ASSESSING THE CLIMATE CHANGE-MIGRATION NEXUS THROUGH THE LENS OF MIGRANTS:

The Case of the Republic of Mauritius

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.

Migration, Environment and Climate Change: Evidence for Policy (MECLEP) is a three-year project funded by the European Union, implemented by the International Organization for Migration (IOM) through a consortium with six research partners. The project aims to contribute to the global knowledge base on the relationship between migration and environmental change, including climate change. The innovative research aims to formulate policy options on how migration can benefit adaptation strategies to environmental and climate change. The six project countries are the Dominican Republic, Haiti, Kenya, Mauritius, Papua New Guinea and Viet Nam.

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The Case of the Republic of Mauritius

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Contents

List of tables

List of figures

Acknowledgements

Acronyms

GIS	Geographic Information System
INDC	Intended Nationally Determined Contribution
IOM	International Organization for Migration
IPCC	Intergovernmental Panel on Climate Change
MECLEP	Migration, Environment and Climate Change: Evidence for Policy
NGO	non-governmental organization
RCP	Representative Concentration Pathway
TWG	Technical Working Group
UNFCCC	United Nations Framework Convention on Climate Change
UNI-EHS	United Nations University Institute for Environment and Human Security

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Executive summary

The main objective of the Migration, Environment and Climate Change: Evidence for Policy (MECLEP) project is to increase knowledge and awareness about the relationship between migration and environmental change, including climate change, to support the formulation of related national and regional policy options, with particular emphasis on migration as an adaptation strategy. The Republic of Mauritius[1] is one of the six pilot countries where the MECLEP project is being implemented. In the country's Intended Nationally Determined Contribution (INDC) to the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, specific reference was made to the high vulnerability of the Republic of Mauritius to the impacts of climate change and climate variability (Government of the Republic of Mauritius, 2015). While the Republic of Mauritius is classified as a "high migration State" due to the combination of in- and out-migration flows (Lucas, 2008), migration is still considered as a failure to adapt and as a challenge rather than as an opportunity to adapt in climate change adaptation plans (Melde, 2015).

This report assesses possible positive linkages between environmental and climate change, migration and adaptation strategies. It seeks to provide answers to the question on how migration, displacement and planned relocation benefit, or pose challenges to, adaptation to environmental and climate change. For the study, data and information were collected from households in the Republic of Mauritius through two major sources: a questionnaire-based household survey and qualitative interviews. The household survey collected key characteristics of migrants and non-migrants at both individual and household levels and recorded their observations and experiences of environmental and climate-related events in three sites (Port Louis, Bambous/Flic-en-Flac/Tamarin and Rodrigues). Responses were taken for two time periods: the current period (which coincides with the place of destination) and 10 years ago (which reflects information at the place of origin). Through the "lens of the migrants", the study assessed the changes in different aspects of the livelihoods related to the vulnerabilities of the households over the two time periods.

There is evidence that migrant households observe improved environmental conditions after migration, as those who migrated to the place of destination face less hazardous climatic and environmental events compared with the rate they were facing in their previous location. However, there are cases where internal migrants are facing other environmental risks at the place of destination, including those associated with landslides, droughts and a lack of infrastructure. The change in the environmental conditions is most noticeable in the Port Louis region. There are four major environmental and climatic events that migrant and non-migrant households face: torrential rain, floods, droughts and cyclones. The

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[1] The Republic of Mauritius is located in the South-West Indian Ocean. It includes the islands of Mauritius, Rodrigues, Agalega, Tromelin, Cargados Carajos and the Chagos Archipelago, including Diego Garcia and other islands comprising the State of Mauritius. Its total area is about 2,040 km² with the mainland Mauritius occupying about 1,865 km², and Rodrigues about 108 km². Its ocean territory is very vast compared with its land size, with an exclusive economic zone (EEZ) of about 2.3 million km², including an extended continental shelf of 396,000 km² in the region of the Mascarene Plateau, jointly managed by the Republic of Mauritius and Seychelles, outside the border of their respective EEZ. The Republic of Mauritius has made a submission for an extended continental shelf of an area in the region of Rodrigues Island. It has also deposited a Preliminary Information to the United Nations for an extended continental shelf in the Chagos Archipelago region with the intent to make a complete submission. This report essentially focuses on Mauritius Island and Rodrigues.

occurrence and frequency of the four events vary at the regional level. Floods and torrential rain are the two major events identified by households in Port Louis and Bambous/Flic-en-Flac/Tamarin. Droughts, cyclones and torrential rain were identified as having major effects on livelihoods in Rodrigues. Does migration have an effect on preparedness for future environmental hazards? Migrant households are more likely to adapt compared with non-migrant households. Migration has therefore allowed households to better prepare themselves to face environmental and climatic events.

The survey reveals that migrant households are vulnerable to some extent given that, on average, they have relatively lower incomes than non-migrant households. A high percentage of migrants pointed out that migration was important for income and employment and to a lesser extent trade and investments. Their mobility was also important for credit availability, family relationships, health conditions and education, and therefore had a positive impact on well-being.

A higher percentage of migrants are in a debt situation in the post-migration period and at the same time, the percentage of those who own houses and land has increased over the last 10 years, together with the use of formal banks and financial institutions. However, there are no major differences in housing conditions in terms of the material construction of the roofs and exterior walls of migrant households. Migration is also seen to have a slight improvement on everyday access to good quality health care, clean and safe drinking water, and electricity in the Republic of Mauritius. However, some internal migrants in Rodrigues are facing lower access to water and electricity. The latter may be due to the new residential areas where such infrastructures are yet to be developed, and the former is mostly due to the problem of drought. It has been observed that migration leads to a change in the support network from family to friends, neighbours and religious organizations. At the same time, a high percentage of migrant households also feel that they have nobody to revert to for support. Migrants also find themselves unlikely to be members of organizations such as traders associations, sports groups, or women's or youth groups. There is also a general observation that many migrants do not have a sense of belonging to the place of destination. Migrant households eventually face challenges related to, among other things, security, discrimination and housing, which are strongly linked to general socioeconomic development and urban planning. Policymakers may adopt three strategies in relation to migration and climate change: (a) reducing the influence of global environmental change on migration through policies that strengthen resilience to environmental change especially for trapped communities; (b) recognizing the opportunities inherent in migration in the context of environmental change; and (c) responding to migration, dealing explicitly with different environmental risks, tensions and conflicts. In this respect, the main policy implications emanating from the study for the Republic of Mauritius are:

1. Mainstreaming migration as an adaptation strategy in the policy framework, including in climate adaptation plans, the land and housing planning system, disaster risk reduction and management, and plans for new cities;

2. Enhancing the effectiveness of migration as one climate adaptation strategy by reducing the different environmental risks that migrants and the population at large face at the place of destination;

3. Developing a support framework to protect the well-being of migrants that includes an integration strategy to enhance economic integration and social cohesion, and to reduce tension/conflict between migrants and non-migrants;

4. Initiating capacity-building of stakeholders at different levels so that they are better equipped to manage migration as an adaptation strategy to climate change and to recognize both potential opportunities and ways to reduce harms;

5. Designing a framework to address the effects of migration (and population growth more generally) in infrastructure planning from the beginning through a proactive role rather than being simply a response to such effects;

6. Assisting trapped populations to adapt in situ by increasing resilience and reducing the risk of disasters, thus mitigating environmental hazards;

7. Supporting the population (especially women and the elderly) who decided to stay at the place of origin to ensure their security, health and other aspects related to their livelihoods;

8. Using a participatory approach by involving civil society, non-governmental organizations (NGOs) and community-based associations to make migration a successful adaptation strategy to climate change;

9. Initiating a migration data and monitoring system to collect and disseminate information on migration flows on a regular and systematic basis to inform policy on land planning, infrastructure development and resource management;

10. Encouraging research institutions and universities to conduct evidence-based research and migration studies on the different aspects of migration and on the climate change–migration nexus.

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1

1. Introduction

Migration has always been an important facet of human society. With a need to satisfy basic human requirements such as food, shelter and other resources, migrants are likely to choose a location to support their livelihood and maximize their well-being (Anthony, 1990; Laczko and Aghazarm, 2009; Gemenne and Blocher, 2016). While economic drivers of migration are mainly concerned with the costs and benefits of moving to a better place, there are also social, political and demographic factors affecting migration (Black, Adger et al., 2011; Black, Bennett et al., 2011; Foresight, 2011). Climate change and environmental factors are also underlying causes of migration. Over recent decades, the discourse on the link between degrading environments and human mobility has increased given the observed impacts of global warming on the environment (Laczko and Aghazarm, 2009; Bailey, 2010; Black, Bennett et al., 2011; Warner, 2011; Morinière and Hamza, 2012). The Intergovernmental Panel on Climate Change (IPCC) has established that human-induced climate change is occurring, with severe impacts on the environment and human welfare (IPCC, 2007a, 2007b, 2014). Observations of climate change are numerous and include rising sea levels; increasing global warming; melting glaciers; multiplication of extreme weather events such as storms, cyclones and droughts; desertification; scarcity of water resources; and depletion of natural resources due to more frequent and severe climatic disasters (IPCC, 2007a). The frequency, intensity and severity of natural disasters and calamities have already increased in many parts of the world.

Intergovernmental agencies such as IPCC and the International Organization for Migration (IOM) have drawn attention to the complex nexus between climate change and migration since the 1990s (IPCC, 2007a; Laczko and Aghazarm, 2009; Naser, 2012). The Fifth Assessment Report of IPCC further affirms that "changes in migration patterns can be responses to both extreme weather events and longer term climate variability and change" (IPCC, 2014). Evidence on how environmental disasters might affect migration and displacement can be found in the case of the earthquake in L'Aquila, Italy, in 2009 (Ambrosettia and Petrillo, 2016) and in Mexico (Cohen et al., 2013). However, several researchers highlight that there is weak empirical evidence that masses of people will migrate due to climate change. Environmental and climate change, through slow-onset events, may influence migration by amplifying or modifying the economic, social, political and demographic drivers of migration (Black, Adger et al., 2011; Black, Bennett et al., 2011; Morrissey, 2013). Evidence of slow-onset "environmentally induced migration" can be found in Bangladesh (Joarder and Miller, 2013; Ahsan, Kellett and Karuppannan, 2014), in Brazil (Barbieri et al., 2010), in Kenya (Foresight, 2011) and in Nepal (Massey, Axinn and Ghimire, 2010). Understanding the nature of the climate change–migration nexus is particularly important for the Republic of Mauritius as a small island developing State. Located in the South-West Indian Ocean, the Republic of Mauritius comprises the main island of Mauritius and the outer islands of Rodrigues, Agalega, Saint Brandon, Tromelin and the Chagos Archipelago, with a total area of about 2,040 km² (Government of the Republic of Mauritius, 2015). The mainland Mauritius occupies about 1,865 km², and the island of Rodrigues about 108 km². According to the World Risk Report of 2016, the Republic of Mauritius is ranked thirteenth among 171 countries as far as disaster risk is concerned (Bündnis Entwicklung Hilft and UNU-EHS, 2016). Indeed, the Republic of Mauritius

is highly vulnerable to the threat of climate change, which manifests itself through observed changes in climatological variables such as alterations in precipitation patterns, humidity and temperature, as well as the occurrence of climate change and extreme weather events such as intense cyclones, tidal surges, floods and sea level rise (Government of the Republic of Mauritius, 2012a, 2015; Sobhee, 2016). Such climatological phenomena often result in water shortages, the spread of airborne and vector-borne diseases, and food insecurity, which are already impacting negatively on people and communities in the Republic of Mauritius (Sobhee, 2016). The country is classified as a "high migration State" due the combination of in- and out-migration flows (Lucas, 2008). According to an assessment report on the Republic of Mauritius prepared by Gemenne and Magnan (2011), environmental changes are not expected to drive people out of the country in large numbers, nor to create cohorts of internally displaced people, but they could result in significant internal migration/relocation linked to the impacts. Inter-island migration, in particular, is likely to increase considerably, especially from Rodrigues and Agalega to the island of Mauritius. Sobhee (2016) consequently points out that there is evidence that some people from Rodrigues are moving to the island of Mauritius because of environmental and climate-related issues. This conclusion is consistent with Kelman's (2015), who found that small island States may lack the ability to adapt with local resilience capacity, resulting in increased inter-island migration.

On 28 September 2015, the Republic of Mauritius submitted its Intended Nationally Determined Contribution (INDC) to the UNFCCC secretariat. In this document, specific reference was made to the country's high vulnerability to the impacts of climate change and climate variability, which are seriously impacting on the sustainable development of the country. To adapt to the effects of climate change, the Republic of Mauritius has developed comprehensive action plans. However, the costs of such adaptation measures are so high that financial support is needed in terms of grants and technical support from partners. The INDC states that such support is needed to enable the Government to implement plans to protect the life and property, and mitigate any propensity

of migration, of its population. Migration, in this respect, is considered as a challenge rather than as an opportunity to adapt (Melde, 2015).

This report further adds to the empirical evidence on mobility as adaptation in the context of environmental degradation and climate change in the Republic of Mauritius. In the face of growing empirical evidence on the link between environmental and climate change and migration, the innovative MECLEP methodology analyses the impacts of migration, displacement and planned relocation as a means of adaptation to environmental and climate change and assesses possible positive and negative linkages between environmental and climate change, migration and adaptation strategies. Consequently, the project is aimed at aiding the formulation of policy options on how migration can benefit adaptation strategies to environmental and climate change.

More importantly, the study adopts the perspective that migration can also be used as an adaptation option to both slow-onset and disaster-related climate change events. This perspective on migration has been well documented in the Government of the United Kingdom Foresight report on migration and global environmental change, which emphasizes that migration offers opportunities and challenges (Foresight, 2011). The IPCC Fifth Assessment Report states that migration can be an effective adaptation strategy and mobility can therefore save lives, enhance resilience and reduce risk (IPCC, 2014). In its recent report IOM Outlook on Migration, Environment and Climate Change, IOM also calls attention to the key message that "planned, safe, dignified and orderly migration is a viable adaptation strategy to cope with the adverse effects of environmental and climate change, foster development, increase resilience to disasters and reduce environmental pressure" (IOM, 2014a). Human mobility, if it is to be adopted as a climate change adaptation policy, needs to be systematically addressed, in particular through the national adaptation plans that are developed as part of the UNFCCC process. To meet the objectives of the study, data and information were collected in the Republic of Mauritius through two major sources: a questionnaire-based household survey and qualitative interviews. The methodological

issues on the data collection techniques for the environment–migration nexus with a focus on adaptation are well documented in the literature (for example, Warner, 2011; Bilsborrow and Henry, 2012; Gemenne and Blocher, 2016). Through the survey, data on key characteristics of migrants and non-migrants were collected in three regions (Port Louis, Bambous/Flic-en-Flac/Tamarin and Rodrigues) at both the individual and the household level, as well as on their observations about and experiences of environmental and climate-related events. Data on the socioeconomic and environmental conditions were collected for two time periods: the current period (which coincides with the place of destination) and 10 years ago (which coincides with the place of origin). Thus, the analysis of the survey data allows for a comparative analysis of migrant versus non-migrant households at the place of destination, and at the same time it compares the socioeconomic and environmental conditions of migrants over a period of 10 years. The socioeconomic characteristics include the average household income and revenue-generating opportunities, the importance of migration on well-being, the overall financial situation, home and land ownership, living conditions, household assets, and use of formal/informal banking and financial institutions. The survey also collected information on the responses of the migrant and non-migrant communities when they faced environmental and climatic events, as well as the adaptation strategies they adopted to better prepare themselves for the danger of these events.

Through the "lens of the migrants", the study assesses the changes in different aspects of the livelihoods as well as the vulnerabilities of the migrant households at the two different time periods, comparing their situation at the place of origin with that at their place of destination. Vulnerability is a key concept that takes into account exposure to environmental factors and capacity to adapt. In short, the study assesses whether and how migration has impacted on the vulnerability of migrants with due consideration to climate change impacts and adaptation strategies.

It is important to mention that this study is based on migration at large and not solely on environmental migrants. As Gemenne and Blocher (2016) put it, migration at large can also have an impact on adaptation whereas focusing on environmental migrants would appear as a limitation when studying the potential of migration as adaptation.

The report is structured as follows: in section 2, a summary is provided on climate change and migration in the Republic of Mauritius based on a review of reports and documents; section 3 is focused on the definitions of the terms used in the report; section 4 details the background of the study and the research design through which it was conducted and completed, and a summary of the sampling strategy is provided (further information is provided in the appendix to this report); section 5 provides the findings from the household survey and the qualitative interviews; section 6 provides a summary of the findings and policy implications; and finally, section 7 concludes the study.

2

2. Migration and climate change in the Republic of Mauritius: Brief review of evidence

2.1. Basic statistics on the Republic of Mauritius

As of 2015, the population of the Republic of Mauritius stood at 1.262 million people, distributed across mainland Mauritius and Rodrigues (figure 2.1), while Agalega Island had fewer than 200 inhabitants and St Brandon did not have any permanent residents (Statistics Mauritius, 2015). Mauritian society is a highly stratified plural society (Government of the Republic of Mauritius, 2010a). The economy is based on several sectors, including sugar, textiles, tourism, financial services, and information and communication technology.

Figure 2.1: Map of the Republic of Mauritius
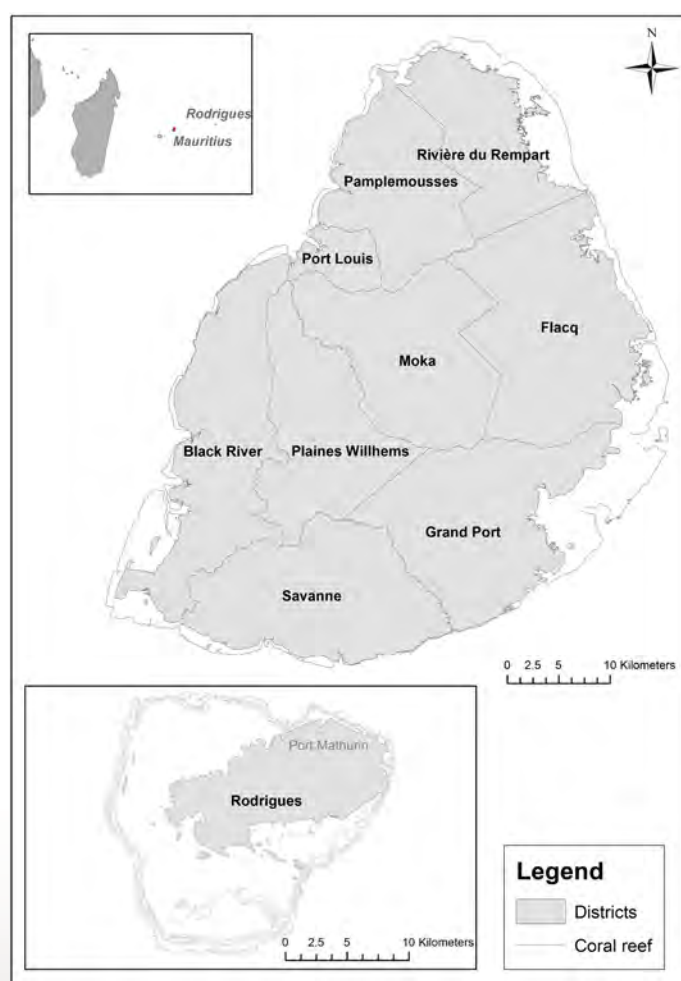
Table 2.1 shows the geographical distribution of the population in the Republic of Mauritius.

Table 2.1: Geographical distribution of population

District	Population (thousands)
Port Louis	120
Pamplemousses	139.8
Rivière du Rempart	108
Flacq	138.5
Grand Port	113
Savanne	68.7
Plaines Wilhems	369
Moka	83.2
Black River	80.6
Rodrigues	41.9

Source: Statistics Mauritius, 2015.

Table 2.2 shows basic statistics on the socioeconomic profile of the Republic of Mauritius.

Table 2.2: Socioeconomic profile of the Republic of Mauritius

Population (thousands), 2015 estimates	1,262.6
Population density (per km2), 2015	641
Life expectancy at birth, male, 2015	71.2
Life expectancy at birth, female, 2015	77.9
Age composition (%), 2015	
Under 15 years	19.6
15–59 years	65.6
60–64 years	5.4
65 years and over	9.4
GDP at market prices (millions of MUR), 2015	403,536
Per capita GDP (MUR), 2015	319,536
Average monthly earnings (rupees), 2015	26,331
Sectoral contribution to GDP (%), 2015	
Primary	3.2
Secondary	22.4
Tertiary	74.4
Human Development Index, 2014	0.777

Housing characteristics (%), 2011	
Owner	88.9
Tenant	7.9
Free	3.0
Other	0.2
Construction materials of housing (%), 2011	
Concrete walls and roof	92
Concrete walls and iron or tin roof	2.7
Iron or tin walls and roof	4.5
Wooden walls and iron, tin or shingle roof	0.4
Other	0.4
Average household size	3.5
Gini coefficient	0.414

Source: Statistics Mauritius, 2015.
Notes: GDP – gross domestic product.
MUR – Mauritian rupees.
United Nations exchange rate average in 2016: 1 USD = 35,553 MUR.

2.2. Climate change in the Republic of Mauritius

The National Climate Change Adaptation Policy Framework for the Republic of Mauritius (Government of the Republic of Mauritius, 2012b) clearly highlights the vulnerability of the country to the threat of climate change, which manifests itself through environmental hazards and disasters such as intense cyclones, tidal surges, droughts and floods. The environmental hazards include elevated levels of flooding, coastal inundation and landslides. There is also degradation of the coastal riverine and marine ecosystems, which is mainly due to human activities in those regions. The major climatic variables and impacts are summarized below.

Temperature: Climate records over the period 1951–2014 show a significant warming trend of about 1.2° C in Mauritius and Rodrigues. Analyses of temperature records indicate that the observed rate of temperature change was on average 0.020° C per year for Mauritius for the period 1951–2014 and 0.023° C per year for Rodrigues for the period 1961–2014. Projections made on the basis of Representative Concentration

2. Migration and climate change in the Republic of Mauritius: Brief review of evidence

Pathway (RCP) 4.5 and RCP 8.5 (the business-as-usual scenario and the worst-case scenario, respectively) indicate an increase in temperature of up to 2° C for both Mauritius and Rodrigues for the period 2051–2070 (Government of the Republic of Mauritius, 2016).

Precipitation: An analysis of rainfall for the period 1951–2014 shows a decreasing trend in the amount of rainfall of about 8 per cent for Mauritius. For Rodrigues, which is a water scarce island, a downward trend in the amount of rainfall has also been observed. However, projections for RCP 4.5 and RCP 8.5 scenarios do not show significant variations from the present rainfall pattern (Government of the Republic of Mauritius, 2016).

Sea level rise: An analysis of available sea level records indicates an accelerated rise of 5.6 mm/year for, strikingly, both Mauritius and Rodrigues since 2003, which is much higher than the global average of 3.2 mm/year (Government of the Republic of Mauritius, 2016).

