republic of Tanzania: Temperature Projections"). These changes are likely to worsen over the course of the century and would be unmanageable under the higher-end climate change scenarios like RCP8.5, which corresponds to a global average surface temperature increase of over 4°C. The central and northern regions also have the highest concentration of predominantly pastoralist and agropastoralist communities. While exact estimates are not available due to government definitions and freedom of ethnicity, regions like Arusha and Manyara each account for under 4 per cent of the total national population (United Republic of Tanzania, NBS, 2013). There is some evidence that pastoralist mobility is more sensitive to rainfall changes than migration of members of farming households (see the "Climate Change and Human Mobility" section). Livestock herders in the northern and central regions of the United Republic of Tanzania may move more frequently and in less predictable patterns than before, due to the changes to pasture and water resources. Others may permanently abandon their home communities as conditions become unbearable. In similar

contexts, persistent drought has contributed to permanent outmigration of large numbers of people. Such permanent outmigration of pastoralists in the face of deteriorating environmental local conditions may not follow a linear pattern but rapidly scale up once a certain threshold perceived risk is reached (so-called migration "tipping points"). Still, others will become involuntarily immobile, relegated to cope in situ, despite eroding household resources and dwindling livestock. As pastoralist women tend to migrate less often than men – and when they do, it is often for marriage and not for income-generating activities – they are likely to be among the most vulnerable to multidimensional poverty and least able to benefit from mobility as a coping strategy. For all these reasons, we can expect pastoralist households in the United Republic of Tanzania's central and northern regions to be among the most severely affected by climate change.

Moreover, a number of pastoralist households will diversify their household resources by choosing to adopt sedentary livelihoods, including for work in farming and in agricultural value chains. The evidence in the previous chapter suggests this trend is likely to be associated with migration away from environmentally harsh conditions and is likely to be positive for many households. It is important to consider these potential population and livelihood shifts in national development planning and climate change adaptation strategies.

In the coastal zone and Zanzibar, the most important impacts of climate change for populations will be increased incidence of droughts and heavy rainfall. Not only are these areas home to a variety of livelihoods, they host the largest and most densely populated urban areas. Disaster displacement risk is likely to increase, and some residents may ultimately require relocation away from islands and coasts.

The coastal areas and islands of the United Republic of Tanzania will be affected by warming, very hot days and a decline in the *msimu* long rains season. Importantly, this zone will experience more droughts and extreme rainfall brought on by increased sea surface temperatures. These climate impacts lead to crop damages, flooding, overloading of hydroenergy production, and increase of waterborne and vector-borne diseases. While some of these impacts will affect all population groups, rural agricultural households will be differently affected than urban dwellers. Some households in rural areas will alter their migration patterns in response to weather variability, choosing to relocate to more favourable rural areas or to urban areas for labour opportunities and to access services. For groups practising low-input agriculture, minor improvements to irrigation and sustainable land practices could have significant positive effects on livelihoods security. As for comparatively wealthy urban dwellers, voluntary migration is unlikely to be significantly changed. However, sea-level rise and meteorological hazards will compound disaster displacement risk, affecting a

broad range of population groups. Moreover, urban poor are particularly at risk of disaster displacement. Even under optimistic climate change scenarios like RCP2.6, which would keep average global surface temperature increase under 2°C, sea-level rise will contribute to flooding and loss of land across Tanzanian coast and islands. High population density combined with high population growth in coastal urban areas means vulnerability to hazards will increase over time. Even with significant poverty reduction and disaster risk management policy advances, disaster displacement risk will be heightened. Adequate disaster risk reduction and management plans as well as humanitarian responses will be needed.

Heating and erratic rainfall will affect the lake zone. Population groups relying on the fishing value chain will face negative livelihood impacts of climate change, through its role exacerbating ongoing degradation of water resources and fisheries. Farmers, livestock herders, and urbanites are affected by weather variability and sudden-onset hazards.

