

**ASSESSING THE RELATIONSHIP BETWEEN CLIMATE CHANGE AND HUMAN MIGRATION IN THE
REPUBLIC OF MAURITIUS**

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ABSTRACT

Assessing the Relationship Between Climate Change and Human Migration in The Republic of Mauritius

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Small Island States are highly vulnerable to the impacts of climate change such as sea-level rise and coastal erosion among others. The Republic of Mauritius is a Small Island States in the Indian Ocean with a population of approximately 1.3 million people and is highly vulnerable to the impacts of climate change. The aim of this paper is to determine if there is a need to include human migration as a climate change adaptation strategy for the Republic of Mauritius. By analyzing the literature about the impacts of climate change on the island, this research assesses the adaptation strategies that has already been implemented or will be implemented on the island. This paper also explores the relationship between other Small Island States such as Kiribati and human migration as an adaptation strategy to climate change. Some of these small islands have officially implemented migration as an adaptation strategy to climate change and this has contributed to the assessment of the need for migration in the Republic of Mauritius. While it was determined that the Republic of Mauritius has a good adaptation strategy plan, such as the development of a coastal protection plan, yet internal migration will increase due to sea-level rise, coastal erosion, and storm surges. Therefore, in order to prevent forced and unplanned migration from taking place, there remains a need to implement a more relevant strategy geographically and ecologically in relation to human migration and climate change

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CHAPTER 1

Introduction

1.1 Thesis objectives

Climate change is a threat to many communities around the world. We are already seeing the impacts of climate change through the increased intensity of wildfires due to high temperatures in California (Wong-Parodi, 2020) while in other places such as India, they are experiencing an increase in precipitation which is destroying their crops (Chevuturi et al., 2018). The effects of climate change will be felt differently around the world (IPCC, 2014) meaning that climate change adaptation will be unique to different settings and contexts. For many islands and coastal areas, the main threats from climate change are sea-level rise and coastal erosion. Islands contribute the least to climate change (IPCC, 2014) but many of them are at risk of disappearing because of the increase in sea-level (Klepp, 2017). The risk of islands completely disappearing has prompted discussions about officially adopting human migration- be it internally or internationally- as an adaptation strategy to climate change. Although environmental factors have always played a role in causing people to migrate (Klepp, 2017), they were not taken into consideration until much more recently. With climate change increasing the risks of coastlines disappearing, as well as implementation of costly mitigation strategies, some islands have already adopted migration as an adaptation strategy to climate change (Kelman et al., 2017).

Being from the Republic of Mauritius, (an island nation in the Indian Ocean), this thesis will look at the societal impacts of climate change in the Republic of Mauritius and assess whether it is considering migration as an adaptation strategy to climate change.

This thesis will address the following three objectives:

1. Assess the vulnerability of the Republic of Mauritius with respect to climate change.
2. Assess the need for internal or external human mobility to be included in the climate change adaptation strategy for the Republic of Mauritius.
3. Investigate lessons from other Small Island States who adopted migration as an adaptation strategy.

1.2 Climate change

The occurrence of climate change has been confirmed by the IPCC's Fourth Assessment Report (2007). They have not only shown that the average temperature has been increasing for the past years but also shown that both natural and anthropogenic activities have contributed to climate change through computer models (IPCC, 2007). Today, discussions around climate change are not so much about whether humans have contributed to climate change or not but what can be done to mitigate the effects of climate change. The Paris Agreement, adopted by nations all around the world in 2016, aimed to keep the increase in temperature below 1.5°C above pre-industrial levels and to lower greenhouse emissions (UNFCCC, 2015). The Paris Agreement not only brought consensus among countries for the need to mitigate and adapt to climate change but also acknowledged that countries in the Global North contributed the most

to climate change (IPCC, 2014). There have been some questions raised regarding the predictions of the impacts of climate change, as predictions are often laced with uncertainties. However, with many places experiencing the effects of climate change firsthand, such as longer drought periods and frequent heatwaves, (Aghakouchak et al., 2014) the pressures to adapt to and mitigate the effects of climate change are felt more so today than ever before. The environmental impacts, as well as the societal impacts related to climate change are many and diverse, and hence the need to explore different adaptation strategies is pressing.

1.2.1 Environmental impacts of climate change

Climate change is going to have some serious environmental impacts globally, ranging from global warming to disruptive ecosystems to loss of species (Allen et al., 2018). We saw that the global surface mean temperature (which consists of the surface and ocean temperature) increased by 0.87°C for the 2006-2015 period (Allen et al., 2018) relative to the 1850-1900 period which is deemed as the pre-industrial period (IPCC, 2007). The global surface mean temperature has been increasing since the last century and some of the warmest years ever recorded since we started recording temperature was observed in the 21st century (IPCC, 2014; Perkins et al., 2012). Most of this increase has been attributed to anthropogenic activities such as burning of fossil fuel which releases greenhouse gases into the atmosphere (Haustein et al., 2017).