Landslides and flooding: The intensity and frequency of extreme precipitation events are likely to increase, leading to significant exposure to flood hazards of different intensities. An increase in the frequency of extreme weather events and torrential/heavy rains and storms, and an explosive intensification of cyclones are expected due to climate change (Government of the Republic of Mauritius, 2010a, 2010b). Key infrastructure, namely, schools, health centres, hotels, fire stations, police stations and industrial sites, are likely to be affected by inland flooding, coastal inundation and landslide hazards (Government of the Republic of Mauritius, 2016).

Coastal inundation: Coastal inundation is caused mainly by sea level rise, storm surge/flooding and beach erosion. In Rodrigues most of the inundated areas have affected rivers' mouths.

2.3. Economic impacts of climate change

Four main sectors are affected by climate change, namely, agriculture, water, fisheries and tourism. The agricultural sector is affected by temperature rise and changes in the patterns of rainfall, droughts, cyclones, climate extremes and sea level rise. Warmer temperatures and milder winters favour higher incidence of pests and diseases. Changes in agricultural productivity may occur mainly because of, among other things, a change in soil moisture and heat stress on crops, increased risk of flooding and soil erosion, and salinization of irrigation water in coastal zones. Changes in precipitation patterns will affect the water supply in the Republic of Mauritius, making the islands vulnerable to shortages of water in the residential and non-residential sectors. Climate change is expected to lower productivity in the fisheries sector. With the El Niño phenomenon becoming more frequent, more intense and of longer duration, the size and location of fish stocks and fish migration are likely to be affected. The tourism sector is very vulnerability to the effects of climate change through tidal waves and surges, and deterioration of the coral reef through global warming, among other things.

2.4. Migration in the Republic of Mauritius

The Republic of Mauritius has been classified as "high migration State", not only because of the size of its diaspora, but also due to the combination of in- and out-migration flows (Lucas, 2008). According to Lincoln (2012), the Republic of Mauritius has five distinct types of migration. The first is emigration, that is, people leaving the country to establish themselves in other countries. There have been two major waves of emigration in the past decades: the first wave was at the time of independence in 1968, owing to political uncertainty and high levels of unemployment; and the second was observed during the economic downturn in the 1980s (Sobhee, 2016). This led to a diaspora of the population estimated in 2000 to be about 9 per

cent of the then population of the country of 1.2 million (Dinan and Dinan, 2014). The second type of migration is the movement of people between Rodrigues and Mauritius, and more specifically from Rodrigues to Mauritius. Given the lack of economic opportunities in Rodrigues, there is a strong incentive for economic migration from there to Mauritius. This is classified as internal migration because Rodrigues is part of the territory of the Republic of Mauritius. The third form of migration refers to the movement of workers arriving primarily from India, China, Sri Lanka and Bangladesh to work in the Republic of Mauritius. These workers compensate for the shortage of local skilled workers; procedures and eligibility have become more flexible to encourage skilled migrants. Fourth, circular migration programmes have also been implemented by the Ministry of Labour, Industrial Relations, Employment and Training in collaboration with IOM Mauritius, mostly to Canada and Italy. Through its initiative to develop circular migration, the Government of the Republic of Mauritius aims to widen the scope of opportunities for national workers to work abroad, save money and return to start a small business or to invest in domestic economic activities. The fifth type of migration corresponds to State-led land-owning residential programmes, which have attracted investors and professionals since 2006 (Integrated Resort Scheme). The scheme offers foreigners the possibility of obtaining permanent resident status under the investment and residential programmes (Ramtohul, 2016).

2.4.1. Internal migration

One of the main sources of data on internal migration in the Republic of Mauritius is the population census (Statistics Mauritius, 2012, 2014). The most recent census was conducted in 2011 and published in 2014. For the census, data were collected on the population's current usual residence and the place of usual residence five years before. It considers movements between municipal wards and village council areas and therefore defines internal migration as the movement of people within the country from one municipal ward or village council area to another. Based on the census data (Statistics Mauritius,

2014), between 2006 and 2011, 91,986 people (8% of the total population aged 5 years and over) changed their place of residence to a different area within the country. Among all persons who migrated within the islands, 89,808 (95.3%) changed residence within the island of Mauritius, 2,232 (2.2%) changed their residence within the island of Rodrigues and 2,178 (2.3%) moved between the islands of Mauritius and Rodrigues. Among the latter, 1,116 (51.2%) left Rodrigues to settle in Mauritius, while 1,062 (48.8%) moved from Mauritius to Rodrigues, thus accounting for a relatively stable exchange of people between the islands (table 2.3). Young adults aged between 16 and 29 years were the most mobile age group. Table 2.3 provides a summary of the data collected through the 2011 census.

Table 2.3: Migration in the Republic of Mauritius based on census data (within and across islands)

Movement	Number of migrants
Migrants between islands of Mauritius and Rodrigues	2,178
Rodrigues to Mauritius	1,116
Mauritius to Rodrigues	1,062
Migrants within island of Mauritius	89,808
Between districts	36,455
Within districts	53,353
Total	**91,986**

Source: Statistics Mauritius, 2014.
Note: The definition of migrant is based on persons having a different address from what they had five years before.

Table 2.4 shows inter-district migration flows. One important finding from the census data is that most of the internal migration that took place during the five years previous to the 2011 census was from neighbouring districts (refer to figure 2.1). There was relatively lower movement from one side of the country to the other (from the north to the south and vice versa, or from the east to the west and vice versa).

Table 2.4: Internal migration flows in the Republic of Mauritius

	Port Louis	Pamplemousses	R. du Rempart	Flacq	Grand Port	Savanne	Plaines Wilhems	Moka	Black River	Rodrigues	Total
Port Louis	-	980	153	140	81	75	808	388	430	175	3,230
Pamplemousses	1,918	-	1,153	498	168	97	873	269	276	159	5,411
R. du Rempart	264	971	-	414	124	54	535	162	112	52	2,688
Flacq	236	467	462	-	350	128	596	587	125	38	2,989
Grand Port	146	161	105	250	-	540	1,139	163	79	47	2,630
Savanne	84	76	64	68	549	-	566	98	121	43	1,671
Plaines Wilhems	1,397	843	498	694	1,040	772	-	1,111	1,200	365	7,920
Moka	755	212	141	553	211	143	1,289	-	229	105	3,638
Black River	1,204	412	119	117	162	186	2,591	295	-	130	5,216
Rodrigues	186	159	57	60	62	48	326	79	85	-	1,062
Total	**6,190**	**4,281**	**2,752**	**2,794**	**2,747**	**2,043**	**8,723**	**3,152**	**2,657**	**1,116**	**36,455**

Source: Statistics Mauritius, 2014.
Note: The definition of migrant is based on persons having a different address from what they had five years before.

One important finding, as shown in table 2.4, is that Black River district registered the highest net gain while Port Louis district recorded the highest net loss. Black River's large net gain in population was mainly driven by new housing development projects. The net loss in Port Louis is the result of the continued proliferation of commercial buildings at the expense of residential ones. However, there are different characteristics associated with the city of Port Louis. For instance, Tranquebar, located inside Port Louis, is a low to middle income settlement and includes a large number of migrants from Rodrigues. Tranquebar is both a destination point for migrants and a place threatened by environmental disruptions. It is often flooded and threatened by mudslides due to its topography and location (Gemenne and Magnan, 2011). It is also the only primary site that is located inland. Migration is already a major issue in Rodrigues. Though this migration is currently mostly driven by economic reasons (Sobhee, 2016), environmental threats will exacerbate this situation (Gemenne and Magnan, 2011). Internal migrants are more likely to be female, between 16 and 44 years of age, and married or in a union (Statistics Mauritius, 2014).

2.4.2. International migration

In the 2011 census, nearly 25,000 persons reported that they had been living in another country five years prior to the census of whom 5,300 were Mauritians and 19,500 of foreign nationality (Statistics Mauritius, 2014). Most of the immigrants came from Asia (66%). There was a net loss of more than 29,000 Mauritian citizens between 2000 and 2011, while at the same time, there was a net gain of some 9,000 non-Mauritians. To encourage business formation via direct investment, and to support high-end estate development, the Republic of Mauritius issues an Occupation Permit to professionals, investors and retired non-citizens who move to the Republic of Mauritius and earn above a certain income (Ramtohul, 2016). However, the social consequences (for example, the dynamics related to integration) of migration processes should also be considered and evaluated (Lincoln, 2012).

2.5. Environment–migration nexus

Using expert interviews, focus group discussions and field visits, Gemenne and Magnan (2011) established possible linkages between environment and migration in several sites of the island. At Rivière des Galets, the inhabitants have noticed significant environmental degradation in the last few years, with regular floods, coastal erosion and a decline in fish stocks. Expert interviews by Gemenne and Magnan (2011) reveal that many people have had their houses flooded on numerous occasions and note that the sea is coming closer. Indeed, the inhabitants show a fear since tsunamis and other floods have deeply affected their daily lives.

The whole coastal area is particularly at risk because of a combination of environmental factors such as sea level rise, cyclones, coastal erosion and tsunamis. The inhabitants are therefore at risk and require adaptation options. Environmental changes also cause economic hardship and psychological suffering. According to Gemenne and Magnan (2011), there are two major conclusions regarding the environment–migration nexus in the Republic of Mauritius. First, environmental changes are not expected to drive large numbers of people out of the country nor to create cohorts of internally displaced people. They could, however, result in significant internal migration/relocation linked to the impacts of environmental changes on some economic sectors. Internal migration is thus likely to increase as a result of these changes. As far as inter-island migration is concerned, there is likely to be flow from Rodrigues and Agalega to Mauritius. Cities in Mauritius will need to adapt to these demographic changes and provide new resources. Second, economic activities in the country could undergo major changes and reshuffling due to environmental changes. This is primarily because key economic sectors are linked to environmental conditions. This could result in major changes to population distribution across the country, as the distribution of the population often follows economic developments.

Villages in Bambous. © 2016 Riad Sultan.

3

3. Defining migration and migrants

There is a need to define the terms migration and migrant as used in this report,[2] as it is necessary to define such terms used in this type of study, as emphasized by Bilsborrow and Henry (2012). For most purposes and policy formulation, the concept of recent migrants is of particular interest (Bilsborrow and Henry, 2012). In this report, migrants refers to recent migrants who migrated between 2006 and 2016.

Migration is the "movement of a person or a group of persons, either across an international border, or within a State. It is a population movement, encompassing any kind of movement of people, whatever its length, composition and causes; it includes migration of refugees, displaced persons, economic migrants, and persons moving for other purposes, including family reunification" (IOM, 2011). There have been intense discussions and debates on the definition of migrants in relation to environmental and climate change. IOM considers migration linked to climate change as a subset of environmental migration and defines it as "persons or groups of persons who, for compelling reasons of sudden or progressive changes in the environment as a result of climate change that adversely affect their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad" (IOM, 2007). The definition encompasses population movement or displacement, whether temporary or permanent,

internal or cross-border, voluntary or forced or due to sudden or gradual changes in environment. According to the United Nations Statistics recommendations of 1998, a migrant refers to cases where the decision to migrate is taken freely by the individual, for reasons of personal convenience and without intervention of an external compelling factor. However, despite the definition referring to voluntary movement, natural hazards such as storms, floods and droughts can compel people to move or to be in need of relocation. Thus, IOM (2011) defines forced migration as a "migratory movement in which an element of coercion exists, including threats to life and livelihood, whether arising from natural or man-made causes (e.g. movements of refugees and internally displaced persons as well as people displaced by natural or environmental disasters, chemical or nuclear disasters, famine, or development projects)." Migration linked to environmental factors tends to occur mostly within countries (Bardsley and Hugo, 2010), namely, internal migration. Internal migrants also include internally displaced persons, defined as "persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized State border" (IOM, 2011).

There are different types of environmentally induced migration. The first one is disaster-related migration, that is, sudden flows of people responding to an environmental disaster such as a flood, earthquake, volcanic eruption or tsunami. The second type is migration due to less

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[2] The definitions are given strictly for the purpose of the survey, which is defined in the methodology. The definitions are not based on others used in the literature on the topic. The definitions are highlighted here to inform the reader about the assumptions and the definitions that would be applied to the present study, irrespective of the more general connotations used in the previous section.

dramatic, gradual and deteriorating environment conditions, including climate stress such as increased droughts, water shortages or coastal flooding. Environmental and climate change affect the livelihoods of migrants through reduced income, increasing the risk of income reduction in the future and making the environment less healthy. Finally, there is migration in response to the construction of a mega project. The last type is not the focus of this study. As noted by Bardsley and Hugo (2010), a clear distinction needs to be made between mobility as a strategy for adapting in an anticipating manner and mobility as a displacement when environmental deterioration becomes extreme.

It is also important to emphasize that the study was not undertaken to search for environmental migrants per se; instead, it analyses migration at large and its impact on a series of variables that characterize the socioeconomic and environmental conditions, as well as vulnerabilities, of the migrant. According to Gemenne and Blocher (2016), focusing only on migrants whose mobility is related to environmental changes – "environmental migrants" – would be restrictive in studying the potential of migration as adaptation, as migration at large can also have an impact on adaptation. Thus, for the purposes of this study, migration is categorized as follows:

(1) *Internal migration*: a movement of people from one area of a country to another area of the same country for the purpose or with the effect of establishing a new residence. This migration may be temporary or permanent (IOM, 2011). The standard demographic definition of a migrant as documented by Bilsborrow and Henry (2012) is that the internal migrant within the country is distinguished according to the nation's

specification of administrative borders such as provinces, states, districts, municipalities and subdistricts. The Republic of Mauritius is divided into 10 districts including Rodrigues. An internal migrant in this respect is one whose place of origin is a district different from the one at the place of destination. The island of Rodrigues is further divided into six subregions and hence an internal migrant is also a person who has moved from one subregion to another. Inter-island movement is also classified as internal migration. Changes of residence at the lowest administrative level are not considered in the present report.

From the above definition, an internal migrant household is a household whose members have moved from another district to their place of destination within the previous 10 years.

(2) *International migration*: an international migrant is any person who changes his or her country of usual residence (UN DESA, 1998, 2015).

(3) *Disaster-related displacement*: the forced removal of a person from his or her home or country due to a natural disaster (IOM, 2011).

(4) *Planned relocation*: migration that has been carried out by public authorities at the national or subnational level.

The time element is also key in classifying migrants. Hence, several subcategories can be distinguished: for categories (1) and (2), migration can be further classified as being short-term (between 3 months and 12 months), long-term or permanent (at least 12 months) or recurrent/seasonal (several times for at least 3 months); for category (3), that is disaster-related displacement, the time period is at least one night.

Researcher training in Port Louis.
© IOM 2016 (Photo: Susanne Melde)

4

4. Methodology

4.1. Background of the study

Through the MECLEP project, important contributions have been made to understanding the climate change–migration nexus. Through a questionnaire-based household survey and qualitative interviews, it collected and analysed data at the household level on internal and international migration. In the Republic of Mauritius, the study started with several initiatives that were part of the MECLEP project, which prepared the ground for conducting the household survey and the qualitative interviews. Preliminary research was conducted in the Republic of Mauritius to establish a country profile, identifying the basic facts, expected key environmental and climatic changes, national level policies and strategic documents, migration patterns, and findings of past research on migration and environment in the country. The findings initially established the main migration corridors in the Republic of Mauritius (Sobhee, 2016). The preliminary information was discussed by the Technical Working Group (TWG) under the aegis of the Ministry of Environment, Sustainable Development, and Disaster and Beach Management. The survey sites were selected by the TWG based on previous reports and the MECLEP country assessment. More specifically, a site selection matrix that identified migration corridors in different regions of the Republic of Mauritius was developed and used. The site selection matrix proposed study regions in relation to several criteria, which included:

- Evidence of naturally caused changes in the environment, including climatic changes;

- Increased frequency and severity of environmental events over the past 5 to 10 years (such as floods, droughts, earthquakes and cyclones/hurricanes);

- A variety of forms of livelihoods and levels of well-being;

- The purported linkage between the changing climate, livelihoods and human mobility patterns;

- A variety of forms of migration;

- The ability to inform key policies on how migration, displacement and planned relocation can contribute to adaptation (that is, a link to the Government's policy priorities);

- The place of destination of migrants.

The sites were selected based on discussions that resulted from the meetings of the TWG with the view that the study would also be used by the Government of the Republic of Mauritius and the relevant stakeholders as an aid to formulate related policies. As such, several other criteria were further considered for the selection of the sites, including the diverse risk that existed in relation to coastal inundation and storm surges, the socioeconomic profiles and livelihoods of the population, and the number of inhabitants. Moreover, there were several sites where previous studies had been carried out in relation to different projects, such as the Africa Fund Board project, and hence the TWG selected sites where information was sparse. The Port Louis region, which includes Vallée Pitot, Tranquebar, Pointe aux Sables and the adjacent area of Baie du Tombeau, was chosen as the first survey site. Bambous/Flic-en-Flac/Tamarin (Black River district) and Rodrigues were two other sites that were selected for the survey.

Climate factors are not solely responsible for driving migration, but rather they are contributing factors that interplay with other environmental, social, economic, demographic and political factors. It is a challenge to isolate environmental factors and the interplay that exists between other factors. A study on the climate change–migration nexus considering adaptation is even more challenging. As suggested by Warner (2011), in order to reduce natural heterogeneity, a comparable questionnaire was used for both migrants and non-migrants and guidelines for semi-structured expert interviews were also followed. The household survey and its contents are analysed in section 5 of this report and to avoid repetition, no further explanation is given in this section. However, the sampling strategy is an essential component of the research design and a summary is therefore provided in section 4.2. Additional information is given in the appendix to this report.

4.2. A summary of the sampling strategy of the household survey on migrants and non-migrants

The sampling strategy was based on the basic principle that it must be representative of the migrant and non-migrant population. Two stages were defined. In the first stage, a predetermined sample size was established for the migrant and non-migrant households in the three survey sites, based on the proportional allocation rule. This means that the sample size for each region was proportional to its respective population.

Although the proportion of the non-migrant population is significantly higher than the migrant population, it was ensured that 50 per cent of the total respondents in the sample were migrant households. This disproportionate sampling is common in surveys where there are very few elements to be analysed from a particular group in the population. This procedure therefore permits an analysis of migrants in a perfectly acceptable manner (see Babbie, 1990). A random sampling was applied to select the migrant households using the random street approach with every nth household selected until a migrant was found.

The sample size for non-migrants corresponded to a control group, that is, a group who had not migrated to any region.

In the second stage, each site was further divided into subregions. The sample size was then adapted to each subregion according to their population density (migrant and non-migrant) as provided by the census.

4.3. Technical Working Group discussion: Towards a holistic approach to sampling design

Alternative sampling designs were discussed during a meeting with representatives from the Ministry of Environment, Sustainable Development, and Disaster and Beach Management, and Statistics Mauritius, and were presented at the TWG meetings. Following the recommendations of the TWG members, including contributions from Statistics Mauritius, it was decided that a mixed method would be used, that is, a combination of stratified, systematic and random sampling, to ensurwe that sufficient units were sampled in each region.

4.4. Study sites
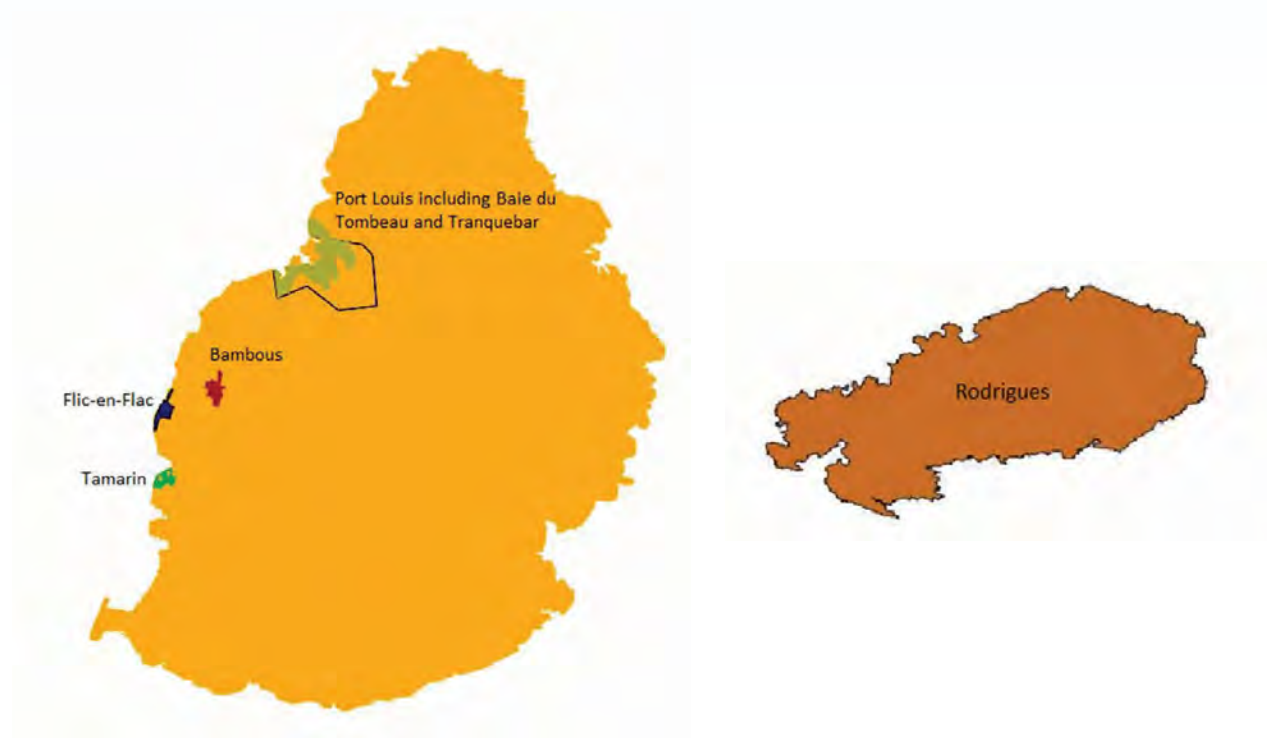
Figure 4.1 shows the three study sites on the islands of Mauritius and Rodrigues. The region in the west of Mauritius includes Bambous, Flic-en-Flac and Tamarin. According to the 2011 census, the population of Bambous was 14,061 while Flic-en-Flac had 2,070 inhabitants and Tamarin 3,477. The aggregate population in this region was therefore 19,608.

The 2011 census, which was published in 2014, also revealed that about 1,705 residents in Bambous, 406 in Flic-en-Flac and 612 in Tamarin, had a different address five years before, representing 12.1 per cent, 19.1 per cent and 17.6 per cent of the population, respectively. They were thus identified as internal migrants. As previously stated, an internal migrant is defined as one who had moved from another district within the previous 10 years and has been settled in the new district for at least three months.

Figure 4.1: Study sites

Source: Illustration by the author.
Map of Rodrigues: Statistics Mauritius, 2014.

The Port Louis region includes Baie du Tombeau and Tranquebar and is situated in the north-west of the island. The census shows that the total population who had a different address five years before stands at 9.93 per cent. Baie du Tombeau had a population of 13,675, with 2,723 inhabitants having had a different address five years before. Rodrigues had a population of 36,630, with 3,543 inhabitants having had a different address five years before.