Evidence suggests western United Republic of Tanzania will also be affected by warming and changes to rainfall, with negative impacts on agricultural livelihoods. The lake zone is home to some of the most densely populated areas of the United Republic of Tanzania and also has a high turnover of lifetime migrants. The main groups likely to be impacted by climate change are fishers, pastoralists, agropastoralists and smallholder farmers. While an exact share of the population that is dependent on fisheries is difficult to estimate, a significant number of people depend on small-scale fisheries and on the fisheries value chains more broadly, especially from Lake Victoria. Climate change exacerbates already important threats to fisheries by warming the waters of coastal and inland lakes and by reducing river output, exacerbating water resources degradation. Existing migration and pastoralist mobility may be altered as a result of climate impacts, as people seek to improve their livelihoods. Some people will become immobile as their livelihoods are eroded, unable to invest in migration to diversify household resources.

Agricultural livelihoods dominate the western zone and the southern highlands zone. Data limitations make it difficult to draw robust conclusions about the impacts of climate change on mobility. However, current projects to expand irrigated agriculture reduce vulnerability to climate impacts in the short term.

There is insufficient evidence of both weather trends and migration in the western and southern regions of the United Republic of Tanzania to address the possible impacts of climate change on human mobility. In addition to the warming trend expected across the countries, some areas of the southern highlands may see increased total rainfall and rainfall during a more erratic *msimu* long rains season

(see the section on rainfall, under "Current Climate and Future Projections"). The population groups most likely to be impacted are pastoralists and smallholder farmers. Migration flows in these regions, which current knowledge indicates are largely rural–rural and motivated by a search for favourable farmland or agricultural work, are likely to continue. Work opportunities created by the SAGCOT programme may be a more important driver of novel migration flows than weather variability (see Table 2). Given investments in irrigation and modern agricultural practices as well as its intended benefits for food security and poverty reduction, SAGCOT is likely to at least initially reduce residents' vulnerability to climate change impacts projected for lower-end climate change scenarios. In part because the baseline level of agronomic management in the country is low, especially for smallholder farmers that represent the majority of the agricultural sector, minor improvements to irrigation and sustainable land practices could have significant positive effects on livelihoods security.

It is plausible to forecast that few communities in the country would escape the adverse impacts of higher-end climate change scenarios, and rural–urban migration will become more common as virtually no unaffected land for agriculture remains.

Under the unmitigated RCP8.5 scenario, as described in the section "Climate Change in the United Republic of Tanzania: Temperature Projections", by the end of the century every region of the country would face increased temperatures of between 2.3°C and 5.2°C and a significant increase in the number of very hot days annually (days on which temperatures exceed 32°C). The negative impacts on agricultural productivity, water resources and pasture would be difficult to manage. Some hot and humid areas will become practically intolerable to human habitation many days of the year, because biological thermal thresholds for the human body will be exceeded. This is all the more worrying in a country where the subsistence of the population majority relies on pastoralism, farming and fishing. While irrigation might be an adaptation strategy for farmers against drought, it is certainly not an adequate adaptation strategy against extreme heat. In this scenario for which there is virtually no unaffected agricultural land to move to, urban migration destinations are likely to become more attractive to agriculturalists from rural areas. Importantly, forced immobility of people unable to afford the costs of migrating is a likely outcome for agricultural population groups in many rural areas. However, as in situ coping strategies lose their effectiveness as climate change impacts increase in severity, "distress" or "survival" migration may be more prevalent for comparatively poorer households. Moreover, as is becoming increasingly clear, access to health services is a key factor driving rural–urban migration in the context of climate change. Temperature increases and heavy rainfall exacerbate a wide range of health risks for people and livestock

(see section on migration and health), prompting people to choose to be near services in urban areas.

More research is needed to understand the impacts of resource-based conflicts, including their impact on migration and displacement. However, climate change adaptation and resilience supports conflict reduction.