This increase in the global surface mean temperature is causing disruption in the precipitation cycle of the earth, with some places experiencing more rain while other places are experiencing severe droughts (Aghakouchak et al., 2014; Chevuturi et al., 2018). For example, in the past couple of years, California has experienced abnormally high temperatures and low precipitation which caused severe drought that led to massive wildfires (Marklein et al., 2020; Wong-Parodi, 2020). Unfortunately, extreme heat and weather events like this are predicted to be further exacerbated in the coming years because of climate change (Aghakouchak et al., 2014). The Asian-Australian Monsoon region, which consists of East Asia, India and Australia is also experiencing changes due to climate change with East Asia and India getting an increase in precipitation leading to severe flooding, while Australia is going through a severe drought (Chevuturi et al., 2018).

Climate change is also causing a decrease in snow cover in the northern hemisphere as well as causing the glaciers to melt (Allen et al., 2018). Glaciers that have been present for thousands of years are now melting at an unprecedented pace because of climate change (Briner et al., 2020; Jiang et al., 2020). The Greenland ice sheet, which is the second largest ice sheet in the world, is melting at a faster rate than predicted, with around 6100 billion tons of ice melted per century (Briner et al., 2020; Jiang et al., 2020). This is very significant because if the Greenland Ice Sheet melts completely, it will cause the sea level to rise up to seven meters, which will cause the disappearance of several coastal communities and species (Briner et al., 2020). Climate change is also causing the melting of the permafrost which consists of ground that stays frozen year-round and contains a large amount of carbon. If the permafrost is melted, it

will release even more greenhouse gas emissions in the atmosphere, and hence further accelerating climate change.

Moreover, the rise in ocean temperature is causing significant damages to the marine ecosystems and coral reefs (Allen et al., 2018). The increase in temperature has caused coral bleaching to happen, which is when the corals expel their algae and lose their color. Coral bleaching does not mean that the coral is dead but rather that they are more brittle and more prone to die. Coral reefs are very important for the coastal ecosystems as they provide food and shelter to many marine species as well as protect the shorelines from coastal erosion. Coral bleaching is a threat to many marine species and coastal communities as it will cause a decline in the marine biodiversity in that area. An increase in ocean temperature will also force many marine species to move towards higher latitudes where the water is cooler (Allen et al., 2018) which will further disrupt the marine biodiversity.

1.2.2 Societal Impacts of climate change

Climate change does not only impact the environment but also affects the economic and social life of communities around the world. The effects of climate change will be felt worldwide with millions of people being affected and a majority from the Global South and islands (IPCC, 2014). The increase in temperature, causing more frequent heatwaves and longer drought periods can cause serious harm to the health of people as well as to their means of living (Allen et al., 2018; Basel et al., 2020).

In many places, especially in countries in the Global South, agriculture is the main source of food and income for many people and this sector is facing a lot of challenges due to climate change (Torres et al., 2020). This is because agriculture vastly depends on the weather, but with climate change causing a change in weather patterns, it makes it harder and more expensive to farm. The change in weather patterns will cause a shift in growing seasons, which people will have to adapt to, which might not be an option for many of them (Marklein et al., 2020). Many communities that depend on agriculture in the Global South are vulnerable communities as they rely on agriculture for labor and as their main source of food (Torres et al., 2020). In various communities, getting involved in agriculture is often the way that people get out of poverty and have food security, but with climate change making it harder and more challenging to do so, there is a fear that people will get poorer and food insecure (Allen et al., 2018; Torres et al., 2020).

The rising ocean temperatures and coral bleaching also pose a problem for coastal communities. Many coastal and island communities depend on fishing, which is affected by climate change. The rise in ocean temperatures, as well as coral bleaching, causes a decline in the coastal marine species and it becomes harder to get the same catch that they used to (Allen et al., 2018; Kelman, 2017). Moreover, many of these coastal communities are affected by coastal erosion which is often directly linked to sea-level rise (Kelman, 2017). Sea-level rise is a real threat to many of these communities as it is threatening their land and housing. Many coastal communities will have to be relocated as a result of sea level rise as their house and land will be completely washed away (Basel et al., 2020; McNamara et al., 2016).