For each region, the total population, the population with the same address, and the population who had a different address five years before, as well as estimates of the share of internal migrants, are shown in table 4.1.

Table 4.1 : Population of the selected sites and percentage of internal migrants

Region	Population in 2011	Population with same address 5 years before	Population with different address 5 years before	Percentage of internal migrants
Port Louis	111,378	100,321	11,057	9.93
Bambous	14,061	12,356	1,705	12.13
Flic-en-flac	2,070	1,664	406	19.61
Tamarin	3,477	2,865	612	17.60
Total for B/F/T	19,608	16,885	2,723	13.89
Rodrigues	36,630	33,087	3,543	9.67

Source: Statistics Mauritius, 2012.
Note: B/F/T – Bambous/Flic-en-Flac/Tamarin.

The data provided in table 4.1 include residents who were in the same district but who had changed their address within the previous five years. For the purpose of this study, a migrant is considered to be any person who had moved to the survey site within the previous 10 years but who has lived in the new site for more than three months. Thus, the statistics on the migrants must be interpreted carefully. Further adjustment was made to the figures when the sampling was carried out, removing those persons who had moved within the same district and who were not considered relevant for this study.

4.5. Implementation of the survey

The national household survey was conducted in June and July 2016 at the selected sites. A local research capacity-building workshop for the MECLEP survey team was held in April 2016, during which *the sampling strategy was defined and finalized for the survey sites. The questionnaire was translated into French and Creole and adapted to the Mauritian context, with consultation with representatives from the* Ministry of Environment, Sustainable Development, and Disaster and Beach Management, *and Statistics Mauritius. The surveyors were trained and the questionnaire was pilot-tested among themselves before being administered in the field.*

Sampling bias occurs when the units that are selected from the population for inclusion in the sample are not characteristic or representative of the population. Once the allocation is made, the next step in the sampling strategy is to design a sample implementation mechanism that will ensure that the sample does reflect the population. For the purpose of the survey, Geographic Information System (GIS) maps were prepared to identify (a) the concentration of households and (b) the streets that would be used to ensure that the households were selected randomly. Random sampling implies that each household (migrant and non-migrant) had an equal chance of being selected. This condition was satisfied by developing the random street strategy. The street where the interviewers were expected to select the household was identified at random. In each region, a list of streets was identified at random.

Depending on the length of the street and the concentration of the residents, interviewers had to choose every fifth household on the street until they found a non-migrant household. Each interviewer was given a unique random number from 1 to 15 for the first selection. This was important so that in case two interviewers were attributed the same street, they would not choose the same houses. Moreover, when possible, interviewers were allocated different streets. Thus, the interviewer was instructed to choose the street parallel or perpendicular to the one identified in case another interviewer was allocated the same street. For the selection of the migrant households, the interviewers were expected to walk down the specified street until he or she identified a migrant household. The interviewer guidelines also included a screening question to identify the migrant household. In fact, the interviewers were expected to ask the head of households the number of years he or she had been living in the survey area to verify whether it was less than 10 years and if they resided at their current address for more than three months, as those were the criteria defined for migration in the survey. Further details are given in the appendix.

4.6. Qualitative interviews

Qualitative interviews were used to supplement the collection of information on migration, environmental and climate change and the impacts of migration in a more specific and contextual manner. The interviews were based on a semi-structured questionnaire with the following themes:

- Observations of climate change and environmental change in the region
- Observations of migration in general in the region
- Opinion of migration as an adaptation strategy
- Management of environmental migration
- Institutions and migration policy

The target groups included key informants such as representatives from the relevant authorities and migrants. For the purpose of this study, meetings were held with representatives from the following institutions: the Municipal City Council of Port Louis, the District Council of Black River, the Ministry of Housing and Lands, the Commissioner of Land in Rodrigues and the Statistics Unit in Rodrigues.

Canal Dayot in Port Louis at high risk of flooding. © 2016 Riad Sultan.

5

5. Climate change–migration nexus: Findings from the survey and qualitative interviews

In this section the findings from both the household survey and the qualitative interviews are provided. Section 5.1. provides information on the key characteristics of the survey data, and section 5.2. describes the socioeconomic profiles of the migrant and non-migrant households. Section 5.3. discusses what the qualitative interviews revealed about migration in the different regions. The analysis starts in section 5.4. with the households' observations on environmental and climatic events in terms of prevalence and frequency. The rationale for the analysis is also documented. In order to examine the impacts of migration, several aspects that are linked to the livelihoods and vulnerabilities of the migrants are considered. In section 5.5., the analysis attempts to compare the socioeconomic conditions of the migrant households between the "current" period, reflecting the place of destination, and the "previous" period, reflecting the place of origin. The current period is conceptualized as being during the year prior to the survey (2016) and the "previous" period corresponds to 10 years before the survey date (2006). In the second part of section 5.5., the changes in the non-migrant households' socioeconomic conditions between 2016 and 2006 are analysed. Comparisons between the two groups (migrants and non-migrants) and across groups determine whether the migrant households faced an improvement or a deterioration in their livelihoods and increased or decreased vulnerabilities as a consequence of the migration.

5.1. Key characteristics of the survey data

Some key characteristics of the survey data are presented in this section. The survey covers 1,130 households: 50.3 per cent are classified as migrant households and 49.7 per cent as non-migrant households. A migrant household is one whose members, including the head of the household, have moved to the place of destination and the previous address was in another district.

Table 5.1 shows that the sample included 128 non-migrant households with at least one member who moved in or out of the district. Such migration implies that the household members did not migrate to another location permanently but had only one or more members who migrated. The member may have already returned (if it was short-term migration) or would eventually return to the family in the future. Taking into account the latter type of migration, 61.6 per cent of the households included in the survey have at least one migrant member.

Table 5.1: Number of migrant households in the sample

Internal migrant households	At least one household member has moved in or out of the district in the last 10 years		Total
	Yes	**No**	
Migrant households	568	-	568
Non-migrant households	128	434	562
Total	**696**	**434**	**1,130**

Source: MECLEP survey, 2016.

From the 696 households in the survey, there were a total of 1,702 migrants. The proportion of migrants according to the different types of migration is shown in table 5.2. Short-term migrants represent 6.29 per cent of the sampled migrants, while 91.8 per cent of movements were long term or permanent. A very small percentage of migrants are classified as being recurrent (less than 1%) while 1.4 per cent of migrant members stated that they had been displaced for at least one night due to a disaster.

Table 5.2: Type of migration based on survey data
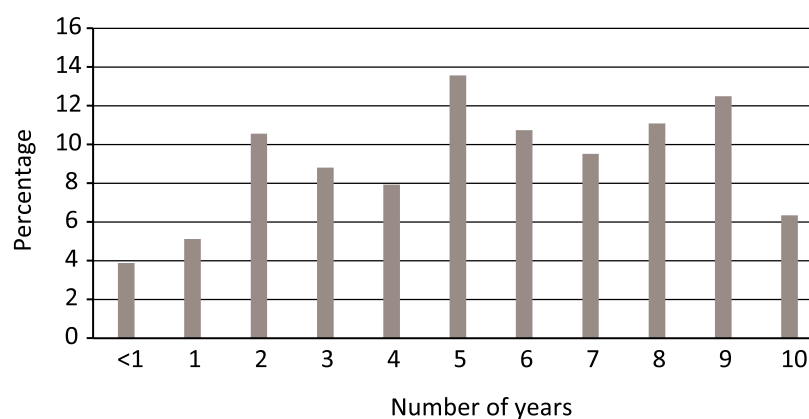
Type of migration	Total members	%
Short-term movement (3 months to 1 year)	107	6.29
Long-term or permanent movement (over 1 year)	1,563	91.83
Recurrent/seasonal movement (for at least 3 months, several times)	8	0.47
Disaster-related displacement for at least 1 night with no choice but to flee	24	1.41
Total	**1,702**	**100**

Source: MECLEP survey, 2016.

Migrant households are those that have moved to the place of destination within the previous 10 years. However, the number of years since the move varies from household to household and also from region to region. The number of years may show the migration flows across regions. Figures 5.1 to 5.4 show the number of years the migrant households have been living in the new location.
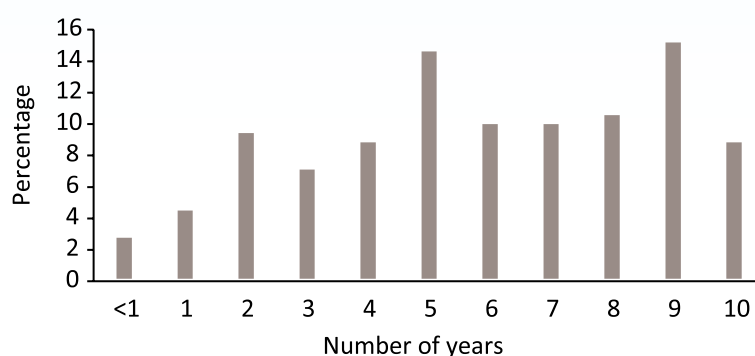
Figure 5.1: Number of years the migrant households have been living in the survey sites

Source: MECLEP survey, 2016.
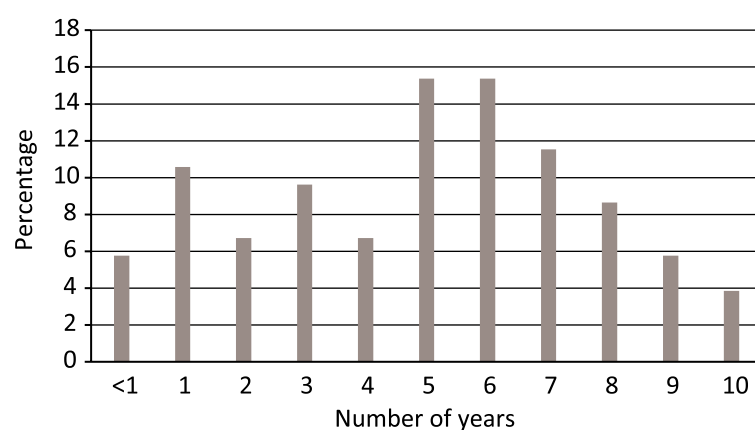
The aggregate data show a fairly even distribution of migrant households across the 10-year period, with a relatively lower proportion having moved to their current location 10 years before.

5. Climate change–migration nexus: Findings from the survey and qualitative interviews?

Figure 5.2: Number of years the migrant households have been living in Port Louis
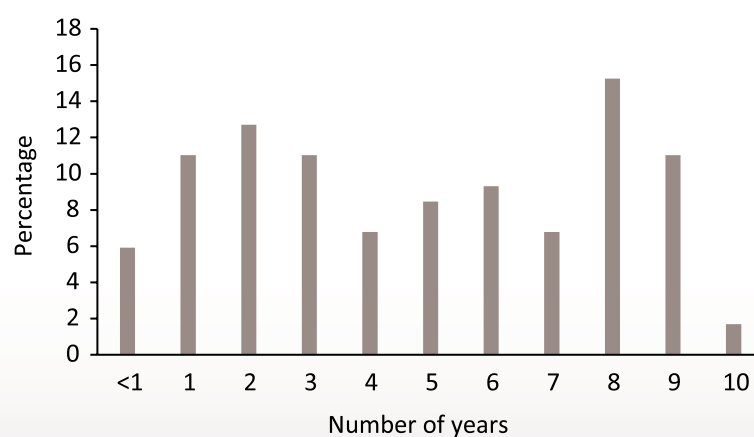
Source: MECLEP survey, 2016.

Figure 5.3: Number of years the migrant households have been living in Bambous/Flic-en-Flac/Tamarin

Source: MECLEP survey, 2016.

Figure 5.4: Number of years the migrant households have been living in Rodrigues

Source: MECLEP survey, 2016.

At the three survey sites, about 52 per cent of migrant households had moved five or more years before the survey, meaning that almost 48 per cent have migrated recently, that is, within the previous four years. In Port Louis, more than 68 per cent had moved between 5 and 10 years before the survey, and only 32 per cent have moved to their place of destination recently (during the previous 4 years). In the Bambous/Flic-en-Flac/Tamarin region, almost 60 per cent of the migrant households surveyed had migrated between 5 and 10 years before. An explanation for the different migration flows is provided in section 5.3., which is based on the qualitative interviews with key informants in the three survey sites.

Table 5.3: International migrants

Number of international trips made by migrants	Migrant households	Non-migrant households	Total
1	9	67	76
2	9	17	26
3	5	1	6
4	3	2	5
6	1	-	1
Total	**27**	**87**	**114**

Source: MECLEP survey, 2016.

A total of 114 households (representing 10.1% of the sample) stated that they had at least one international migrant who had either moved out of or moved into their households in the previous 10 years. Of these, 27 are migrant households (internal) and 87 are non-migrant households.

5.2. Socioeconomic profile of migrant households based on survey data

The socioeconomic profiles of migrant households are important sources of information for understanding mobility in the Republic of Mauritius. Table 5.4 depicts, for both migrant and non-migrant households, the average age of the head of the household, the average number of years of schooling, the average household size and the average number of employed household members. The average age of heads of migrant households is 42.3 years, while the average age of heads of non-migrant households is 49.5 years. Table 5.4 also differentiates between male and female headed households, showing that the household size and years of schooling of male-headed households are likely to be greater than those of female-headed households. There are no major differences between the groups of households regarding the average number of years of schooling.

Table 5.4: Profiles of households

Households		Age of household head (years)	Years of schooling of household head	Household size	Number of employed household members
Migrant		42.26	8.55	3.44	1.54
	Male	42.29	8.75	3.50	1.66
	Female	42.20	8.03	3.27	1.21
Non-migrant		49.54	8.53	3.65	1.76
	Male	49.08	8.72	3.70	1.85
	Female	51.07	7.84	3.45	1.15

Source: MECLEP survey, 2016.
Note: Age refers to the age at the last birthday.

5. Climate change–migration nexus: Findings from the survey and qualitative interviews?

Table 5.5: Profiles of households at the three survey sites

Households	Age of household head (years)			Years of schooling of household head			Household size			Number of employed household members		
	PL	B/F/T	RO	PL	B/F/T	RO	PL	B/F/T	RO	PL	B/F/T	RO
Migrant	41.30	45.08	42.58	7.95	9.35	9.59	3.54	3.37	3.21	1.55	1.86	1.20
Male	41.15	44.97	43.18	8.16	9.76	9.51	3.64	3.30	3.3	1.72	1.93	1.27
Female	41.69	45.36	40.64	7.43	8.33	9.85	3.30	3.53	2.92	1.11	1.73	1.0
Non-migrant	49.41	48.80	50.46	8.83	9.07	7.24	3.66	3.43	3.77	1.92	1.88	1.5
Male	49.22	48.25	49.46	8.99	9.16	7.50	3.71	3.44	3.9	1.94	1.89	1.50
Female	50.12	51.56	52.94	8.24	8.63	6.62	3.47	3.44	3.42	1.80	1.88	1.51

Source: MECLEP survey, 2016.
Note: PL – Port Louis; B/F/T – Flic-en-Flac/Bambous/Tamarin; RO – Rodrigues.

Table 5.5 shows the profiles of the households surveyed in the three survey sites. The finding that the average age of the heads of the migrant households is lower than that of non-migrant households is consistent for the three survey sites, with small differences across the regions. This is also consistent with the overall migration literature which states that migrants tend to be of working age and younger than the native population. In the Bambous/Flic-en-Flac/Tamarin region, the average age of the household head is relatively higher (45.1) than in Port Louis (41.3 years) and in Rodrigues (42.6 years). In the Port Louis region, the average years of schooling of the household head is relatively lower in migrant households than in non-migrant households. No significant difference is observed in the Bambous/Flic-en-Flac/Tamarin region, while in Rodrigues, the average years of schooling of the heads of migrant households is higher than those of the heads of non-migrant households.

5.3. Migration in the Republic of Mauritius based on qualitative interviews

The qualitative interviews reveal that migration takes different forms in the three regions. In Port Louis, some segments of migrants are motivated by commercial and trade opportunities, as the city offers the most important corridors for business and trade. There are also people who have moved to Port Louis from the neighbouring districts because of occupation-related factors.

In Rodrigues, some internal migration is the result of the Government's land bail policy, through which permits to build houses are being given to inhabitants, especially young people, who wish to settle in other regions. The second main corridor of migration is from Rodrigues to the island of Mauritius, which has been emphasized in other reports (see Sobhee, 2016). The people who migrate to the island of Mauritius often do so for study or economic reasons. International migration is also common; for example, people leave Rodrigues to go to other countries. The latter is also common in all of the three regions of this study.

In Bambous/Flic-en-Flac/Tamarin, there are different types of internal migration. One type involves Mauritians moving to new residential development areas in Flic-en-Flac and Tamarin. International migrants are a second type. The Immigration Act of the Republic of Mauritius was amended in 2000 to allow a foreigner to be granted the status of permanent resident if he or she invested a minimum of USD 500,000 in a set of identified business activities (Ramtohul, 2016). The qualitative interviews conducted for the study reveal that this type of migration is taking place in the Tamarin region. A third type of migrant, mostly in the lower income groups and most of whom are vulnerable, have moved to the Bambous area. As a fourth type, there are squatters who have been relocated to the region by the Government.

5.4. Households' observations of environmental and climate change-related events

This subsection focuses on the observations of migrant and non-migrant households of environmental and climatic events. For the household survey, the respondents were asked whether they had been affected by environmental and climatic events, such as droughts, landslides, floods, cyclones and so forth, during the last 10 years. The responses were treated as indicators on whether migrant households have benefited from improved environmental conditions after the migration or whether environmental and climate factors could also have formed part of the migration decision. To mention some examples, drought-driven migration is being observed in Mexico (Feng, Krueger and Oppenheimer, 2010), while key environmental drivers in Burkina Faso include high rainfall variability (Henry, Boyle and Lambin, 2003). The analysis therefore compares the responses of migrant households (their observations on the place of origin 10 years ago and on the place of destination for the past year), and those of non-migrant households (which would coincide with the environmental conditions at the place of origin and at the place of destination of the migrants, but without changing from one to the other as no movement took place, so observations are for the same location 10 years ago and now).

Table 5.6 shows that 37.5 per cent of migrant households have faced a drought at least once during the last 10 years; however, at the place of destination, 23.1 per cent of respondents have faced the same problem. The figures show that droughts as an environmental event have been faced by both groups of respondents. This could be due to the size of the country, meaning that, to a certain extent, environmental events such as cyclones, floods, torrential rain and droughts are likely to take place in several if not all administrative areas.

Table 5.6: Households affected by environmental and climatic events during the last 10 years (%)

Environmental and climatic events	Migrant households			Non-migrant households			Non-migrant households who had to stay		
	Several times	Once	Never	Several times	Once	Never	Several times	Once	Never
Droughts	12.68	24.82	62.5	13.52	9.61	76.87	17.39	8.7	73.91
Landslides	1.76	10.56	87.68	0.53	2.49	96.98	-	4.35	95.65
Wildfires	2.82	13.91	83.27	0.89	2.49	96.62	1.09	3.26	95.65
Volcanic eruptions	-	-	-	-	-	-	-	-	-
Floods	14.61	34.68	50.7	13.88	25.8	60.32	18.48	36.96	44.57
Cyclones	19.37	23.59	57.04	20.28	14.95	64.77	21.74	14.13	64.13
Storm surges	1.94	2.29	95.77	1.6	4.09	94.31	1.09	4.35	94.57
Riverbank erosion	0.88	1.23	97.89	0.36	2.67	96.98	1.09	4.35	94.57
Earthquakes	-	-	-	-	-	-	-	-	-
Torrential rain	13.91	42.43	43.66	14.77	34.88	50.36	23.91	38.04	38.04

Source: MECLEP survey, 2016.

28

5. Climate change–migration nexus: Findings from the survey and qualitative interviews?

The differences in the percentages indicate that a relatively higher proportion of migrant households faced, among other things, droughts, landslides and wildfires perhaps because of their previous geographical locations. The survey reveals that this conclusion is consistent for major environmental and climatic events such as landslides (12.3% of migrant households versus 3.0% of non-migrant households), wildfires (16.7% of migrant households versus 3.4% of non-migrant households), floods (49.3% of migrant households versus 40% of non-migrant households), cyclones

(43% of migrant households versus 35.2% of non-migrant households) and torrential rain (56.3% of migrant households versus 49.6% of non-migrant households).

Tables 5.7 to 5.9 depict the households' observations on environmental and climatic events in the Port Louis, Bambous/Flic-en-Flac/Tamarin and Rodrigues regions. The findings in the Port Louis region are consistent with the aggregate data.

Table 5.7: Households affected by environmental and climatic events in Port Louis over the last 10 years (%)

Environmental and climatic events	Migrant households			Non-migrant households		
	Several times	Once	Never	Several times	Once	Never
Droughts	6.36	30.64	63.01	4.07	7.27	88.66
Landslides	1.73	15.90	82.37	-	1.16	98.84
Wildfires	4.05	21.68	74.28	1.45	1.45	97.09
Volcanic eruptions	-	-	100.00	-	-	100.00
Floods	15.90	50.87	33.24	13.66	36.63	49.71
Cyclones	10.98	32.08	56.94	13.08	16.28	70.64
Storm surges	-	0.87	99.13	0.58	2.33	97.09
Riverbank erosion	0.29	0.29	99.42	0.29	1.74	97.97
Earthquakes	-	-	100.00	-	-	100.00
Torrential rain	17.05	54.91	28.03	17.73	41.86	40.41

Source: MECLEP survey, 2016.

However, tables 5.8 and 5.9 show that, for Bambous/Flic-en-Flac/Tamarin and Rodrigues, there are no major differences between internal migrant households and non-migrant households with regard to being affected by environmental events, with the exception of droughts. Drought is one of the climatic events that exhibit different findings in terms of their effects on households.

In the Bambous/Flic-en-Flac/Tamarin region, a higher percentage of migrants face drought than non-migrant households (table 5.8), reflecting a high exposure to the hazard at the place of destination. However, with regard to droughts, in Rodrigues it appears that migrant households faced better environmental conditions at the place of origin than in the place of destination (table 5.9)

Table 5.8: Households affected by environmental and climatic events in Bambous/Flic-en-Flac/Tamarin over the last 10 years (%)

Environmental and climatic events	Migrant households			Non-migrant households		
	Several times	Once	Never	Several times	Once	Never
Droughts	3.85	20.19	75.96	1.04	17.71	81.25
Landslides	-	-	100.00	-	1.04	98.96
Wildfires	-		100.00	-	-	100.00
Volcanic eruptions	-	-	100.00	-	-	100.00
Floods	19.23	10.58	70.19	16.67	14.58	68.75
Cyclones	25.96	5.77	68.27	27.08	8.33	64.58
Storm surges	0.96	-	99.04	-	1.04	98.96
Riverbank erosion	1.92	1.92	96.15	-	3.13	96.88
Earthquakes	-	-	100.00	-	-	100.00
Torrential rain	5.77	35.38	58.65	4.17	37.50	58.33

Source: MECLEP survey, 2016.