As noted previously, there is currently little to no evidence that climate change affects international migration of Tanzanians. However, this may change in a future in which human habitation is practically untenable in many parts of the country and outmigration becomes more palatable. Competition over resources and localized conflicts can be expected to continue, if not worsen. More research is needed to understand the non-climatic factors that contribute to conflict dynamics as well as the outcomes of disputes. Notably, larger-scale conflicts and subsequent outmigration have been identified in other developing countries where population discontent towards inefficient response of the government to climate

In addition to the indicators in the past census that focused on residence, questions on migration motivations, outcomes, timing, and duration could be added. Importantly, the limited longitudinal data limits the study of patterns of migration. Targeted surveys and qualitative research supplement current understandings.

Improvements to migration data and research can help policy actors to better understand and address migration. As with weather data, more harmonized and systematic data collection across the country can enhance understandings of migration at finer scales. Policies to improve the adaptive capacity to deal with the effects of climate change are likely to have additional returns by reducing the likelihood of conflict and subsequently of forced migration (Abel et al., 2019; Miguel et al., 2004; Blocher, forthcoming).

RECOMMENDATIONS: SUPPORT EVIDENCE-BASED POLICIES

The Government of the United Republic of Tanzania – like many other developing nations – needs to find climate-proof development solutions. Climate adaptation policies should first and foremost consider different climate impact scenarios and uncertainties. The evidence presented in this report also underlines the need for these solutions to systematically distinguish the livelihoods of different population groups (including subsistence farmers, fishers, pastoralists, agropastoralists and urban dwellers), regional climate impacts and different climate change scenarios. To expand adaptive capacities while addressing short-term challenges, a long-term view and knowledge about the vulnerabilities of different population groups under a worst-case scenario of climate change are necessary.

Based on the present-day evidence on climate change and migration, we suggest that the Government of the United Republic of Tanzania and its partners pursue a three-tier approach to guide national adaptation, which would help prepare for different degrees of severity of climate impacts at multiple time horizons and foster sustainable human development. These three broad tiers are as follows:

1. **Beat the heat.** Continue to support infrastructural development, provision of services, improvements to water access and provision, and development of diversified livelihoods options for Tanzanian populations. This will enhance their capacities to beat the heat when extreme heat days, drought, extreme rainfall and flooding occur more frequently. In addition, humanitarian solutions, crop insurance, social safety nets and other short-term solutions can help communities cope in the short term and build back (show resiliency) sooner.
2. **Combine tradition with technology.** Implement strategies to address medium-term problems like low agricultural productivity and poor agronomic management. For example, a climate change-induced shift in the agroecological zones will require the expanded use of drought-resilient crops and agricultural inputs to sustain productivity. Traditional adaptive methods for water harvesting need to be combined with new solar power-based irrigation systems.
3. **Grow and regrow forests for resilient communities.** An investment in long-term, nationwide measures to protect the populations from severe climate impacts in the future is needed. In particular, afforestation and reforestation can improve local climatic conditions, buffer future climate impacts and diversify income sources – all of which are central action points to decrease migration pressures for people who want to remain in their communities. Wider access to clean energy in the long term is a related need, to reduce pressure on the country's forests while expanding the development potential of its people through education and irrigation. For example, decentralized, small-scale solar projects, of which there are already many in the United Republic of Tanzania, can reduce household dependency on wood and charcoal and support economic development.

In addition, a number of important policy steps can be taken to improve migration management in the country:

4. **Take the different vulnerabilities of livelihood groups into account.** In addition to these concrete steps for policies and programmes, an important perspective must be adopted by policy actors: climate change has variable impacts on different regions, groups, households and individuals. Some of the literature reviewed for the chapters in this report conflate Tanzanians into one group, or into a few wealth groups. Yet there are important reasons to distinguish people by their different livelihood groups, capabilities and aspirations, which varying prevailing sociocultural norms and global as well as local connectedness affect. Some of these factors are shared among members of different livelihood groups, and some cut across livelihoods divisions. Because all of these points are relevant to how communities experience climate change, as well as to migration decisions, policies should consider and develop climate change response plans for these populations separately.
5. **Develop a policy on internal migration management that includes an evidence-based approach to climate-related migration.** The backbone of migration policy should be the distinct human mobility patterns addressed in this report, for which distinct policy plans should be developed. Moreover, the assessment presented outlines likely changes to migration trends in the zones of the United Republic of Tanzania, which can help inform policy priorities.
6. **Enhance the development potential of remittances.** The Government can work with partners to reduce the cost of remittances, which currently undercut their use to Tanzanians of all backgrounds. Most money transfers currently, especially for internal remittances, are overwhelmingly informal and thus vulnerable to theft and disruption. The impact of crises on remittances channels can be dire. For rural households in particular, depriving much-needed income is counter to communities' coping strategies and larger development. In order for remittances to deliver their development potential, strategies to reduce fees can be employed with the Government and the private sector (Ratha, 2014), alongside efforts to expand Internet penetration.