Table 5.9: Households affected by environmental and climatic events in Rodrigues over the last 10 years (%)

Environmental and climatic events	Migrant households			Non-migrant households		
	Several times	Once	Never	Several times	Once	Never
Droughts	38.98	11.86	49.15	50.00	9.84	40.16
Landslides	3.39	4.24	92.37	2.46	7.38	90.16
Wildfires	1.69	3.39	94.92	-	7.38	92.62
Volcanic eruptions	-	-	100.00	-	-	100.00
Floods	6.78	8.47	84.75	12.30	4.10	83.61
Cyclones	38.14	14.41	47.46	35.25	16.39	48.36
Storm surges	8.47	8.47	83.05	5.74	11.48	82.79
Riverbank erosion	1.69	3.39	94.92	0.82	4.92	94.26
Earthquakes	-	-	100.00	-	-	100.00
Torrential rain	11.86	11.86	76.27	14.75	13.11	72.13

Source: MECLEP survey, 2016.

Finding 1: There is evidence that a high percentage of migrant households faced environmental and climatic events such as droughts, landslides, wildfires, floods and torrential rain at their location before migration. A lower proportion of respondents at the place of destination reported experiencing these environmental and climatic events. Migrants are therefore relatively better off due to the improved environmental conditions that they encounter at their destination after migration.

It has been observed in existing migration studies that the greatest risks are likely to be borne by those who are unable or unwilling to move elsewhere (Foresight, 2011). The survey therefore included a follow-up question asking non-migrant respondents why they did not move in/out in the last 10 years. Respondents were asked to choose from three possible answers: first, they decided to stay or never thought of moving; second, they had to stay (that is, they were forced to stay); and the third possible response was "don't know". Those

5. Climate change–migration nexus: Findings from the survey and qualitative interviews?

who chose the second option may provide a crude estimate on a category of households who stayed in their current location even if they might have wished to move: this category can be referred to as a "trapped population" (Foresight, 2011). Trapped populations are those who are willing but unable to move away from environmental threats and are particularly vulnerable to environmental changes because of their lack of capital. From this perspective, households who stated that they had to stay are interpreted to be those who wished to migrate but could not. A separate analysis of this category may reveal whether they face the same degree – prevalence and frequency – of environmental and climatic events. Among the non-migrant households, 92 stated that they had to stay (16.4%). The responses of such non-migrant households are significantly different from those of non-migrant households in general3 with respect to two environmental events: floods and torrential rain. Accordingly, 55.4 per cent of the trapped population stated that they had been affected by floods during the previous 10 years, versus 40 per cent for non-migrant households in general. Similarly, 62 per cent of them were affected by torrential rain, while the figure stands at 50.0 per cent for migrant households in general. Another difference is the frequency of the events. Table 5.6 shows that 12.7 per cent of migrant households stated that they had faced droughts several times during the previous 10 years; this figure stands at 13.5 per cent for non-migrant households. However, the percentage stands at 17.4 per cent for those non-migrant households who stated that they had to stay. This pattern is consistent for the following environmental events: floods (14.6% of migrant households, 13.9% of non-migrant households, 18.5% of the trapped population), cyclones (19.4% of migrant households, 20.3% of non-migrant households, 21.8% of the trapped population) and torrential rain (13.9% of migrant households, 14.8% of non-migrant households, 23.9% of the trapped population). The variation is quite small for the responses for cyclones and is moderate for floods and torrential rain. The small

variation is attributed to the size of the island, as pointed out earlier.

Finding 2: Households who stated that they "had to stay" even if they faced environmental and climatic events represent a special case of "trapped populations". The existing literature concludes that such responses reflect a higher percentage of these populations facing environmental and climatic events compared with non-migrants in general. Indeed, the survey data confirm this conclusion.

A total of 229 migrant households and 160 non-migrant households stated that there was a single environmental or climatic event that affected their livelihood more than any other.

Table 5.10: Single environmental and climatic event affecting livelihoods (%)

Environmental and climatic events	Migrant households	Non-migrant households
Droughts	15.09	20.99
Landslides	2.59	1.85
Wildfires	1.72	1.85
Volcanic eruptions	-	-
Floods	15.09	19.75
Cyclones	9.48	13.58
Storm surges	-	1.23
Riverbank erosion	-	-
Earthquakes	-	-
Torrential rain	55.17	40.74

Source: MECLEP survey, 2016.

There are four major environmental and climatic events that have a significant impact on the livelihoods of migrants and non-migrants. In the Republic of Mauritius, these are droughts, floods, cyclones and torrential rain. Almost 55 per cent of migrant respondents said that they had been affected by torrential rain, while this figure is 40 per cent of non-migrant households. Droughts and floods are ranked second and third, respectively, while cyclones are fourth. These findings are consistent with those found in the *Second National Communication of the Republic of Mauritius under the United Nations*

Framework Convention on Climate Change (UNFCCC) (Government of the Republic of Mauritius, 2010b), which states that the number of heavy rainfall events has increased in recent years. Consequently, flash floods and temporary disruption of various socioeconomic activities have been witnessed in Port Louis (Government of the Republic of Mauritius, 2010b). At the regional level, the environmental and climatic events vary. Thus, torrential rain and floods were the two major events identified by households in Port Louis and in Bambous/Flic-en-Flac/Tamarin. Droughts, cyclones and torrential rain were identified as events that had a major effect of livelihoods. Droughts were particularly noted in Rodrigues.

Table 5.11: Single environmental and climatic event affecting livelihoods at the regional level (%)

Environmental and climatic events	Port Louis	Bambous/Flic-en-Flac/Tamarin	Rodrigues
Droughts	6.75	-	38.10
Landslides	3.07	-	1.59
Wildfires	2.45	-	-
Volcanic eruptions	0.61	-	-
Floods	17.79	16.67	7.94
Cyclones	-	-	34.92
Storm surges	-	-	-
Riverbank erosion	-	-	-
Earthquakes	-	-	-
Torrential rain	68.71	83.33	17.46

Source: MECLEP survey, 2016.

The household survey also collected information on the year in which the environmental and climatic events occurred. Table 5.12 shows the responses. While isolated cases were mentioned for 2006 to 2012, the year 2013 was identified by most respondents as the one in which they were most affected by environmental and climatic events. The years 2014 to 2016 were also identified but to a lesser extent.

Table 5.12: Environmental and climatic events by year of occurrence

Environmental and climatic events	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Droughts	-	-	3	-	2	1	2	25	11	21	4	69
Landslides	-	-	-	-	-	-	-	6	-	3	-	9
Wildfires	-	-	-	-	-	-	1	5	-	1	-	7
Volcanic eruptions	-	-	-	-	-	-	-	1	-	-	-	1
Floods	-	-	1	1	-	1	-	42	1	14	7	67
Cyclones	-	-	-	-	-	-	1	5	15	17	2	40
Storm surges	-	-	-	-	-	-	-	-	2	-	-	2
Riverbank erosion	-	-	-	-	-	-	-	-	-	-	-	-
Earthquakes	-	-	-	-	-	-	-	-	-	-	-	-
Torrential rain	1	-	-	-	3	1	4	69	5	28	83	194
Total	**1**	**-**	**4**	**1**	**5**	**3**	**8**	**153**	**34**	**84**	**96**	**389**

Source: MECLEP survey, 2016.

5. Climate change–migration nexus: Findings from the survey and qualitative interviews?

The qualitative interviews with key informants from the different regions reveal that there have indeed been changes in different variables characterizing environmental and climatic events. In Port Louis, there is a clear indication that rain falls more frequently and with greater intensity. Torrential rain occurs very frequently, leading to floods in a shorter period of time, sometimes within hours. Such observations have been pointed out in the second and third national communications to UNFCCC (Government of the Republic of Mauritius, 2010b, 2016). The example given by key informants was the 2013 flooding in Port Louis, when 11 Mauritians lost their lives. Many places were flooded, houses were destroyed and people suffered losses in terms of their assets. The second example given was the 2016 torrential rain that again caused flooding. The responses of the qualitative interviews were consistent with the findings of the survey, where many respondents highlighted the years 2013 and 2016 and the torrential rain and flooding as the main environmental and climatic events affecting their livelihoods. In Rodrigues, the key informants emphasized that droughts affect the population, together with changes in rainfall patterns. There are also changes in the yield of agricultural products. Torrential rain and flooding were also highlighted in the Bambous/Flic-en-Flac/Tamarin region. The observations revealed through both the quantitative household survey and qualitative interviews are consistent with those in official documents on climate change, such as national communications and the INDC (Government of the Republic of Mauritius, 2015), as well as other related reports (see Gemenne and Magnan, 2011).

The interviews reveal that there is a strong link between natural change and man-made change that leads to flooding. In the city of Port Louis and in the Bambous/Flic-en-Flac/Tamarin region, construction works carried out in the last decades were undertaken with due consideration to the climatic conditions prevailing at that time. With changes in the climatic conditions (more torrential rain), the existing drainage system cannot sustain the intensity of the flow of water, leading to flooding in many different parts of these regions. In Rodrigues, the natural course of water has been altered, and in Port Louis, there are many places where unplanned infrastructure development has diverted the natural course of water. It was also highlighted that many construction works do not follow the guidelines, and the municipalities have to intervene. However, even when monitoring takes place, if the owners are changing the course of water on their properties, there may be environmental consequences in later years. In Rodrigues, the natural course of water has been altered for 30 to 50 years.

Finding 3: There are four major environmental and climatic events that have a significant impact on the livelihoods of migrant and non-migrant households. These are droughts, floods, cyclones and torrential rain. The occurrence of the four events varies between the regions. Torrential rain and to a lesser extent floods are the two major events identified by households in Port Louis and Bambous/Flic-en-Flac/Tamarin. Droughts, cyclones and torrential rain were identified as the events that had a major effect on livelihoods in Rodrigues.

5.5. Impacts of migration

Households who migrated to the three survey sites are most likely to face a different set of social, economic and environmental conditions, which may affect their well-being or vulnerability.

5.5.3. Effects on income and employment

Table 5.13 shows the average income of migrant and non-migrant households. Migrant households currently have a lower average income than non-migrant households, as was the case 10 years ago. The percentage increase in average household income is also higher for non-migrant households than for migrant households. The conclusion emanating from the aggregate data is consistent with the data for the Port Louis region. In Bambous/Flic-en-Flac/Tamarin, even if the average income was more or less the same for both groups of households 10 years ago, the percentage increase in average household income is lower for migrant households than for non-migrant households. In Rodrigues, migrant households had a higher income level than non-migrant households 10 years ago. However, the

ASSESSING THE CLIMATE CHANGE–
MIGRATION NEXUS THROUGH THE LENS OF MIGRANTS:
The Case of the Republic of Mauritius

33

percentage increase is much higher for non-migrant households, which means the income gap in the current period is lower. In the case of Rodrigues, it appears that it was not the poorest who migrated, but now the migrant households earn almost the same as those who stayed. One reason for the higher average income of migrant households in Rodrigues 10 years ago is the government land bail policy, which ensures that qualified young beneficiaries have the means necessary to construct houses and undertake land development strategies. In contrast to the current situation, average incomes are more or less the same, reflecting the geographically constrained economic opportunities and convergence of wages in Rodrigues.

Table 5.13: Average household incomes

Region	Average income of migrant households (MUR)			Average income of non-migrant households (MUR)		
	2016	2006	% increase	2016	2006	% increase
Aggregate households	17,092.53	11,447.3	49.31	21,181.60	13,595.31	55.80
Port Louis	16,058.79	10,564.58	52.00	22,245.18	14,688.50	51.45
Bambous/Flic-en- Flac/Tamarin	21,029.85	13,438.50	56.48	22,178.08	13,459.33	64.78
Rodrigues	16,653.50	12,280.66	35.61	17,398.53	10,619.85	63.83

Source: MECLEP survey, 2016.
Notes: MUR – Mauritian rupees.
        United Nations exchange rate average in 2016: 1 USD = 35,553 MUR.

Finding 4: Average household income is lower for migrant households than for non-migrant households at present, as it was 10 years ago. However, the rise in average household income between the two periods differs across the three survey sites. In Port Louis, the percentage increase in average income was the same for both groups of households, while it was lower for migrant households in Bambous/Flic-en-Flac/Tamarin and considerably lower for migrant households in Rodrigues, who have still not attained the level of income reached by non-migrant households 10 years ago. This finding may also indicate that those who are able to adapt in situ tend to be better off than those who migrated to other regions, as movement involves a certain level of investment (for example, transportation costs, education and new housing).

Table 5.14 depicts the different sources of income of the households. There is a noticeable contrast between migrant and non-migrant households in that approximately 16.6 per cent of the former work in the public sector while this figure stands at 23.1 per cent for the latter. A relatively higher percentage of migrant households (66.2% at present versus 68.3% 10 years ago) are self-employed or are employed in the private sector.

Table 5.14: Households' sources of income (%)

Income source	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Employed in public sector/employer	16.55	15.85	23.13	24.91
Self-employed/employed in private sector	66.20	68.31	60.14	63.17
Street vendor	1.41	1.58	0.89	1.07
Savings	2.11	1.23	2.31	1.25
Rental income	-	-	-	-
Remittances (from people in Mauritius/Outer Islands)	0.35	0.18	0.18	0.18
Remittances (from people abroad)	0.18	0.18	0.18	
Agriculture	1.41	1.94	1.42	2.14
We don't have another source	0.53	1.84	0.89	1.25
Other	11.09	7.92	10.85	6.05
Don't know	0.18	0.88	-	-

Source: MECLEP survey, 2016.

The sources of income differ substantially between migrant households in Rodrigues and those in Mauritius (see tables 5.15 to 5.17). In Rodrigues, just over 40 per cent of migrant households and almost 40 per cent of non-migrant households are employed in the public sector, while in Port Louis and in Bambous/Flic-en-Flac/Tamarin most of the households are employed in the private sector. In Port Louis, a very low percentage of migrant households are employed in the public sector compared with non-migrant households (10.1% versus 20%). The same conclusion applies to Bambous/Flic-en-Flac/Tamarin, though the gap is smaller (10.6% versus 15.6%).

Table 5.15: Sources of income in Rodrigues (%)

Income source	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Employed in public sector/employer	40.68	39.83	37.70	40.98
Self-employed/employed in private sector	27.97	40.68	27.87	29.51
Street vendor	0.85	0.85	-	-
Savings	8.47	4.24	7.38	4.92
Rental income	-	-	-	-
Remittances (from people in Mauritius/Outer Islands)	-	-	0.82	-
Remittances (from people abroad)	-	-	4.10	-
Agriculture	6.78	7.63	-	6.56
We don't have another source	-	-	2.46	3.28
Other	15.25	6.78	19.67	14.75
Don't know	-	-	-	-

Source: MECLEP survey, 2016.

Table 5.16: Sources of income in Bambous/Flic-en-Flac/Tamarin (%)

Income source	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Employed in public sector/employer	10.58	13.46	15.63	15.63
Self-employed/employed in private sector	82.69	80.77	77.08	79.17
Street vendor	1.92	2.88	-	-
Savings	0.96	0.96	1.04	-
Rental income	-	-	-	-
Remittances (from people in Mauritius/Outer Islands)	-	-	-	-
Remittances (from people abroad)	0.96	-	-	3.13
Agriculture	-	0.98	3.13	-
We don't have another source	-	0.96	-	2.08
Other	2.88	-	3.13	-
Don't know	-	-	-	-

Source: MECLEP survey, 2016.

Table 5.17 provides information on income sources in Port Louis. Almost 66.7 per cent of non-migrant households and 74.3 per cent of migrant households are self-employed or are employed in the private sector. This figure is somewhat higher for Bambous/Flic-en-Flac/Tamarin. An analysis of "other" sources reveals that most of the households receive pensions through different schemes, including retirement pensions from the Government. Very few households have an alternative source of income, as shown in table 5.18. Migrant households in particular have very few alternative sources of income, leading to the conclusion that migration did not result in a diversification of income, as assumed in the general migration literature.

Table 5.17: Sources of income in Port Louis (%)

Income source	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Employed in public sector/employer	10.12	8.38	20.06	21.80
Self-employed/employed in private sector	74.28	73.99	66.86	70.64
Street vendor	1.45	1.45	1.45	1.74
Savings	0.29	0.29	0.87	0.29
Rental income	-	-	-	-
Remittances (from people in Mauritius/Outer Islands)	0.58	0.29	0.29	0.29
Remittances (from people abroad)	-	0.29	-	-
Agriculture	-	0.29	-	0.29
We don't have another source	0.87	2.89	0.58	0.29
Other	12.14	10.69	9.88	4.65
Don't know	0.29	1.45	-	-

Source: MECLEP survey, 2016.

5. Climate change–migration nexus: Findings from the survey and qualitative interviews?

Table 5.18: Alternative sources of income (%)

Income source	Migrant households		Non-migrant households	
	2016	**2006**	**2016**	**2006**
Employed in public sector/employer	0.70	0.18	1.60	1.42
Self-employed/employed in private sector	5.28	3.70	9.25	8.36
Street vendor	0.53	0.53	1.07	0.71
Savings	0.70	0.35	1.25	0.71

Source: MECLEP survey, 2016.

Tables 5.19 to 5.22 show the responses from the household survey regarding the four categories of revenue-generating opportunities, namely, income, employment level, trade opportunities and investments. The migrant households were asked to rate the degree of importance of the migration on income, employment level, trade opportunities and investments.

Table 5.19: Impact of migration on revenue-generating opportunities (%)

Revenue-generating opportunity	Important	Of little importance	Unimportant
Income	70.26	22.41	7.33
Employment level	64.66	30.75	4.60
Trade opportunities	42.53	48.13	9.34
Investments	40.95	48.71	10.34

Source: MECLEP survey, 2016.

The aggregate data show that 70.3 per cent of migrant households stated that migration had an important effect on their income. The figure is much higher in Port Louis and in Bambous/Flic-en-Flac/Tamarin than in Rodrigues.

Table 5.20: Impact of migration on revenue-generating opportunities in Port Louis (%)

Revenue-generating opportunity	Important	Of little importance	Unimportant
Income	78.79	19.70	1.52
Employment level	62.12	36.36	1.52
Trade opportunities	31.82	60.61	7.58
Investments	45.45	48.48	6.06

Source: MECLEP survey, 2016.

Table 5.21: Impact of migration on revenue-generating opportunities in Bambous/Flic-en-Flac/Tamarin (%)

Revenue-generating opportunity	Important	Of little importance	Unimportant
Income	81.82	18.18	-
Employment level	72.73	27.27	-
Trade opportunities	31.82	50.00	18.18
Investments	31.82	59.09	9.09

Source: MECLEP survey, 2016.

Migration had a lower impact on employment level than on income, while only 42.5 per cent and 41 per cent of migrants stated that migration had been important for trade opportunities and investments, respectively. This conclusion is very similar in Port Louis and in Bambous/Flic-en-Flac/Tamarin.

Table 5.22 : Impact of migration on revenue-generating opportunities in Rodrigues (%)

Revenue-generating opportunity	Important	Of little importance	Unimportant
Income	30.01	30.13	39.86
Employment level	44.85	44.90	10.25
Trade opportunities	10	77.50	12.50
Investments	17.50	67.50	15

Source: MECLEP survey, 2016.

The case of Rodrigues exhibits a different tendency. There, only 30 per cent of migrants stated that migration had had an important impact on their income, while 40 per cent said that it was unimportant. Moreover, only 45 per cent stated that migration had had an important impact on their employment level.

Finding 5: Most migrant households agreed that migration had been important for increasing their income and their employment level, and to a lesser extent for trade opportunities and investments. Thus, according to the survey, migration has had a positive impact on reducing their vulnerability, as it creates revenue-generating opportunities. However, this conclusion does not apply in Rodrigues, where a significant percentage do not view migration as having been important for income, employment level, trade opportunities or investments. The main reason for this may be that Rodrigues is much smaller than the island of Mauritius and it may therefore exhibit uniform economic opportunities throughout the island.

5.5.2. Influence on overall financial situation

The overall financial situation of households is assessed in terms of three statuses: being in a savings situation, having no savings or debts, and being in a debt situation. The question relates to the overall situation of the household, taking into account all types of debt and all revenue sources. If the overall household debts are higher than overall savings, the household is said to be in a debt situation, while the opposite would indicate a savings situation. The third option is that the household is neither in a savings situation nor in a debt situation. Table 5.23 depicts the results with the aggregate data.

Table 5.23: Overall financial situation of households (%)

	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Savings	14.79	11.27	24.56	13.70
No savings, no debts	33.27	44.54	36.48	44.31
Debts	51.58	42.78	37.90	40.75
Don't know	0.35	1.41	1.07	1.25

Source: MECLEP survey, 2016.

Table 5.23 shows that a relatively higher percentage of migrant households are in a debt situation now compared with 10 years ago, while the situation is the opposite for non-migrant households. Further, a higher percentage of migrant and non-migrant households hold savings now compared with 10 years ago. The changes could be attributed to those migrant households that were neither in the savings category nor in the debt category 10 years ago but that have shifted to a debit situation today.

5. Climate change–migration nexus: Findings from the survey and qualitative interviews?

Tables 5.24 to 5.26 show the financial situation at the regional level. In Port Louis, there has been an increase in the percentage of non-migrant households in a savings situation, and a decrease in the percentage of those in a debt situation. The situation is the opposite for migrant households, as there has been an increase in the percentage of those in debt and a decrease in the percentage of those in a savings situation.

Table 5.24: Overall financial situation of households in Port Louis (%)

	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Savings	10.98	8.09	21.51	12.50
No savings, no debts	39.60	51.45	44.48	48.26
Debts	49.42	39.31	32.56	37.50
Don't know	-	1.16	1.45	1.74

Source: MECLEP survey, 2016.

According to the survey responses in Bambous/Flic-en-Flac/Tamarin, there has been a significant drop in the percentage of households with no savings and no debts, which means there has been a rise in the percentage of households in both a savings situation and in a debt situation. However, a significant percentage of migrant households are in a debt situation (66.4%) compared with non-migrant households (51%).

Table 5.25: Overall financial situation of households in Bambous/Flic-en-Flac/Tamarin (%)

	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Savings	13.46	6.73	26.04	6.25
No savings, no debts	18.27	38.56	21.88	51.04
Debts	66.35	51.92	51.04	41.67
Don't know	1.92	2.88	1.04	1.04

Source: MECLEP survey, 2016.

In Rodrigues, there has been no change in the percentage of migrant households in a debt situation over the last 10 years. On the contrary, there has been a rise in the percentage of migrant households in a savings situation. No major differences between the financial situation of migrant households and that of non-migrant households are seen. Given the change in the percentage of migrant households in the debt category, coupled with the average household income, it seems that it is not the households in the higher income quintiles who migrate.

Table 5.26: Overall financial situation of households in Rodrigues (%)

	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Savings	27.12	24.58	31.97	22.95
No savings, no debts	27.97	29.66	25.41	27.87
Debts	44.92	44.92	42.62	49.18
Don't know	-	0.85	-	-

Source: MECLEP survey, 2016.

Finding 6: Most migrant households find themselves in a debt situation compared with their situation before migration. Based on the findings that more migrant households are in the lower income groups and in a debt situation, it appears that more migrant households are in a lower income group than non-migrant households.

5.5.3. Home and land ownership

One of the main driving factors to migrate is related to the ownership of houses and land. Tables 5.27 to 5.29 provide information on home and land ownership by household. Table 5.27 shows that 10 years ago, 13.4 per cent of non-migrant households owned a house, while this figure is 7.4 per cent for migrant households. At present, about 15 per cent of both migrant and non-migrant households own a house. The percentage of respondents who own both a house and land has also increased over the 10-year period.

Table 5.27: Home and land ownership (%)

	Migrant households		Non-migrant households	
	2016	**2006**	**2016**	**2006**
Own house	15.32	7.39	15.12	13.35
Own land	1.41	2.99	2.67	5.69
Own house and land	62.50	46.13	74.56	66.73
Own neither house nor land	20.77	43.49	7.65	14.23

Source: MECLEP survey, 2016.

It appears that an outcome of migration is higher levels of home and land ownership. This may also explain the figures showing greater debts and less savings. Table 5.28 depicts the statistics for migrant households. In all of the regions, there has been a rise in the percentage of those who own a house and land. This change is particularly noticeable for migrant households in Rodrigues and even more so in Bambous/Flic-en-Flac/Tamarin.

Table 5.28: Regional differences in home and land ownership of migrant households (%)

	Port Louis		Bambous/Flic-en-Flac/Tamarin		Rodrigues	
	2016	**2006**	**2016**	**2006**	**2016**	**2006**
Own house	17.63	6.07	10.58	5.77	12.71	12.71
Own land	1.45	2.02	-	6.73	2.54	2.54
Own house and land	56.07	45.95	73.08	43.27	72.03	49.15
Own neither house nor land	24.86	45.95	16.35	44.23	12.71	35.59

Source: MECLEP survey, 2016.

For non-migrant households, there has been no significant change in home or land ownership mainly because households already owned a house and land 10 years ago. The statistics on home and land ownership tend to converge in the current period for migrant and non-migrant households, though there are still some gaps between the two groups. Migrant households are still less likely to own a house and land than non-migrant households. Figures 5.5 and 5.6 provide a graphical illustration of the statistics.
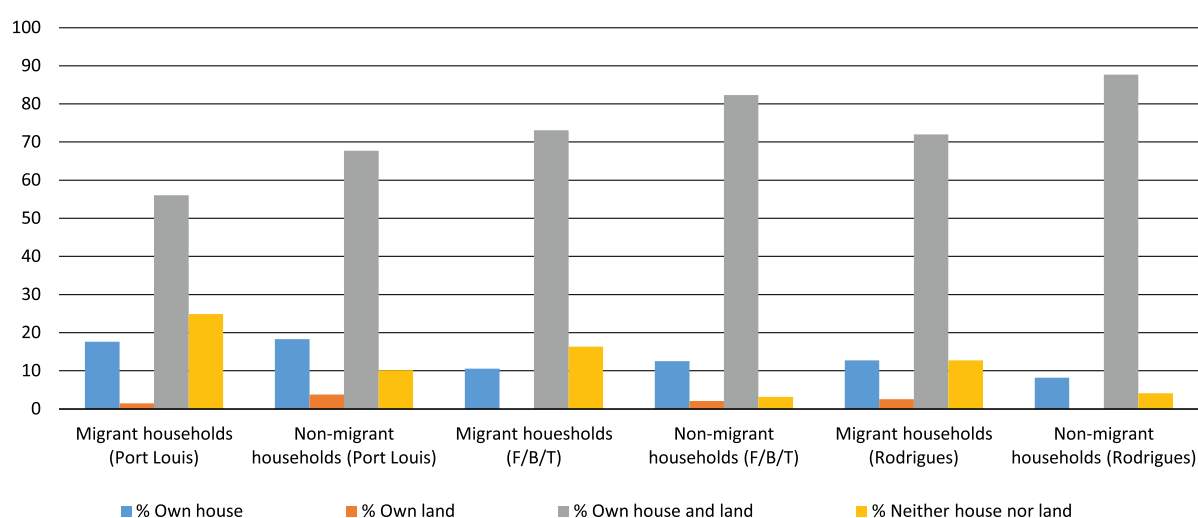
5. Climate change–migration nexus: Findings from the survey and qualitative interviews?

Table 5.29: Regional differences in home and land ownership of non-migrant households (%)

	Port Louis		Bambous/Flic-en-Flac/Tamarin		Rodrigues	
	2016	**2006**	**2016**	**2006**	**2016**	**2006**
Own house	18.31	14.83	12.50	10.42	8.20	11.47
Own land	3.78	5.52	2.08	12.50	-	0.92
Own house and land	67.73	63.66	82.29	66.67	87.70	75.41
Own neither house nor land	10.17	15.99	3.13	10.42	4.10	12.30

Source: MECLEP survey, 2016.

Figure 5.5: Home and land ownership of migrant and non-migrant households, present

Source: MECLEP survey, 2016.
Note: B/F/T – Bambous/Flic-en-Flac/Tamarin.

Finding 7: Migration is related to higher ownership of homes and land. Even if the migrant households have a lower income on average and are in a debt situation, the percentage who own houses and land has increased significantly since their migration. The empirical evidence shows a strong link between household income, home and land ownership, the financial situation and migration. However, in all three regions, the migrant households are less likely to own a house and land than the non-migrant households.

5.5.4. Household assets

An important finding from the survey is that non-migrant households in the area of destination possess relatively more household assets than migrant households did 10 years before (table 5.30). The situation of the migrant households in the post-migration period has changed substantially and most of them own more household assets today than they did 10 years ago.

Table 5.30: Household assets: A comparison of migrant and non-migrant households (%)

Household asset	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Television	92.61	85.21	98.58	98.40
Mobile phone	92.25	72.18	95.02	76.16
Radio	85.04	80.63	93.59	92.70
Computer/laptop	38.03	20.95	51.07	27.40
Electric/gas stove or wood burner	86.27	77.29	94.31	86.65
Sewing machine	14.44	13.03	28.39	25.80
Motorized two-wheel vehicle	18.13	14.08	31.32	22.60
Motorized four-wheel vehicle	20.60	10.92	31.85	14.95
Non-motorized vehicle	11.27	10.92	14.06	14.41
Boat	0.18	0.70	1.78	1.60
Air conditioner	8.45	3.87	12.46	3.56
Water tank	38.56	26.23	67.08	43.95
Washing machine	54.40	36.27	79.36	54.50
None of the above	1.58	2.99	0.18	0.71

Source: MECLEP survey, 2016.

5.5.5. Effects of migration on construction materials

Living conditions are strongly related to construction materials for housing. For the household survey, information was collected on the construction materials used for the roof and the exterior walls of the housing units of both migrant and non-migrant households for the current period and for 10 years ago. This section provides the findings and aims to provide insights on whether migration has led to an improvement in the living conditions of the migrant households.

Roofs

Table 5.31 shows the percentage of households for each type of roofing structure. The construction materials used for the roofs have not changed significantly for migrant households over the 10-year period, while there has been a slight increase in the use of cement/reinforced concrete and brick roofs for non-migrant households. Comparing migrant and non-migrant households, the former are a lot less likely to have more robust houses (cement) and they are thus more vulnerable to the effects of torrential rain and cyclones, which are listed above as important events.

Table 5.31: Changes in construction material used for roofs (%)

Primary construction material	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Metal sheeting	33.80	34.87	9.61	13.08
Cement/reinforced concrete	61.80	60.35	87.01	83.51
Brick	3.70	4.07	3.20	3.05
Logs	0.35	0.35	-	-
Plywood	0.18	-	0.18	0.18
Don't know	0.18	0.35	-	0.18

Source: MECLEP survey, 2016.

5. Climate change–migration nexus: Findings from the survey and qualitative interviews?

There has been a slight increase in the migrant households' use of cement/reinforced concrete or brick in the Port Louis region. There are regional differences in preferences for or use of materials. In Port Louis, a high percentage of migrant households have metal sheeting for their roofs, while the figure is relatively lower for Rodrigues and much lower for Bambous/Flic-en-Flac/Tamarin.

Table 5.32: Changes in construction material used for roofs of migrant households (%)

Primary construction material	Port Louis		Bambous/Flic-en-Flac/Tamarin		Rodrigues	
	2016	2006	2016	2006	2016	2006
Stone and mortar	-	-	-	-	-	-
Metal sheeting	46.53	49.85	4.81	4.81	22.03	17.80
Cement/reinforced concrete	49.13	46.65	85.58	86.54	77.97	77.12
Brick	3.18	2.33	9.42	8.65	-	5.08
Logs	0.58	0.58	-	-	-	-
Plywood	0.29	-	-	-	-	-
Reed	0.29	-	-	-	-	-
Other	-	-	-	-	-	-
Don't know	-	0.58	-	-	-	-

Source: MECLEP survey, 2016.

In Rodrigues and Bambous/Flic-en-Flac/Tamarin, there has been no major difference in the use of cement/reinforced concrete, but a decrease in the use of metal sheeting is noticeable (table 5.33).

Table 5.33: Changes in construction material used for roofs of non-migrant households (%)

Primary construction material	Port Louis		Bambous/Flic-en-Flac/Tamarin		Rodrigues	
	2016	2006	2016	2006	2016	2006
Stone and mortar	-	-	-	-	-	-
Metal sheeting	9.88	12.94	3.13	3.13	13.93	21.31
Cement/reinforced concrete	86.05	82.94	91.67	91.67	86.07	78.69
Brick	3.78	3.53	5.21	5.21	-	-
Logs	-	-	-	-	-	-
Plywood	0.29	0.29	-	-	-	-
Reed	-	-	-	-	-	-
Other	-	-	-	-	-	-
Don't know	-	0.29	-	-	-	-

Source: MECLEP survey, 2016.

Walls

The situation is the same with regard to the construction materials used for the walls of the housing units as for roofs. The percentage of migrant households whose houses have exterior walls made of metal sheeting, cement/reinforced concrete or brick remained more or less the same after migration. Compared with non-migrant households, migrant households seem to use weaker materials for construction.

Table 5.34: Changes in construction material used for exterior walls of housing units (%)

Primary construction material	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Stone and mortar	0.35	0.18	-	-
Metal sheeting	31.16	31.51	7.47	9.96
Cement/reinforced concrete	20.60	18.49	22.78	20.82
Brick	47.01	48.06	69.22	68.33
Logs	0.70	1.06	0.36	0.36
Plywood	0.18	0.18	0.36	0.18
Reed	-	0.18	-	0.18
Other	-	0.18	-	0.18
Don't know	-	0.18	-	0.18

Source: MECLEP survey, 2016.

Table 5.35: Changes in construction material used for exterior walls of housing units of migrant households at the regional level (%)

Primary construction material	Port Louis		Bambous/Flic-en-Flac/Tamarin		Rodrigues	
	2016	2006	2016	2006	2016	2006
Stone and mortar	0.29	0.29	0.96	-	-	-
Metal sheeting	45.38	47.40	2.88	0.96	14.41	11.86
Cement/reinforced concrete	10.98	8.67	5.77	5.77	61.86	58.47
Brick	41.91	41.33	90.38	92.31	23.73	28.81
Logs	1.16	1.73	-	-	-	-
Plywood	0.29	0.29	-	-	-	-
Reed	-	-	-	0.96	-	-
Other	-	--	-	-	-	-
Don't know	-	0.29	-	-	-	0.85

Source: MECLEP survey, 2016.

Table 5.36: Changes in construction material used for exterior walls of housing units of non-migrant households at the regional level (%)

Primary construction material	Port Louis		Bambous/Flic-en-Flac/Tamarin		Rodrigues	
	2016	2006	2016	2006	2016	2006
Stone and mortar						
Metal sheeting	9.88	10.47	2.08	4.17	4.92	13.11
Cement/reinforced concrete	12.21	11.92	2.08	1.04	68.85	61.48
Brick	77.03	76.16	95.83	94.79	26.23	25.41
Logs	0.58	0.58	-	-	-	-
Plywood	0.29	0.29	-	-	-	-

Source: MECLEP survey, 2016.

5. Climate change–migration nexus: Findings from the survey and qualitative interviews?

Tables 5.31 to 5.36 show that the construction materials of migrants have not improved substantially since they migrated. This leads to the conclusion that a high percentage of migrant households may be part of the relatively poorer group in society, adding support to the previous findings on average household incomes and financial situations.

Finding 8: In terms of the types of construction material used for the roofs and exterior walls of housing units, there have been no major improvements in the living conditions of migrants and non-migrants over the past 10 years. A high percentage of migrant households still have metal sheeting for their roofs and exterior walls after migrating, especially in the Port Louis region. A slight improvement can, however, be observed. The situation may reflect the low standard of housing for newcomers in Port Louis in general.

5.5.6. Use of formal and informal banks and financial institutions

Sections 5.5.6. and 5.5.7. provide information on the use of formal banks/financial institutions and informal banks/financial institutions. There has been an increase in the percentage of migrant households using formal banks/financial institutions, as shown in table 5.37 (at the aggregate level).

Table 5.37: Households' use of formal banks/financial institutions (%)
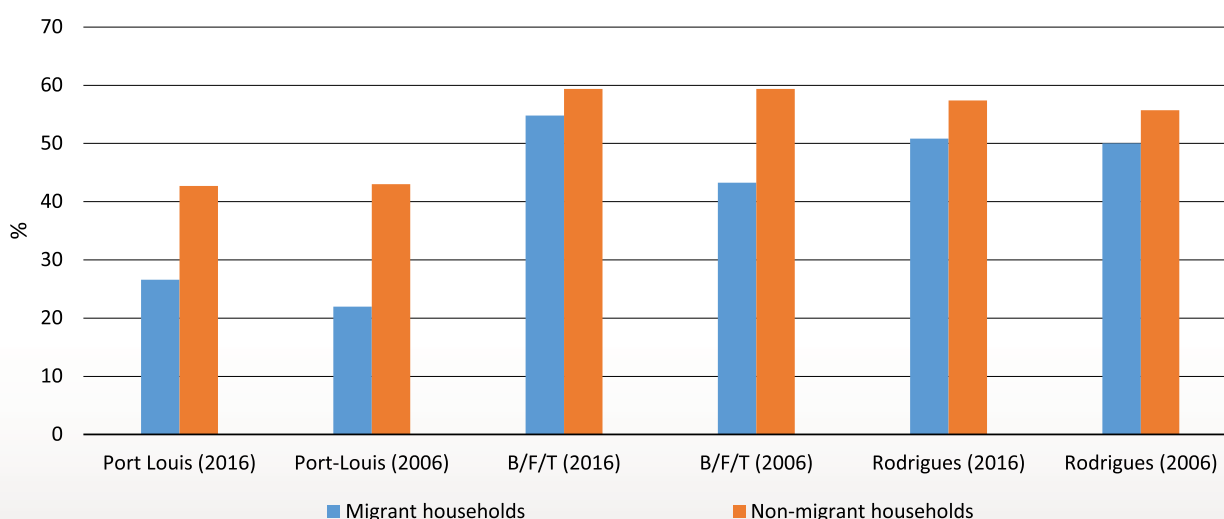
	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Yes	36.80	31.69	48.75	48.58
No	63.03	67.96	50.89	51.07
Don't know/refused to answer	0.18	0.35	0.36	0.36

Source: MECLEP survey, 2016.

At the regional level, the increased use of such formal types of financial institutions by migrant households is mostly found on the island of Mauritius, that is, in Port Louis and Bambous/Flic-en-Flac/Tamarin. In Rodrigues, the percentage of households using formal banking has remained more or less the same.

Figure 5.6: Percentage of households using formal banks/financial institutions

Source: MECLEP survey, 2016.
Note: B/F/T – Bambous/Flic-en-Flac/Tamarin.

5.5.7. Use of informal banks/financial institutions

Similar to the use of formal banks/financial institutions, the percentage of migrants using informal types of banking has increased at the aggregate level (table 5.38). A small increase can be observed for migrant households in Port Louis, while the percentage of migrant households in Bambous/Flic-en-Flac/Tamarin using informal types of banking has remained the same (figure 5.7).
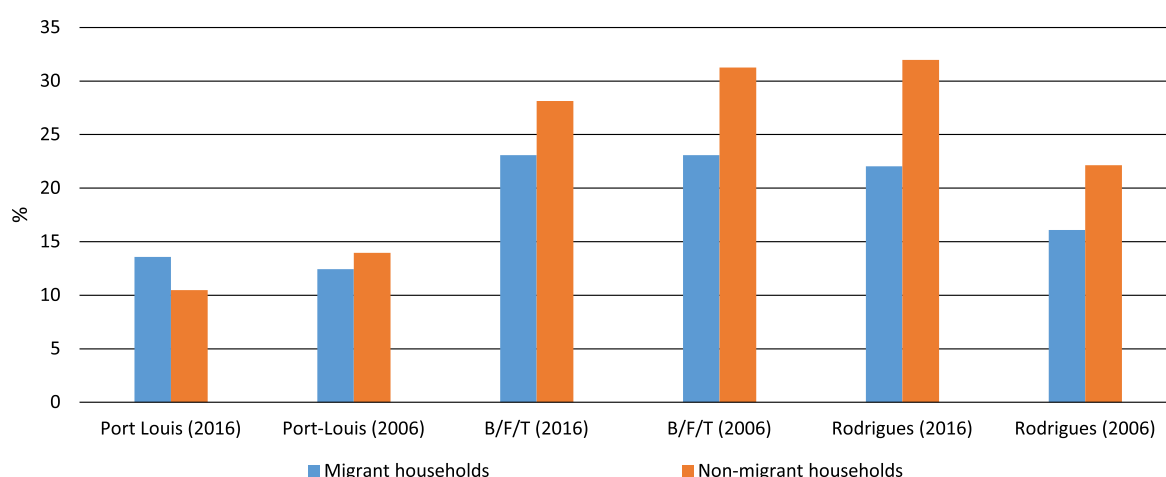
Table 5.38: Use of informal banks/financial institutions (%)

	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Yes	17.08	15.14	18.15	18.68
No	82.75	84.51	81.85	80.60
Don't know/ refused to answer	0.18	0.35	-	0.71

Source: MECLEP survey, 2016.

A rise in the use of informal banks/financial institutions can be observed in Rodrigues (figure 5.7). The main reason for this may be the different structure of the financial sector – the financial sector on the island of Mauritius is more developed than it is in Rodrigues.

Figure 5.7: Percentage of households using informal banks/financial institutions

Source: Household survey, 2016.
Note: B/F/T – Bambous/Flic-en-Flac/Tamarin.

Finding 9: There has been a rise in the use of both formal and informal banks/financial institutions by migrant households on the island of Mauritius (at both survey sites), while a significant increase in the use of informal banks/financial institutions can be seen in Rodrigues.

5.5.8. Migration and remittances

The survey reveals that 42 households stated that they had sent remittances to the migrant family members who had moved out of their village during the last 10 years, and 72 households stated that they had received remittances from the migrants. A summary of the amounts sent and received by the households is shown in table 5.39.

Table 5.39: Remittances sent and received by households

Remittances	Mean	Standard deviation	Minimum	Maximum
Remittances sent by households (MUR)	41,215	59,359	1,500	225,001
Remittances received by households (MUR)	35,343	91,466	800	700,001

Source: MECLEP survey, 2016.
Notes: MUR – Mauritian rupees.
United Nations exchange rate average in 2016: 1 USD = 35,553 MUR.

There is a small percentage of households in the survey sites that stated that they had received or sent remittances. Remittances are mostly spent on food, clothing and to a lesser extent health-related products. This finding is similar to that found in the general migration and development literature on the topic, that is, remittances are used for necessities, not for long-term investments.

Responses from the qualitative interviews on remittances

It was difficult to obtain accurate opinions of those interviewed during the qualitative interviews as far as remittances are concerned. However, there is the perception that remittances from migrants from the island of Mauritius to households in Rodrigues are very low. On the contrary, according to the interviews, it is the households in Rodrigues that send money to the migrants who moved to the island of Mauritius. This finding is supported by the data in table 5.39 which show that the remittances received by households were lower than the remittances sent by households. In fact, this finding shows the vulnerability of migrants who moved from Rodrigues to the Port Louis region.

5.5.9. Effects on infrastructure

The household survey included a question on whether respondents had access to good quality health care, clean and safe drinking water, and electricity services during the current period and 10 years ago. The percentage of the households with access to good quality health care has slightly increased for both migrant and non-migrant households over the past 10 years. This could be due to a general improvement in the health-care system. However, there has been a decline in the percentage of migrant households with access to clean and safe water with full pressure 24 hours per day, and to electricity every day. The opposite can be observed for non-migrant households, and so it appears that migrant households are worse off due to migration.

Table 5.40: Changes in access to health, water and electricity services (%)

	Migrant households		Non-migrant households	
	2016	**2006**	**2016**	**2006**
Households with access to good quality health care	90.4	88.91	90.39	88.79
	9			
Households with access to clean and safe drinking water with full pressure, 24 hours per day	80.28	84.86	83.45	81.14
Households with daily access to electricity	86.80	94.54	98.22	96.26

Source: MECLEP survey, 2016.

Tables 5.41 to 5.43 show the changes in access of migrant and non-migrant households in the three survey sites.

Table 5.41: Changes in households' access to health, water and electricity services in Port Louis (%)

	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Households with access to good quality health care	91.04	89.31	90.12	89.24
Households with access to clean and safe drinking water with full pressure, 24 hours per day	80.35	86.71	82.56	79.36
Households with daily access to electricity	81.21	92.49	97.38	95.93

Source: MECLEP survey, 2016.

Table 5.42: Changes in households' access to health, water and electricity services in Bambous/Flic-en-Flac/Tamarin (%)

	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Households with access to good quality health care	91.35	90.38	93.75	90.63
Households with access to clean and safe drinking water with full pressure, 24 hours per day	92.31	90.38	96.88	90.63
Households with daily access to electricity	98.08	100.00	100.00	95.83

Source: MECLEP survey, 2016.

Table 5.43: Changes in households' access to health, water and electricity services in Rodrigues (%)

	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Households with access to good quality health care	88.14	86.44	88.52	86.07
Households with access to clean and safe drinking water with full pressure, 24 hours per day	69.49	74.58	75.41	78.69
Households with daily access to electricity	93.22	95.76	99.18	97.54

Source: MECLEP survey, 2016.

Finding 10: Daily access to clean and safe water has deteriorated in Rodrigues, perhaps because of the problems related to the droughts that were emphasized by many key informants. The decrease in access to electricity in the city of Port Louis may mostly affect the segments of migrants that are relatively poor. This finding supports the fact that migrants are a diverse group and the impacts of migration are not the same for all people in all areas. Access to good quality health care is on the rise for both migrant and non-migrant households.

5.5.10. Migration and security aspects

Table 5.44 depicts figures on food and security in relation to survey questions about whether household members had enough food (three meals per day) and about whether they faced any security problems. Interviewers further explained to respondents that security referred to a general feeling of security in the place they were living in terms of crime, violence or any other elements linked to feeling insecure. As far as food security is concerned, there have been no major changes for both migrant and non-migrant households during the past 10 years.