RECOMMENDATIONS: IMPROVE RESEARCH AND DATA

In order to develop appropriate policy responses, it is necessary to develop the evidence base on the impacts of climate change as well as of migration patterns in general further. Improving current knowledge will help researchers disentangle the linkages between environmental factors and human mobility, as well as the additional pressures and risks provoked by climate change. Interoperability of data, which prevents migration and displacement data from being directly compared with climate and weather data, remains a challenge in most countries of the world. Innovations in this area are needed as these two types of data are generally on different spatial and temporal scales, which prevents a meaningful overlaying of information. Moreover, as previously indicated, human agency, perceptions and contextual factors are often paramount in migration decisions irrespective of measured climate patterns.

Nevertheless, gaps in data exist that can be addressed to help policy actors better understand and address climate change and migration, including:

7. **Enhancements to the weather station infrastructure, improvements to data collection methods, and more systematic and regular central processing of the data help in providing improved weather forecasts and advisories.** The dearth of past weather data is limiting for current weather forecasts and projections of future weather regimes. In general, researchers must depend on global satellite data to produce estimates of rainfall and temperatures rather than national data. Moreover, such efforts would improve the day-to-day weather forecasts and advisories from the TMA on which Tanzanians rely to plan their agricultural activities and to prepare for hazard events.
8. **Modifications to the census questionnaire can allow for a better understanding of migration and of climate change impacts on people.** Only the most recent census information (2012) allows for an assessment of interdistrict migration, which is an improvement on previous rounds that collected information relevant to migration only at the regional level. It is therefore difficult to conduct quantitative analyses of the rural–rural internal migration that is known to be the bulk of movements in the country, and which are the most likely to be influenced by climate change. In addition to the indicators in the past census that focused on residence, questions on migration motivations, outcomes, timing and duration could be added. Importantly, the limited longitudinal data limits the study of patterns of migration. Targeted surveys and qualitative research supplement current understandings.

9. **Improvements to migration data and research can help policy actors to better understand and address migration.** As with weather data, more harmonized and systematic data collection across the country can enhance understandings of migration at finer scales. Importantly, targeted and longitudinal surveys, as well as qualitative research, are needed to understand the evolution of people's vulnerabilities, exposure to hazards and their responses – including migration – over time.

10. **Evidence is key to policymaking on migration as well as to climate change adaptation, and each should inform the other.** Plans to improve the adaptive capacities of Tanzanians to deal with the effects of climate change is likely to have addition returns, such as by reducing the likelihood of localized conflicts and ensuring migration is a choice, not a necessity. Moreover, a better understanding of migration to growing agglomerations in rural areas and to large cities, including to unplanned settlements, should inform urban planning, public investments in infrastructure and services, climate change adaption planning, disaster risk reduction and management, and migration management.

As with the policy direction suggested in this section, it is important to disaggregate, distinguish and deflate different communities in research and data. For example, it is noted previously (in the chapter "Human Mobility in the United Republic of Tanzania: Current Trends") that analyses of migration trends at the national level mask important regional variations in differences in household financial resources and their relationship to migration probabilities. Research gaps and needs are different for different lifestyles.

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ASSESSING THE EVIDENCE:

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Potsdam Institute for Climate Impact Research

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