48

5. Climate change–migration nexus: Findings from the survey and qualitative interviews?

Table 5.44: Food security and general security of households (%)

	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Household members have enough food for 3 meals per day	90.67	91.55	95.73	95.55
Households have problems related to security	25.88	20.25	22.78	18.51
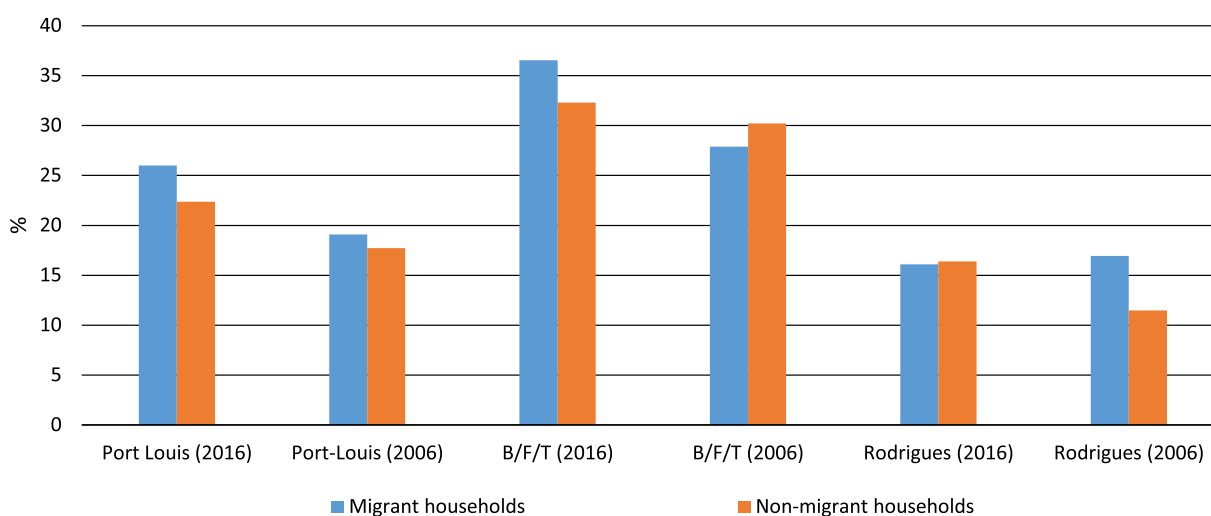
Source: MECLEP survey, 2016.

Security is a problem for the general population; it is not specific to the migrant households surveyed, although the rate is slightly higher for migrant households than for non-migrant households.

Figure 5.8 provides insight at the regional level. Problems related to security are mostly on the rise in the Port Louis and Bambous/Flic-en-Flac/Tamarin regions, where security in general seems to be a more important issue than it is in Rodrigues. While a small percentage of households in Rodrigues stated that they had security issues, according to the survey results, there is an increase in the percentage of non-migrant households and a slight decrease in the percentage of migrant households who face more security issues now than they did 10 years ago.

Figure 5.8: Percentage of households facing security issues

Source: MECLEP survey, 2016.
Note: B/F/T – Bambous/Flic-en-Flac/Tamarin.

Finding 11: A rise in security problems has been witnessed by both migrant households and non-migrant households. However, more migrant households than non-migrant households stated that they had security problems.

5.5.11. Migrants and discrimination

Tables 5.45 and 5.46 reveal an important aspect of migration: discrimination. The following question was posed to respondents: "Would you say that your household has suffered from discrimination/exclusion in employment, health or education?" Table 5.45 shows that the percentage of migrant households who faced some kind of discrimination is almost twice the percentage of non-migrant households.

Table 5.45: Discrimination in or exclusion from employment, health services or education faced by households (%)

	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Households	9.86	8.80	5.34	4.27

Source: MECLEP survey, 2016.

Table 5.46: Discrimination in or exclusion from employment, health services or education faced by households at the regional level (%)

Households	Port Louis		Bambous/Flic-en-Flac/Tamarin		Rodrigues	
	2016	2006	2016	2006	2016	2006
Migrant	10.12	9.83	2.88	3.85	10.17	15.25
Non-migrant	5.52	3.78	1.04	1.04	8.20	8.20

Source: MECLEP survey, 2016.

The percentage of migrants facing discrimination is almost twice that of non-migrants across all of the regions, though the specific percentages differ. The highest percentage of migrant households that face discriminatory behaviour is found in the Port Louis region, while in Rodrigues migration has proved beneficial in reducing discrimination.

Finding 12: There is evidence that migrants face discrimination even if the percentage is very low. However, in relative terms, a higher percentage of migrants suffer from discrimination than non-migrants. This finding is consistent across all regions.

5.5.12. Extent of social integration after migration

Social integration of migrant households is an important facet of the standard of living and well-being of migrants. There are several studies that report that many migrants suffer from trauma and feelings of alienation as a result of their migration (Ahsan, Kellett and Karuppanan, 2014). At the place of destination they are regarded as separate from the established community. The household survey collected information on the sentiments of migrants related to their current location, such as the extent to which the migrant would like his or her family and friends to live at the place of destination in the future, and if he or she missed the place of destination when not there. The list of statements that the respondents were asked to either agree or disagree with is shown in table 5.47. A comparison of the percentage of migrant households and non-migrant households who agreed or disagreed with, or were neutral regarding, the statements reveals the extent to which the households feel a sense of belonging to the place of destination. A summary of the findings is found in figure 5.9.

Table 5.47: Statements used to determine perceptions of the place of destination

I would like my family and friends to live here in the future (even after I die)
I miss this place when I am not here
I feel safe here
I am proud of this place
I would like to move out of here
I don't have anywhere else to go
I feel foreign here

Source: MECLEP survey, 2016.

5. Climate change–migration nexus: Findings from the survey and qualitative interviews?
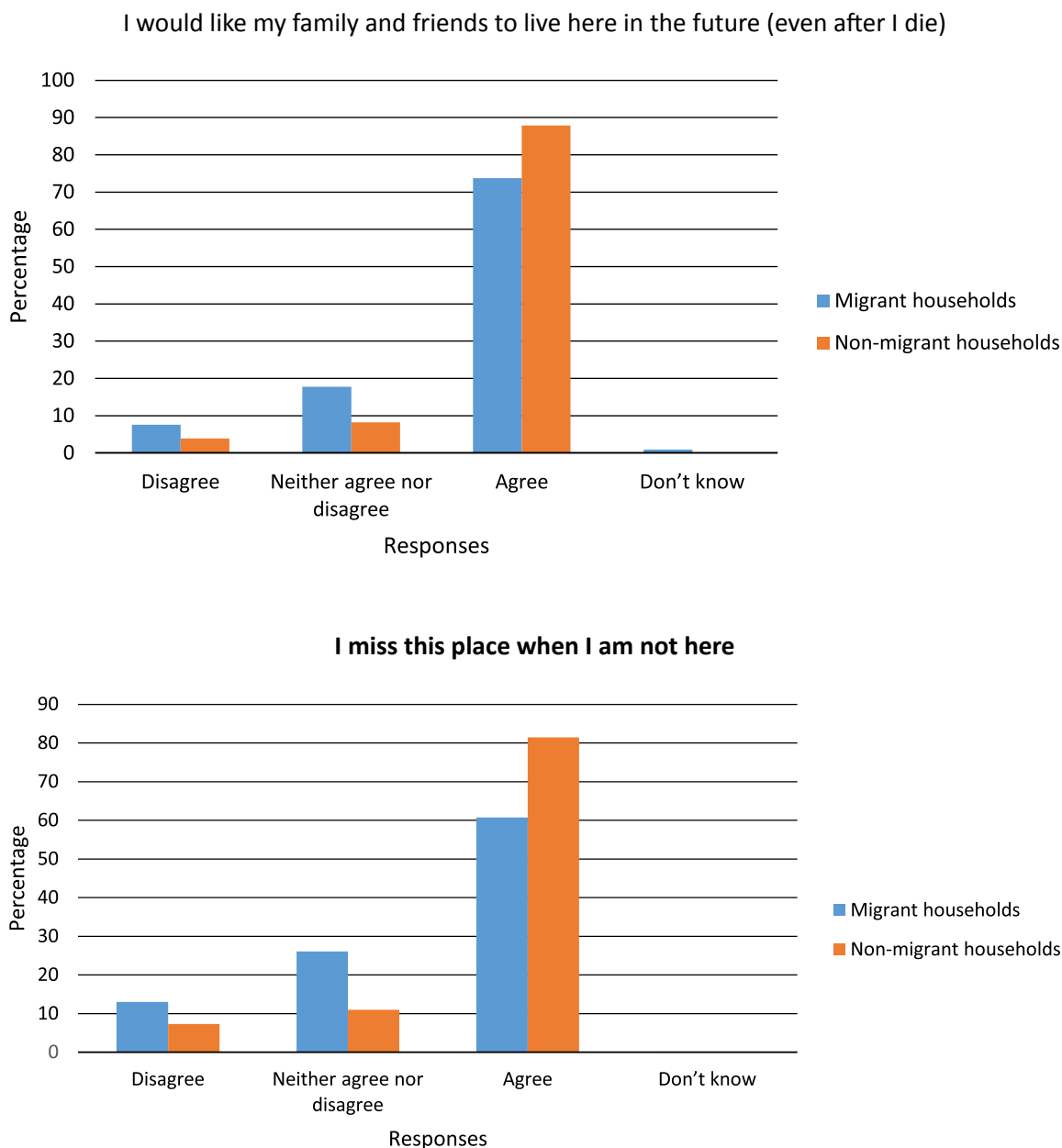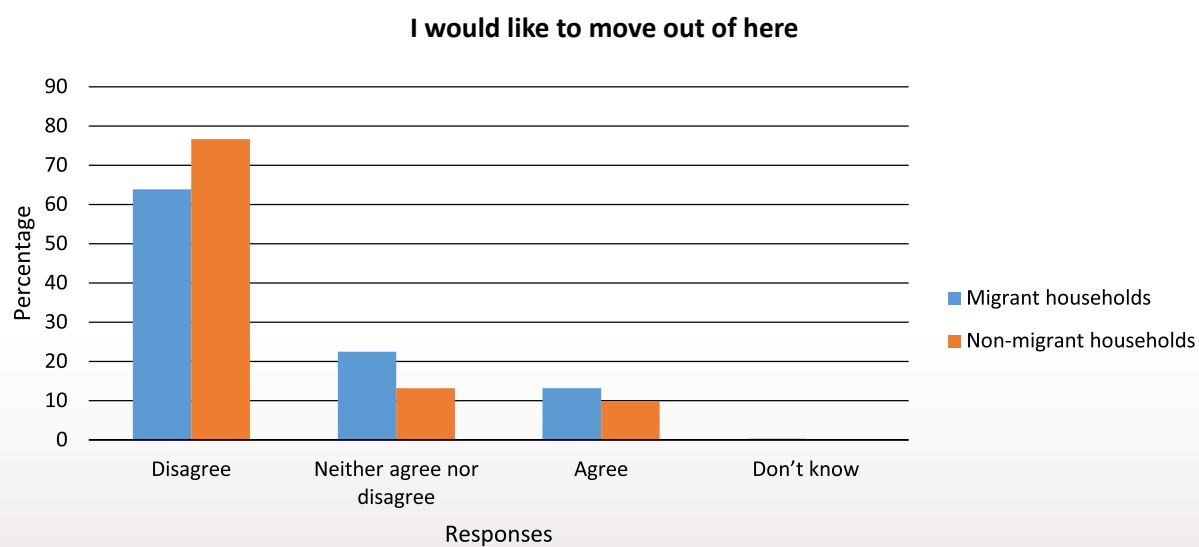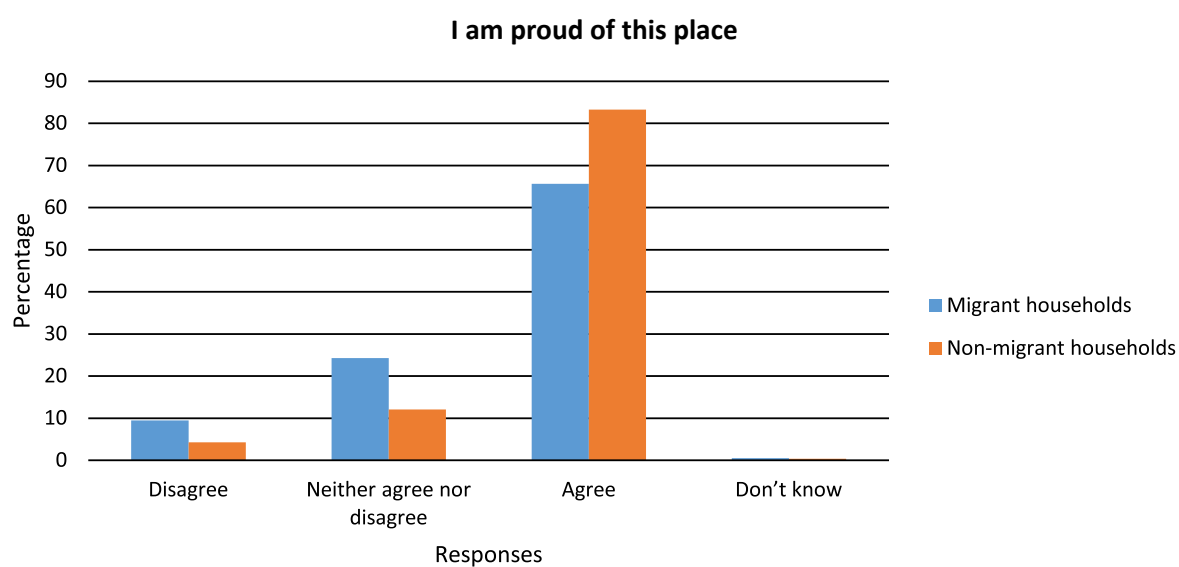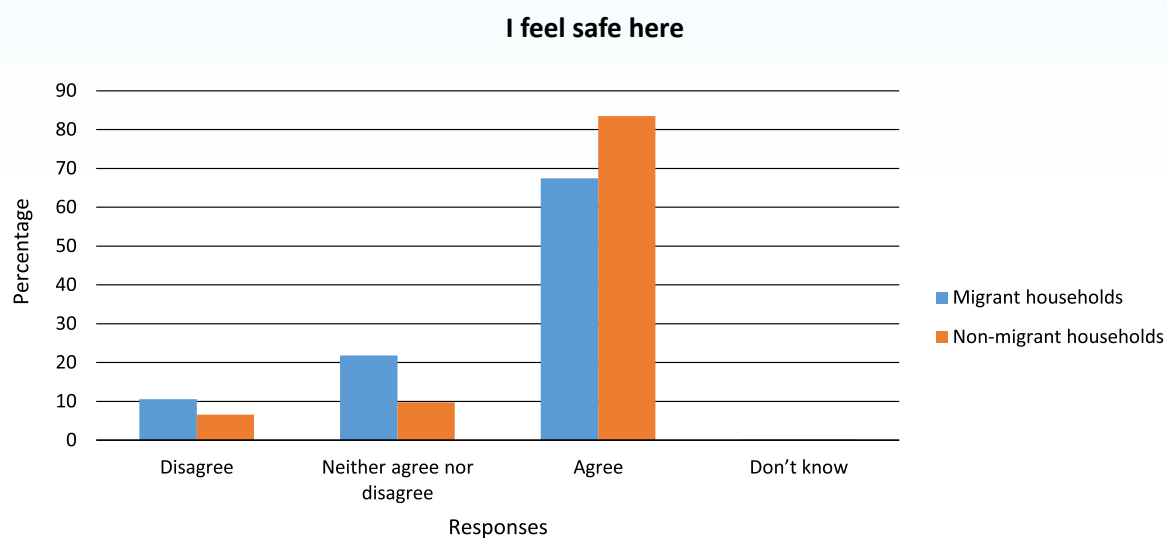
While the migrants agree that they would like their family and friends to live at the place of destination in the future (73.8%), this figure is much higher for non-migrants (87.9%). The percentages of respondents who disagree with the statements "I miss this place when I am not here", "I feel safe here" and "I am proud of this place" are low, but they are twice as high for migrants as they are for non-migrants. The percentage of migrant households who neither agree nor disagree with these statements is also high compared with the percentage of non-migrants.
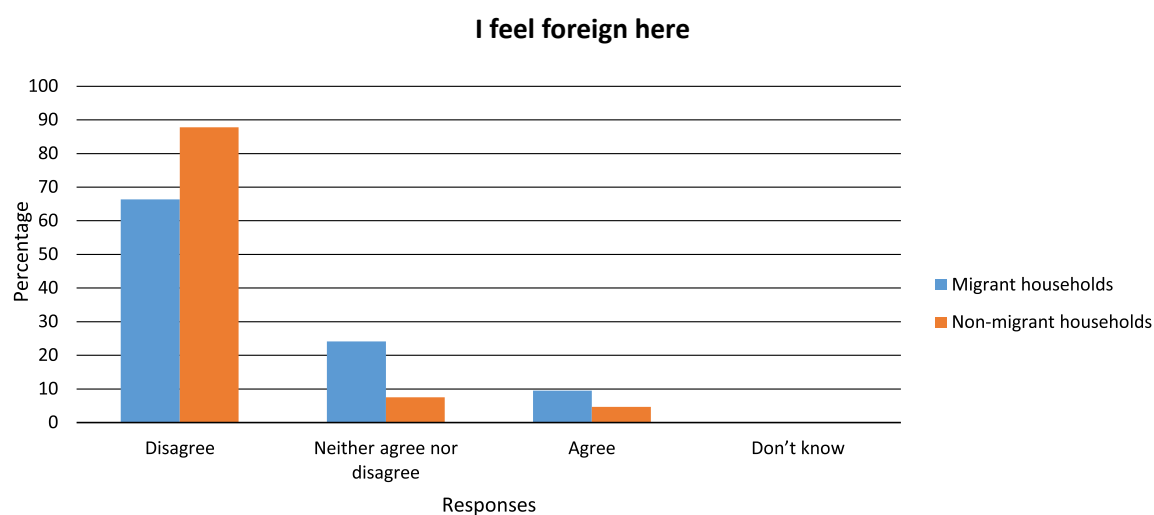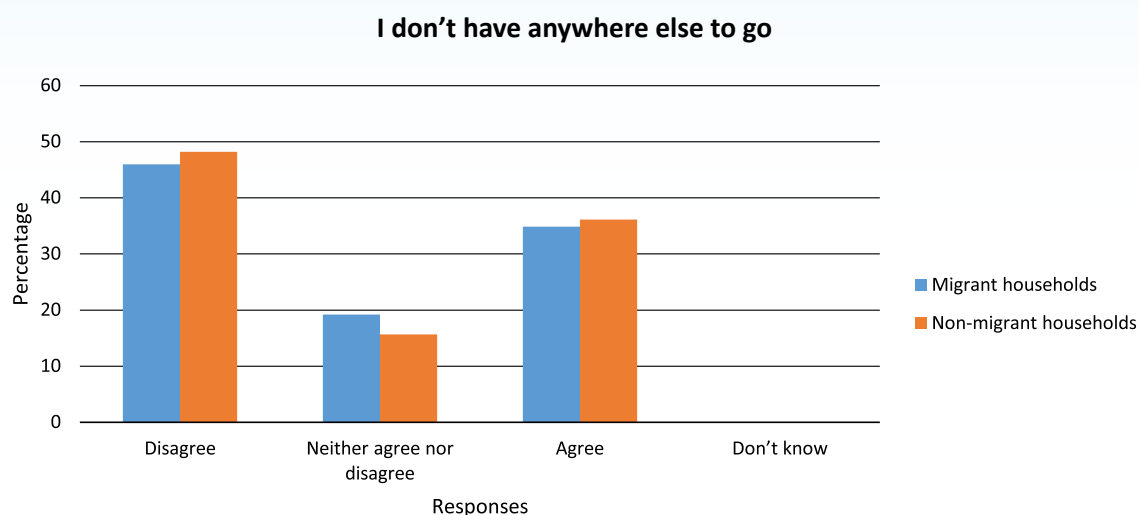
Figure 5.9: Responses to the statements on perceptions of the place of destination

I would like my family and friends to live here in the future (even after I die)

I miss this place when I am not here

I feel safe here

I am proud of this place

I would like to move out of here

5. Climate change–migration nexus: Findings from the survey and qualitative interviews?

I don't have anywhere else to go

I feel foreign here

Source: MECLEP survey, 2016.

Finding 13: It takes time for migrants to feel at home in their place of destination, as many migrants are still not showing a sense of belonging to the place of destination.

5.5.13. Impacts of migration on the support network

Support networks also influence the well-being of households. During times of difficulty, households can turn to family, friends and neighbours, among others. The respondents were asked whom they would go to if they needed help. The options given to them are provided in table 5.48. The question referred to the current period and to 10 years ago. Tables 5.48 to 5.50 provide insights into the support networks available to migrant and non-migrant households.

Table 5.48: Households' support networks (%)

Type of support network	Migrant households		Non-migrant households	
	2016	**2006**	**2016**	**2006**
Family	61.80	67.43	73.31	75.80
Friends	21.30	21.83	25.98	26.87
Neighbours	23.94	20.07	27.58	27.22
Other community members	3.70	2.82	5.87	5.34
Church/religious organization	7.39	4.58	5.87	4.45
Other	0.18	0.35	0.89	1.07
Nobody	18.84	19.01	10.32	9.79
Don't know/refused to answer	1.06	1.23	0.53	0.36

Source: MECLEP survey, 2016.

Table 5.48 shows that there is less of a tendency for the respondents to use family for support; instead there a higher reliance on neighbours and churches/religious organizations. This finding is consistent across the three regions (tables 5.49 and 5.50). The percentage of migrant households who stated that they had "nobody" is much higher than the figure for non-migrant households (18.8% and 10.3%, respectively).

Table 5.49: Migrant households' support networks at the regional level (%)

Type of support network	Port Louis		Bambous/Flic-en-Flac/Tamarin		Rodrigues	
	2016	**2006**	**2016**	**2006**	**2016**	**2006**
Family	57.80	61.27	60.58	71.15	74.58	82.20
Friends	14.16	14.16	37.50	43.27	27.97	25.42
Neighbours	18.50	15.32	40.38	37.50	25.42	18.64
Other community members	1.16	0.58	6.73	8.65	8.47	4.24
Church/religious organization	1.45	0.29	18.27	13.36	15.25	9.32
Nobody	22.83	24.28	19.23	13.46	6.78	8.47

Source: MECLEP survey, 2016.

The decrease in dependence on family is more noticeable in the Bambous/Flic-en-Flac/Tamarin region. In Rodrigues, there has been a slight increase in turning to friends for support. The rise in the use of neighbours is consistent across the three regions.

5. Climate change–migration nexus: Findings from the survey and qualitative interviews?

Table 5.50: Migrant households' support networks at the regional level (%)

Type of support network	Port Louis		Bambous/Flic-en-Flac/Tamarin		Rodrigues	
	2016	**2006**	**2016**	**2006**	**2016**	**2006**
Family	71.22	73.26	78.13	82.29	75.41	77.87
Friends	19.77	20.93	45.83	51.04	27.87	24.59
Neighbours	25.29	23.84	52.08	57.29	14.75	13.11
Other community members	3.78	3.78	9.38	9.38	9.02	6.56
Church/religious organization	0.58	0.58	18.75	16.67	10.66	5.74
Nobody	11.92	11.05	5.21	4.17	9.84	10.66

Source: MECLEP survey, 2016.

Finding 14: Migration leads to a change in the support network from family to friends, neighbours and religious organizations. A high percentage of migrant households feel that they have nobody to revert to for support. Migrants also find themselves less likely to be members of organizations such as traders associations, sports groups, women's groups or youth groups.

5.5.14. Impacts of migration on well-being

Tables 5.51 to 5.54 provide information on the impacts of migration on several dimensions that characterize the well-being of the households. A very high percentage of migrant households stated that migration had the greatest impact on family relationships, on an aggregate basis and at each individual survey site. Migration has had an impact on the health conditions, education levels and well-being of the households. The four dimensions were most revealing for the migrant households in Port Louis.

Table 5.51: Impacts of migration on living conditions of migrant households in the three survey sites (%)

Living conditions	Important	Of little importance	Unimportant	Don't know
Credit availability	39.37	50.14	10.49	-
Family relationships	70.11	26.58	3.30	-
Health conditions	57.90	37.50	4.60	
Education level	55.32	40.52	4.02	0.14
Overall impacts on well-being	57.90	37.50	4.60	-

Source: MECLEP survey, 2016.

Table 5.52: Impacts of migration on living conditions of migrant households in Port Louis (%)

Living conditions	Important	Of little importance	Unimportant	Don't know
Credit availability	55.10	37.86	7.04	-
Family relationships	81.80	17.48	0.73	-
Health conditions	73.79	24.03	2.18	-
Education level	72.09	25.49	2.43	-
Overall impacts on well-being	82.77	16.50	0.73	-

Source: MECLEP survey, 2016.

Table 5.53: Impacts of migration on living conditions of migrant households in Rodrigues (%)

Living conditions	Important	Of little importance	Unimportant	Don't know
Credit availability	8.86	72.15	18.99	-
Family relationships	53.16	34.81	12.03	-
Health conditions	21.52	65.82	12.66	-
Education level	25.95	65.19	8.23	0.63
Overall impacts on well-being	63.92	30.38	5.70	-

Source: MECLEP survey, 2016.

The impact of migration on credit availability appears to be the lowest for migrants in Rodrigues (table 5.53).

Table 5.54: Impacts of migration on living conditions of migrant households in Bambous/Flic-en-Flac/Tamarin (%)

Living conditions	Important	Of little importance	Unimportant	Don't know
Credit availability	26.19	62.70	11.11	-
Family relationships	53.17	46.03	0.79	-
Health conditions	51.59	46.03	2.38	-
Education level	37.30	58.73	3.97	-
Overall impacts on well-being	64.29	34.92	0.79	-

Source: MECLEP survey, 2016.

Finding 15: Migrant households generally seem to feel that migration has contributed to the improved well-being of the households with regard to credit availability, family relationships, health conditions and education levels.

5.5.15. Membership in an organization

Table 5.55 provides the percentage of households that are members of an organization. The percentage of non-migrant households that are members of organizations is much higher than that of migrant households. A higher percentage of non-migrant households are also members of credit or savings associations, women's or youth groups, and village/town councils.

56

5. Climate change—migration nexus: Findings from the survey and qualitative interviews?

Table 5.55: Migration and membership in an organization (%)

Type of organization	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Water/waste or fishermen's group	0.53	0.35	1.25	0.89
Agricultural cooperative	2.11	1.76	4.98	4.27
Traders association/business group	1.06	0.70	2.11	0.71
Credit or savings association	4.75	4.23	8.90	6.94
Religious group/organization	11.09	8.63	20.28	17.26
Political party/group	3.87	2.64	6.23	4.98
Sports, recreational, art or music group	6.16	5.46	11.74	9.79
Women's group/youth group	4.05	2.64	8.19	6.05
School/health committee	2.99	1.94	1.78	1.78
Labour union	2.29	1.41	5.69	4.45
Village/town council	5.11	2.46	7.83	6.05
Humanitarian or charitable organization	1.94	1.76	3.02	2.14
Other	0.18	0.18	1.07	0.53
Don't participate in any organization	72.18	77.74	57.83	62.28
Don't know/refused to answer	0.88	2.29	0.36	1.42

Source: MECLEP survey, 2016.

The above findings are consistent with those provided in section 5.5.13., that is, migrant households have a weak support network.

5.6. Migration and preparedness against future environmental hazards

In a recent article published in Nature, Palmer and Smith (2014) emphasize that an analysis of the current effects and impacts of global warming should focus on how these impact on people's lives and on how people adapt to the effects of climate change. Adaptation is defined as an "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (IPCC, 2007b). The survey respondents were shown five measures to prevent future hazards and were asked to choose the ones they currently adopt and the ones they adopted 10 years ago (table 5.56). If the migrant households have safely migrated and have used migration as an adaptation strategy against future hazards, it is expected that they would currently use more adaptation options than they would have 10 years ago. Thus, the proportion of migrant households who have adopted these measures today should be higher than the proportion 10 years ago.

Table 5.56: Households' preparedness against future environmental hazards (%)

Adaptation options	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Relocated to a safer place	13.91	2.64	5.69	0.71
Used safer building materials	7.04	3.52	7.83	3.74
Constructed physical barriers around house/farm (dykes, walls)	6.16	7.22	6.58	9.61
Diversified economic activities	0.53	0.53	1.25	0.89
Sent a household member outside the village to earn money	1.23	0.18	0.36	0.18
Other	4.23	-	4.80	-
None	68.96	82.92	74.20	79.36
Don't know/refused to answer	-	-	0.53	-

Source: MECLEP survey, 2016.

As shown in table 5.56, 13.9 per cent of migrant households have moved to a safer place during the last year, compared with only 2.6 per cent 10 years ago. This means that migration has supported migrants towards a safer environment. This figure is relatively lower for non-migrant households. About 7.8 per cent and 6.6 per cent of non-migrant households stated that they had used safer building materials and had constructed physical barriers around their house/farm, respectively. At 7.0 per cent and 6.2 per cent, respectively, these percentages are slightly lower for migrant households. The data show to some extent that the construction of physical barriers around the house was preferred more 10 years ago for both the migrant households (7.2%) and the non-migrant households (9.6%). The migrant households' slight decrease in the use of this measure to reduce hazards may be related to their movement. Migration also enhanced their use of safer building materials. More importantly, about 31 per cent of the migrant households have adopted some kind of measure to protect themselves against future environmental hazards.

Table 5.57: Preparedness against future environmental hazards – households in Port Louis (%)

Adaptation options	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Relocated to a safer place	15.03	3.18	2.62	1.16
Used safer building materials	5.49	2.89	7.56	2.03
Constructed physical barriers around house/farm (dykes, walls)	3.47	1.73	6.40	3.78
Diversified economic activities	-	-	-	0.29
Sent a household member outside the village to earn money	2.02	-	0.29	-
Other	5.49	4.62	5.52	5.23
None	68.99	86.99	77.91	83.43
Don't know/refused to answer	-	-	0.87	-

Source: MECLEP survey, 2016.

5. Climate change–migration nexus: Findings from the survey and qualitative interviews?

When comparing the survey sites, however, there are differences in the percentages of households that have taken measures against environmental hazards. A higher percentage of households stated that they had constructed physical barriers around their house as a measure to prevent environmental hazards in Bambous/Flic-en-Flac/Tamarin and in Rodrigues, compared with those in the Port Louis region. The differences are attributed to the fact that, in Port Louis, there is less possibility of constructing physical barriers around the houses given their structure and the lack of space to do so. The figures are higher for migrant households.

Table 5.58: Preparedness against future environmental hazards – households in Bambous/Flic-en-Flac/Tamarin (%)

Adaptation options	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Relocated to a safer place	21.15	1.92	22.92	-
Used safer building materials	14.42	5.77	10.42	3.13
Constructed physical barriers around house/farm (dykes, walls)	8.65	22.12	5.21	30.21
Diversified economic activities	-	0.96	-	1.04
Sent a household member outside the village to earn money	-	-	-	-
Other	-	0.96	-	-
None	62.50	72.12	60.42	68.75

Source: MECLEP survey, 2016.

Table 5.59: Preparedness against future environmental hazards – households in Rodrigues (%)

Adaptation options	Migrant households		Non-migrant households	
	2016	2006	2016	2006
Relocated to a safer place	4.24	1.69	0.82	-
Used safer building materials	5.08	3.39	6.56	9.02
Constructed physical barriers around house/farm (dykes, walls)	11.86	10.17	8.20	9.84
Diversified economic activities	2.54	1.69	5.74	2.46
Sent a household member outside the village to earn money	-	0.85	0.82	0.82
Other	4.24	3.39	6.56	2.46
None	74.58	80.51	74.59	76.23

Source: MECLEP survey, 2016.

Tables 5.56 to 5.59 show that there is an indication that migration has allowed the migrant households to be better prepared for future hazards through the measures listed above. Actually, migrant households are more likely to take measures than non-migrant households, indicating they are slightly better able to adapt. In fact, it is important to highlight that the difference in responses between the migrant households and the non-migrant households lies in the fact that they relocated to a safer place. This implies that the movement itself makes them better able to adapt.

Table 5.60: Barriers to adaptation options – migrant and non-migrant households (%)

Barriers	Migrant households		Non-migrant households	
	2016	2006	2016	2006
There was nothing they could do	12.53	7.16	13.67	9.11
Lack of money	10.74	5.88	5.76	5.04
Lack of skills/knowledge	1.02	0.26	0.24	0.24
Lack of other resources	1.28	1.53	2.64	0.24
Had other priorities	2.56	1.02	2.88	1.68
Wasn't their task	6.91	5.12	10.55	6.71
Didn't know what needed to be done	4.35	3.32	4.56	2.64
Other	-	0.26	0.24	0.24
No hazard, no adaptation needed	62.15	68.80	60.19	64.99
Government took action	2.56	1.79	4.80	0.48
Don't know	0.51	0.26	0.24	0.24

Source: MECLEP survey, 2016.

The inability to do something and a lack of money were the two responses that were chosen the most by respondents when asked why they didn't take any measures.

Finding 16: There is evidence that migrant households are more likely to adopt measures than non-migrant households in relation to mitigating environmental hazards; migration has allowed these households to better prepare themselves to face environmental and climatic events.

5.6.1. Views of key informants: Migration and planned relocation as an adaptation policy

Many of the key informants believe that migration can be used as an adaptation policy as a last resort for those people who are facing extreme weather events that are affecting their livelihoods. In most cases, the key informants were referring to the relocation strategy of vulnerable groups. Planned relocation refers to a process whereby a community's housing, assets and public infrastructure are rebuilt in another location (Jha et al., 2010:77). A relocation strategy is being considered by the authorities for some areas. However, such a strategy is not as easy as it may appear. Much of the coordination effort lies with the National Disaster Risk Reduction and Management Centre, which has a well-defined structure for managing disaster-related effects on people. Meetings at the municipal level suggest that there is a framework in terms of a flood or storm surge simulation exercise that is being applied on a regular basis. The Centre is comprised of representatives from various ministries, the Island Chief Executive from Rodrigues, the Mauritius Fire and Rescue Service, Mauritius Meteorological Services and NGOs, among others. A relocation strategy is also being investigated in depth by various authorities who are active and working closely with people at risk.

The key informants referred to the cultural aspect of a relocation strategy, whereby migrants lose cultural ties by moving to the new location. In Rodrigues, family ties are very strong and migrants are usually unhappy to leave the family to settle in another region. There are sometimes conflicts in the Bambous/Flic-en-Flac/Tamarin region relating to the integration of migrants with the local population. For example, the key informants referred to the fact that some foreign migrants did not really connect culturally with the local population in Bambous/Flic-en-Flac/Tamarin. Evidence of the conflicts between South Africans and Mauritians in Bambous/Flic-en-Flac/Tamarin is documented in Ramtohul (2016). In the same region, migrants that have been

relocated by the Government to an area known as "Model Integrated Village" have highlighted that the cultural setting was extremely different, as the migrants came from different regions and backgrounds, and had different habits and perceptions, making integration difficult.

The key informants also highlighted the consequences of migration in Rodrigues. In fact, those populations who decide to stay often suffer from the departure of their family members, which represents a decrease in the workforce and in the assets available to those who were forced to or decided to stay. The authorities may also reduce their attention in the place of origin and focus more on developing the place of destination. This finding is pointed out in Gemenne and Blocher (2016), who argue that there should also be a meaningful development strategy for the place of origin.

While the key informants expressed concern about the pressure migrants place on existing resources, such as infrastructure and public services (including education, water, transport and health), in the Bambous/Flic-en-Flac/Tamarin and Port Louis regions, it is important to recognize that migration is a natural phenomenon of human behaviour and urban planning must therefore take into account such behavioural change. For instance, greater emphasis should be placed on drainage systems due to the development of housing and land. If new residential areas are developed, with new pipe and drainage networks, the water will eventually end up in the old drainage system, leading to more flooding. In fact, according to the interviews, there is a perception that migration to Bambous/Flic-en-Flac/Tamarin has led to an increase in crime, drug abuse and other societal problems – a finding that is well documented in migration literature (Black et al., 2006; Gemenne and Blocher, 2016). This perception does not reduce the positive facets of migration as an adaptation strategy, but it does highlight that there is a need to increase economic opportunities for and integration of new arrivals, while at the same time countering prejudices and stereotypes not substantiated by evidence. As the survey has shown, migrant households are actually facing higher risks of insecurity and discrimination than non-migrant households and are thus at greater risk than the local population, despite the perception of authorities.

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6

6. Discussion: towards an action plan on migration as adaptation to environmental and climate change

6.1. Summary of findings

This section provides a summary of the findings from the household survey and the qualitative interviews. One main finding is that there is evidence that mobility leads to less exposure to environmental hazards, as people who migrated to the place of destination face less frequent environmental and climatic events compared with the rate they were facing before their move. The migrants eventually moved to a place of destination that exhibits a relatively lower risk of environmental and climatic events. There are regional differences though. For Bambous/Flic-en-Flac/Tamarin and Rodrigues, there are no major differences between the responses of migrant and non-migrant households regarding the effects of environmental and climatic events on their livelihoods, leading to the conclusion that the migrant households had been observing a similar prevalence and frequency of such events prior to their move. However, the change in the environmental conditions is the most noticeable in the Port Louis region, where the migrant households face fewer environmental events than they did before moving. Migration thus has a beneficial outcome.

There are four major environmental and climatic events that are likely to have an impact on migration: torrential rain, floods, droughts and cyclones. The occurrence and frequency of the four events vary at the regional level. Floods and torrential rain were the two major events identified by households in Port Louis and Bambous/Flic-en-Flac/Tamarin. Droughts, cyclones and torrential rain were identified as the events that have major effects on livelihoods in Rodrigues. Does migration have an effect on preparedness against future environmental

hazards? Indeed, there is evidence that migrants are more likely to adopt measures and to be better prepared after migration compared with non-migrants. Migration has therefore allowed households to better prepare themselves to face environmental and climatic events.

There are many diverse impacts of migration in the context of environmental and climate change. The survey reveals that most migrants seem to be part of lower income groups in the region of destination. The lower average household income reflects to some extent the vulnerabilities of the migrants. A high percentage of migrant households pointed out that migration was important for their income and employment and to a lesser extent trade and investments. A high percentage of migrants emphasized that mobility was important for credit availability, family relationships, health conditions and education levels and had a positive impact on well-being. Therefore, the more affluent seem to be able to adapt in situ, while the less affluent seem to be better able to adapt via migration. Migrant households are less likely to have an alternative source of income, leading to the conclusion that migration did not lead to increased incomes and opportunities.

The study reveals that there is a strong linkage between home and land ownership, debts and the use of formal banks/financial institutions. A higher percentage of migrants are in a debt situation than they were before they migrated, which coincides with their greater ownership of houses and land, and greater use of formal banks/financial institutions. In Rodrigues, a higher percentage of the respondents use informal financial institutions. However, to a large extent, there are no major differences between

migrants and non-migrants in housing conditions in terms of the materials used to construct roofs and exterior walls. In fact, in the Port Louis region, a large percentage of migrants reside in houses with metal sheeting, leading to the conclusion that they are in a very low income bracket. Moreover, because of their debt situation, migrant households are often particularly vulnerable. Migration is also seen to have a small but positive impact on access to good quality health care and daily access to safe drinking water and electricity in the three survey sites. However, some internal migrants in Rodrigues are facing lower access to water and electricity. The former is mostly due to droughts and the latter may be due to new development infrastructure.

According to the survey results, there has been a significant change in the support networks of the migrant households since migrating. Migration leads to a change in the support network from family to friends, neighbours and religious organizations. A high percentage of migrant households also feel that they have nobody to rely on for support. Migrants also find themselves less likely to join organizations such as traders associations, sports groups, women's groups or youth groups. The study reveals that it takes time for the migrants to feel at home at the place of destination, as many migrants are still not showing a sense of belonging. Migrant households eventually face challenges in relation to, among other things, security, discrimination and housing, which are strongly linked to general socioeconomic development and urban planning. From the findings described above, the study reveals an important conclusion: migration can be an adaptation strategy with many benefits, but at the same time it also involves risks. While people may use migration to better adapt to changes in environmental and climatic conditions, there is a need to minimize the challenges that they may face in terms of an increase in vulnerabilities in other dimensions such as discrimination, security and debt. The authorities, relevant stakeholders, media and civil society at large play a key role in making migration a successful adaptation strategy. This point is further developed in the next section, where policies and strategies are also proposed.

6.2. Policy implications for an action plan on migration in the context of environmental and climate change

A key message in a recent article published by Palmer and Smith (2014) in the journal Nature is: "We can no longer ignore feedbacks between global warming and how people respond." Indeed, this conclusion is relevant for migration in the Republic of Mauritius. Based on the findings of this study, it is clear that environmental and climatic conditions will have important interactive effects with the social, economic and other factors affecting migration. Evidence from the household survey shows that there is likely to be an outflow from the Republic of Mauritius where there is a perception of deteriorating environmental conditions, in terms of floods, torrential rain, droughts and cyclones, as well as changes in settlement patterns towards areas of low environmental risk. In fact, it is increasingly recognized that climate change will drive migration through new patterns and intensities of droughts, flooding and extreme weather events that would affect food security, health, degradation of land and freshwater resources, and livelihoods (Vörösmarty et al., 2010; IPCC, 2007a; Bailey, 2010).

There are three different strategies that can be followed by policymakers simultaneously and in coordination. The first one is to reduce the influence of climate change on migration. This strategy includes having policies to mitigate the effects of environmental and climate change (including climate policy), and policies to build resilience to climate change, especially for trapped communities. The second strategy is to recognize the opportunities inherent in migration in the context of climate change, emphasizing relocation as adaptation, building new cities and making migration work as adaptation. The third strategy is to plan for and respond to migration influenced by environmental and climate change, dealing explicitly with the different environmental risks, tensions and conflicts associated with migration.

There is therefore a need to mainstream migration as an adaptation option in the main policy framework, for example in climate adaptation plans, the land and housing planning system, disaster risk management and the building of new cities.

In small island developing States such as the Republic of Mauritius, reduced options for migration may cut off important forms of adaptation strategies and lead in the long run to a migration pattern in an unplanned and unpredictable manner. Migrants may move into hazardous areas that are at a high risk of landslides, flash floods, riverbank erosion or sea level rise (Foresight, 2011; Melde, 2015). Thus, migration may increase the vulnerability of people who have reduced options for migration. This conclusion corresponds with that of Massey, Axinn and Ghimire (2010), who state that environmental change and outmigration may also be connected to gradual deterioration of the climate and environmental conditions.

The Government may enhance the effectiveness of migration as one (among many other) climate adaptation strategy by reducing the environmental risks that migrants face in the area of destination. In destination areas, migrants may face challenges relating to economic integration, social cohesion and increased tension and conflict. The survey has clearly shown that migrant households face a degree of discrimination, a lack of social integration and perhaps tension. In cases where a relocation strategy is being adopted, migration can be an effective climate change adaptation strategy provided that there is a framework to ensure that the well-being of migrants is not affected in terms of income-generating opportunities, social integration and so forth.

To use migration as an adaptation strategy to climate change, it is necessary to (a) develop an integration strategy, whereby the well-being of migrants is not affected and (b) use a participatory approach involving civil society, NGOs and community-based associations. The integration strategy would enhance economic integration and social cohesion of migrants, and reduce conflicts between migrants and non-migrants.

Capacity-building (in terms of, for example, training and sensitization) of the relevant stakeholders at different levels (decision-making level, implementation, monitoring) is a precondition to make migration an effective adaptation strategy to climate change.

Migration in the context of climate change can lead to human mobility outcomes that present challenges to policymakers. In fact, there are currently significant operational and technical challenges in terms of sustainable urban growth, pressure on water, transport, education and health services, increased pollution in cities and waste creation, which are faced by city planners as a result of population growth and higher infrastructural needs of the population. Migration is one important factor to take into account. This observation was strongly emphasized by representatives from the municipal and district councils of the study sites.

Thus, there is a need for the relevant authorities to (a) design frameworks that address the probable outcomes of migration, and population growth more generally, at the very outset, and (b) take a proactive role rather than reacting after the migration outcomes occur. Given that migration is likely to play a vital role in increasing settlements, there is a need to design a land-use planning system that is tailor-made to the specific regions. One-size-fits-all planning can no longer be a development strategy given the different environmental and climatic conditions, as well as the social and economic characteristics of the populations and varied vulnerabilities, found in the different regions.

The survey has clearly revealed that there are people who are situated in areas under threat but who do not migrate. Referred to as a "trapped population", they wish to migrate but may not have the resources to move, and their livelihoods have been affected by climate change (Foresight, 2011). Trapped populations require particular attention. From the survey, there is a clear indication that the relevant authorities in the Republic of Mauritius are analysing areas that are at a risk of environmental hazards such as sea level rise, flooding and landslides. In recent years, these areas have been discussed at different levels of

government. While extreme cases of vulnerable populations have been discussed in the context of a relocation strategy, the Government should also realize there are varying forms and degrees of trapped populations.

It is recommended that the Government design a framework to assist trapped populations in general, as well as specific (that is, extreme) cases to mitigate the environmental hazards they are facing. The Government could provide trapped populations with assistance in terms of in situ adaptation options to prevent excessive internal migration flows, which could be detrimental to the livelihoods of the population (existent and migrants). For example, the outcome of torrential rain and floods (the two main climatic events identified in the survey and supported by reports on the island of Mauritius) can be mitigated through a well-defined and integrated drainage system. Problems related to droughts (as identified in Rodrigues) can be remedied through the use of a well-designed water system at the household or national level so that droughts do not lead to increased internal migration.

Human displacement has significant impacts on economic growth, human security and social protection. If it occurs within borders, it poses relatively routine operational challenges that can be managed through emergency planning. Migration can pose demographic challenges in both the areas of origin and the areas of destination; for example, the key informants emphasized that the elderly members of the migrant households are likely to remain at the place of origin and may therefore become more vulnerable and suffer as a result of the departure of their family members. Those who decided or were forced to stay may witness a decrease in the workforce and in assets, as is the most relevant in Rodrigues.

The population (especially women and the elderly) who decide to stay at the place of origin require support if the young members have migrated. The Government, in collaboration with community-based associations, could have a greater role to play to ensure the security, health and other aspects affecting the livelihoods of the population. This policy implication is particularly relevant in Rodrigues.

To design effective policies, it is important to continuously monitor migration in all its forms, internal as well as international. Thus, there is a need to collect information on migration flows on a regular and systematic basis. This data collection exercise may be used to forecast migration for the next 10 to 30 years at the district level. Such forecasting would help planners from the relevant authorities at local district councils and municipalities to integrate migration into disaster risk reduction and early warning systems and to organize the resources needed to develop infrastructure (such as education, health and security), especially in urban areas.

The Government could initiate a migration data and monitoring system to collect and disseminate information on migration flows on a regular and systematic basis to inform policy, especially on land planning, infrastructure development and resource (water, energy and so forth) management. Such a data management system could be easily conceptualized with the collaboration of Statistics Mauritius, which is involved in almost all data collection and statistics for the Republic of Mauritius. Such data could also be used by researchers employing advanced modelling techniques and by policymakers for development plans.

The need to migrate as a result of environmental degradation can be viewed subjectively. To prevent excessive migration flows that can impact on public services and infrastructure in an unsustainable manner, there is a need to systematically conduct research on migration and the climate change–migration nexus, and to disseminate the information to the population so that incorrect perceptions do not exacerbate migration.
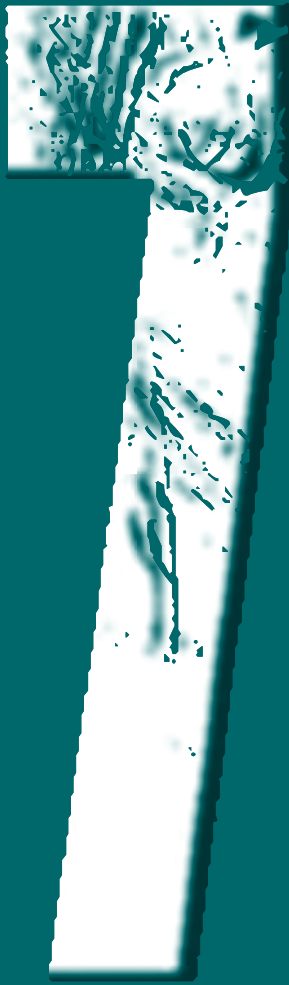
Research institutions and universities in the Republic of Mauritius should also encourage research on the different aspects of migration, including on the climate change–migration nexus. Migration studies would be relevant for policymakers, local authorities and land planners in designing development plans, as well as for NGOs and community-based institutions.

Rodrigues. © 2016 Riad Sultan.

7. Conclusion

Migration has been found to be a positive measure to adapt to environmental and climate change, with risks that need to be addressed (particularly risks for those who cannot move). It adds support to the claim that environmental and climate change, while not leading to massive inflows and outflows of migrants, is likely to interact with social, economic and other factors to change the patterns of migration, thereby posing new challenges and opportunities for policymakers to reduce the impacts of climate change. Therefore, not only the challenges but especially the benefits of migration need to be recognized in policy frameworks, which must move away from perceiving migration as a failure to adapt. Policymakers need to consider the fact that people react to a changing environment and landscape through migration, and may face different types of vulnerabilities at the place of destination. More emphasis should be placed on how to make migration a successful measure to adapt to environmental and climate change, with due consideration for other types of adaptation measures. Attention should focus on planning the future settlement of people and on closely scrutinizing the areas attracting inflows as well as those driving out migrants.

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Appendix

Defining the sampling concepts and main terminology

The survey is concerned with households; hence, the sampling element is a household. Households are the units of analysis, classified as either a migrant household (including at least one migrant) or a non-migrant household. The population for the survey is the total households in the three survey sites, namely, Port Louis (including Baie du Tombeau and Tranquebar), Bambous/Flic-en-Flac/Tamarin, located in the Black River district, and Rodrigues. *Region* and *survey* site are used equivalently in this report and any further classification of a particular region is referred to as a *subregion*. The sampling frame in this study is based on the primary sampling units, which is the total number of households in the three sites, and is further disaggregated into areas within each survey site. The population in each site was used to estimate the number of households. The main source of information that was used to design the sampling strategy is the 2011 census (Statistics Mauritius, 2012).

It is important that the sample size was fairly distributed among the survey sites and within each region so that the sample of respondents was representative of the population. The sampling units were selected from the population in such a way that the elements accurately portrayed the parameters of the total population. Random selection was key to the process, where each household had an equal chance of being selected. The random selection process was applied using GIS mapping with streets chosen randomly. A series of street names was given to interviewers, who had to select the houses at random. The first number was given to them based on a random selection. The interviewers were requested to

choose the fifth house sequentially on the same street or to choose another street on the list. It was ensured that the interviewers in the same subregion did not receive the same starting number on a particular street, and when choosing a street the interviewers were not to select the same street, as far as possible. If this happened, the interviewers were to choose the street either parallel or perpendicular to the one they had been allocated.

Sampling strategy and sample size for the survey

Since migration patterns are analysed in this report, it would be feasible to consider all of the regions where the survey was conducted to be the population frame. The information contained in table 4.1 in this report shows a starting point for the sampling strategy. The sampling strategy was to treat the three regions as one single unit. A two-stage sampling strategy was eventually adopted for the survey. In the first stage, to ensure that the sample contained sufficient elements of migrants and non-migrants in the three regions, a predetermined sample size was calculated. This stage involved defining a population frame for the sample and using the proportional allocation method to calculate the sample size for each survey site. Using the proportional allocation method as provided by Kothari (2004), the following formula was applied:

$$n_k = \left(\frac{N_k}{N}\right) \times n$$

Where N_k is the sample size at each k site, N_k is the population at site k and N is the total population for all sites. To apply the method at shown in the equation, a population frame for

each site was needed. This information was obtained from the census data of 2011 (Statistics Mauritius, 2012). Given that demographic dynamics are long term rather than short term, these are the most accurate data available for the study. From the census, the population in

Port Louis represents 66.5 per cent of the defined population of the study, while Bambous/Flic-en-Flac/Tamarin and Rodrigues represent 11.7 per cent and 21.8 per cent, respectively. Using these ratios, the initial sample size for each survey site is shown in table A.1.

Table A.1:Sample size – stratified proportional allocation rule (number of households)

Region	Sample size	Adjustment	Migrant households	Non-migrant households
Port Louis	676	690	345	345
B/F/T	120	200	100	100
Rodrigues	222	240	120	120

Source: Elaboration by author.
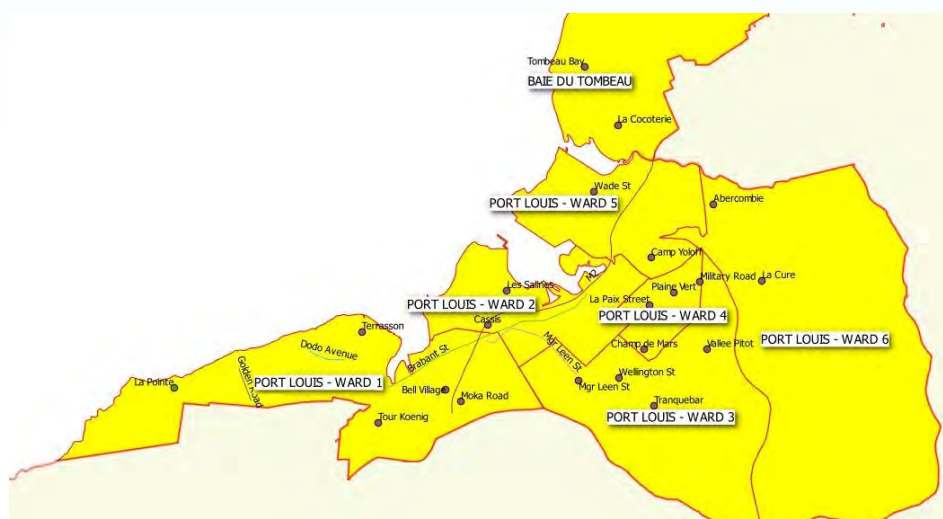*Note:* B/F/T – Bambous/Flic-en-Flac/Tamarin.

The first stage sampling led to a small size for the Bambous/Flic-en-Flac/Tamarin region. While it is optimal when viewed from an aggregate perspective, this sample size was insufficient to be treated as a separate unit of analysis for the study. Following a meeting with the Ministry of Environment, Sustainable Development, and Disaster and Beach Management, the Technical Working Group suggested adopting a sample size that could allow for a separate analysis at Bambous/Flic-en-Flac/Tamarin. Thus, following suggestions from scholars such as Sudman (1976) for when a group was to be treated separately, a sample of 100 elements for the group and 20 to 80 elements for subgroups was determined to be a reasonable size. The sample sizes for Rodrigues and Bambous/Flic-en-Flac/Tamarin were therefore increased to 240 and 200, respectively, so there were 120 more migrants in Rodrigues and 100 more in Bambous/Flic-en-Flac/Tamarin than what is required for a separate analysis. The sample size for Port Louis was rounded off to 690. Table A.1 shows the final sample size for the three survey sites.

The next step was to divide the regional sample into migrants and non-migrants. Table A.1 shows the final number of migrant households and non-migrant households for the survey in Mauritius and Rodrigues.

Sampling strategy at each survey site

After the sample size for each site was determined, the next stage was to implement the survey so that it was representative of the population at each site. Thus, the sample size was further broken down by subregion at each site so that it could be representative of the population size. For Port Louis, including the Baie du Tombeau subregion, the municipal ward classification from the census was used (the census provides information on six subregions in Port Louis, known as municipal wards). The boundaries of each ward are shown in figure A.1, which has been stylized for the purpose of this study.

Figure A.1: GIS mapping by subregion in the Port Louis region

Source: Elaboration by author.

The population distribution in Port Louis according to the municipal wards is shown in table A.2. Comparing the population who had a different address five years before with the total population from the census year, an estimate of the population distribution of migrants in each ward was calculated and used to further determine the sample size for Port Louis. Table A.2 shows the results. It should be noted that the migrant population as shown in table A.2 excludes those who had moved within the same district of Port Louis.

Furthermore, the census database provided the household size for each subregion in Port Louis. However, household size was not available for the separate migrant and non-migrant categories. Hence, average household size was used as an indication and the average household size for each ward was used in an attempt to estimate the number of migrant households. Table A.2 shows an estimate of the number of households in each ward.

Table A.2: Population distribution and total migrants in the Port Louis region

Subregion	Population distribution (%)*	Migrant population	Number of migrant households
Town of Port Louis – Ward 1	9.4	982	278
Town of Port Louis – Ward 2	9.8	900	260
Town of Port Louis – Ward 3	16.3	602	172
Town of Port Louis – Ward 4	14.0	503	148
Town of Port Louis – Ward 5	16.7	1,264	337
Town of Port Louis – Ward 6	22.8	1,282	348
Baie du Tombeau	10.9	2,024	506
Total	**100**	**7,557**	**2,049**

Source: Statistics Mauritius, 2012.
Note: *Total in this column may not be exactly 100 per cent due to rounding of numbers.

Comparing the population distribution with the number of migrant households reveals that Ward 3 and Ward 4 comprise a high percentage of the Port Louis population but have the lowest number of migrant households, while Ward 1 and Ward 2 have the lowest percentage of the population, but these two subregions have a relatively significant number of migrant households. Based on the population distribution and the number of migrant households, table A.3 shows the sample size for the subregions in Port Louis. According to the population distribution, Ward 1

and Ward 2 should have been allocated 64 and 67 respondents from the sample, respectively. The number was raised to 80 for these wards, while for Ward 3 and Ward 4, given the low number of migrant households, 70 respondents were allocated to each. Ward 5 and Ward 6 were allocated 120 and 160 respondents, respectively, to be consistent with the population distribution. Baie du Tombeau in turn was allocated a higher sample size given that the migrant population is relatively higher (table A.3).

Table A.3: Sample size for subregions of Port Louis

Subregion	Allocation based on proportional rule	Total sample size	Migrant households	Non-migrant households
Town of Port Louis – Ward 1	64	80	40	40
Town of Port Louis – Ward 2	67	80	40	40
Town of Port Louis – Ward 3	111	80	40	40
Town of Port Louis – Ward 4	95	70	35	35
Town of Port Louis – Ward 5	113	120	60	60
Town of Port Louis – Ward 6	155	160	80	80
Baie du Tombeau	74	100	50	50

Source: Author's calculations based on 2011 census data (Statistics Mauritius, 2014).

Following the same reasoning, the allocation for the Bambous/Flic-en-Flac/Tamarin region is shown in table A.4. As mentioned earlier, the average household size for each site was used to estimate the number of migrant households. The number of migrant households in Bambous is relatively higher than in Tamarin and in Flic-en-

Flac. Flic-en-Flac has the lowest percentage of the population in this survey site (10.8%). Table A.4 shows the settlements and the geographical distribution in the three subregions within the Bambous/Flic-en-Flac/Tamarin region. In each of the maps in figure A.2, the concentration of houses was identified by using Google Maps.

Table A.4: Population distribution and migrant populations in subregions of Bambous, Flic-en-Flac and Tamarin

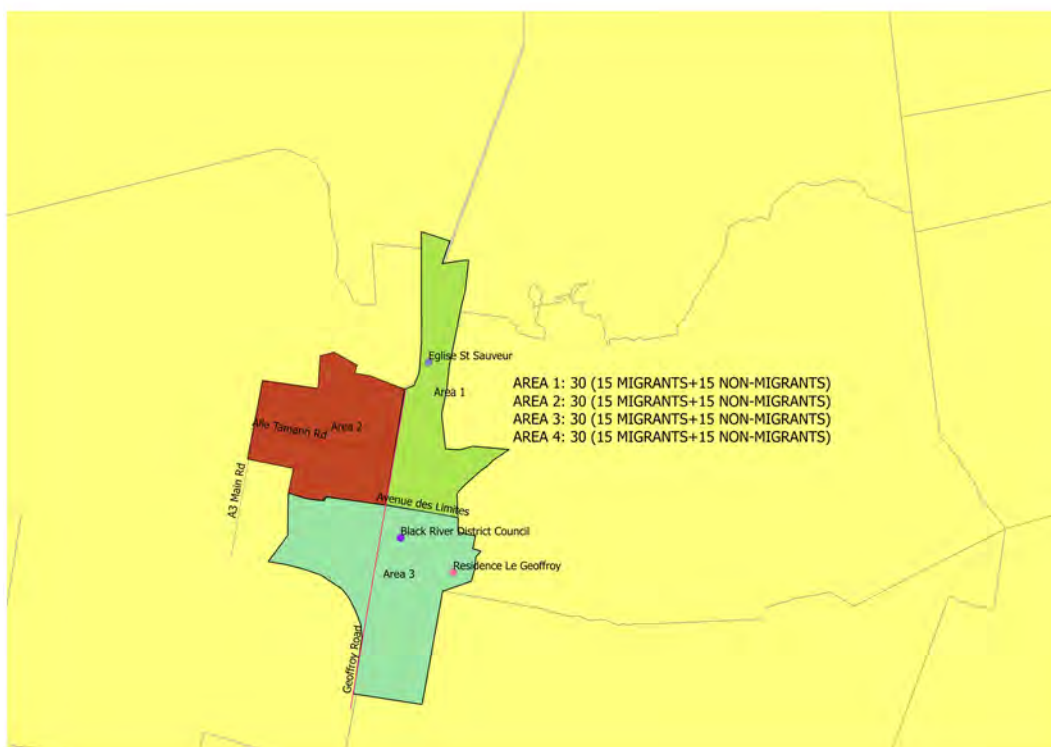| Subregion	Population distribution (%)	Migrant population	Number of migrant households	Sample size	Migrant households in sample	Non-migrant households in sample
Bambous	72.0	986	272	120	60	60
Flic-en-Flac	10.3	259	64	40	20	20
Tamarin	17.7	378	112	40	20	20
Total	100	1,623	447	200	100	100

Source: Author's calculations based on 2011 census data (Statistics Mauritius, 2014).

Each subregion was further divided into different areas where the interviewers were expected to interview the households. Thus, the survey site at Flic-en-Flac was divided into two areas, Tamarin into three areas and Bambous into four areas. Interviewers were allocated households proportionally in each of these areas. Each interviewer was allocated 20 to 25 questionnaires and directed to between 5 and 10 di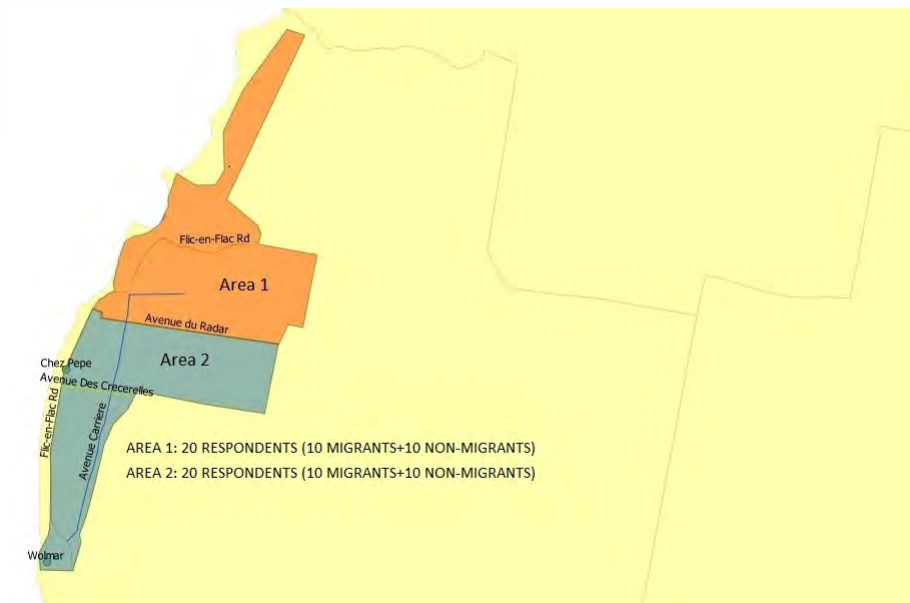fferent streets. On each street, the interviewers selected between two and five households following the nth house (the starting household number and the nth number were randomly selected). A map was used to help identify the street that had been selected at random. In order to find a migrant household, the interviewer continued moving until a migrant household (a household with at least one member who had moved to or out of that place within the previous 10 years) was found.

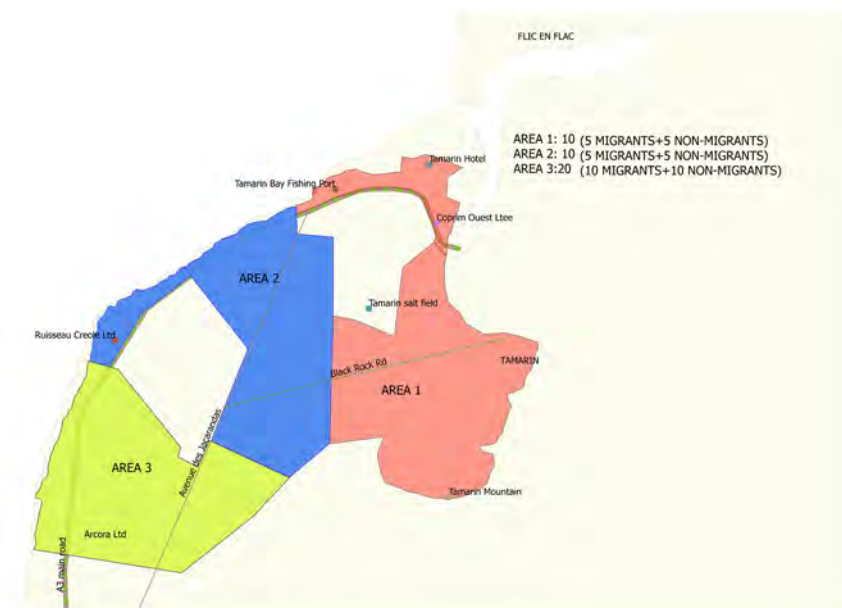**Figure A.2**: Survey areas in Bambous, Flic-en-Flac and Tamarin

Bambous

AREA 1: 30 (15 MIGRANTS+15 NON-MIGRANTS)
AREA 2: 30 (15 MIGRANTS+15 NON-MIGRANTS)
AREA 3: 30 (15 MIGRANTS+15 NON-MIGRANTS)
AREA 4: 30 (15 MIGRANTS+15 NON-MIGRANTS)

Flic-en-Flac

Flic-en-Flac Rd

Area 1

Avenue du Radar

Area 2

Chez Pepe
Avenue Des Crecerelles

Flic-en-Flac Rd

Avenue Carriere

AREA 1: 20 RESPONDENTS (10 MIGRANTS+10 NON-MIGRANTS)
AREA 2: 20 RESPONDENTS (10 MIGRANTS+10 NON-MIGRANTS)

Wolmar

Tamarin

FLIC EN FLAC

AREA 1: 10 (5 MIGRANTS+5 NON-MIGRANTS)
AREA 2: 10 (5 MIGRANTS+5 NON-MIGRANTS)
AREA 3:20   (10 MIGRANTS+10 NON-MIGRANTS)

Tamarin Hotel

Tamarin Bay Fishing Port

Coprim Ouest Ltee

AREA 2

Tamarin salt field

Ruisseau Creole Ltd

Black Rock Rd

TAMARIN

AREA 1

Avenue des Jacarandas

AREA 3

TAMARIN

Arcora Ltd

A3 main road

Tamarin Mountain

Source: Author.

Table A.5 shows the population distribution in Rodrigues, with an estimate of the migrant population and the number of migrant households. Six subregions were included in the survey.

Table A.5: Population distribution and migrant population in Rodrigues

Subregion	Population distribution (%)*	Migrant population	Number of households	Sample size	Migrant households in sample	Non-migrant households in sample
La Ferme	17.0	655	183	40	20	20
Maréchal	14.1	330	89	40	20	20
Saint Gabriel	18.4	502	136	40	20	20
Baie aux Huîtres	15.2	630	183	40	20	20
Port Mathurin	19.0	883	252	40	20	20
Grande Montagne	16.2	543	149	40	20	20
Total	**100**	**3,543**	**991**	**240**	**120**	**120**

Source: Author's calculations based on 2011 census data (Statistics Mauritius, 2014).
Note: *Total in this column may not be exactly 100 per cent due to rounding of numbers.

A simple allocation rule was applied to distribute the sample size of 240 to the six subregions, which means that 40 respondents were allocated to each subregion.