1.2.3 Mitigation and Adaptation Strategies

Mitigation and adaptation strategies to climate change need to be diverse and flexible, as the effects of climate change are unique in each setting. There is no one fit for all. However, global cooperation is needed for effective implementation of the strategies, especially when some of the most vulnerable communities, mainly islands, contributed very little to climate change compared to large countries in the Global North and South (IPCC, 2014). Therefore, the implementation of the Paris Agreement in 2016 by nearly 197 countries was a positive step, as it brought consensus on climate change (UNFCCC, 2015). The Paris Agreement is made up of Nationally Determined Contributions (NDCs) which is a plan produced by each country regarding how they will reduce their emissions. The good thing about NDCs is that each country gets to decide the methods and techniques they would like to use to reduce their emissions (UNFCCC, 2015). The Paris Agreement simply states they must reduce their emissions before 2030 and let each country pick the method that would work the best for them.

The Paris Agreement uses a mix of both mitigation and adaptation strategies to deal with the impacts of climate change. The difference between mitigation strategies and adaptation strategies is that mitigation strategies aim to tackle or eliminate the problem at the source such as reducing emissions of greenhouse gases (UNFCCC, 2015), while adaptation strategies look at ways that we can adapt to the impacts such as relocation because of sea level rise (McNamara et al., 2016). The Paris Agreement is a global response to climate change, but many actions are taken at the local level because local communities are the ones most impacted by it. The changes in weather patterns and decrease in biodiversity are felt more gravely in these

communities who depend on them for a living (Kelman et al., 2017). A lot of mitigation and adaptation strategies undertaken at the local level involve local communities. Basel et al. (2020) looked at community-based adaptation strategies implemented in some of the villages in the Solomon Islands and found that these strategies are very intersectional in terms that it looks at the environmental, social and economic impacts of climate change and involve the community in any adaptation or mitigation strategies being implemented which enhances its resiliency. Basel et al. (2020) showed the importance of local expertise in managing the resources and strengthen the need for inclusive community-based adaptation strategy.

1.3 Climate Change and Migration

1.3.1 Migration

Migrating has always been part of human history, be it for economic opportunities or to flee a disaster. Donato and Massey (2016) talked about the different mass migration periods that happened in modern times namely in the 1500s when Europeans colonized the world and in the 1800s during the industrial revolution where more people moved from Europe to settle in the Americas. However, mass migration of humans is more difficult now because of the systems of passport and visas and increase in border security. Donato and Massey (2016) argue that irregular migration did not exist 100 years ago as people were free to move across borders. However, in today's world with each country strengthening their borders, anything that does not fit within the system is irregular.

In the past couple of years, discussions around whether migration should be implemented as an adaptation strategy to climate change gained in popularity. Migration is defined by the International Organization of Migration (p.137, 2019) as “The movement of persons away from their place of usual residence, either across an international border or within a State”. The reasons as to why people migrate differ by person as there is not just one reason that cause people to migrate. Most of the people who migrate, do so because of work, family or to study while a small percentage migrate because of war, disaster, and persecution (IOM, 2020). In 2019, around 272 million people migrated internationally with around 164 million of them being migrant workers (IOM, 2020). We also have around 48 million people displaced internally with around 17.2 million people displaced because of climate disasters (IOM, 2020). The International Organization for Migration have seen the highest number of people displaced internally because of climate disasters in 2018 and it is predicted that as climate is changing, more people will be forced to move, with a majority of them migrating internally (UNFCCC, 2015). While some island nations such as Kiribati have fully implemented migration as an adaptation strategy (McNamara et al.,2016), there are still a lot of questions and concerns regarding this strategy.

1.3.2 Migration and the Environment

The Paris Agreement stated that countries most at risk of climate change shall be supported to implement adaptation strategies, but there is nothing specific regarding migration. There is even hesitation to officially adopt the term ‘climate refugee’ although we know that climate will force people to move (McNamara et al.,2016). The reason for that is because it is hard to know

if people are moving because of climate change or just for economic purposes. Although we know that in many vulnerable communities, a change in weather patterns can have a direct impact on their economic status (Jacobson et al., 2018), the relationship is often not as simple and clear.

Jacobson et al. (2018) looked at the relationship between climate change, internal migration, and food insecurity in North-Western Cambodia, where many people migrate from rural to urban areas. They found that climate change induces internal migration and contributes to food insecurity as it becomes more difficult to farm and hence people migrate to urban areas to find a job and gain money. However, because these communities are already underprivileged, migrating is done as a means to survive. They also found that because there is no proper support system for these communities, sending a family member away from home can lead them further into debt as they have reduced labor to work the lands and often borrow money to get things done.

In order to prevent this forced and sudden migration that induces poverty, proper migration strategies should be put in place by various governments whose communities are at risk. An example of that would be Kiribati, who is leading in the implementation of a concrete international migration strategy (McNamara et al., 2016). Kiribati is made up of 32 atoll islands which are all at high risk of disappearing because of sea-level rise and because of this risk, both the government and the communities agreed to be relocated and the motto 'migrate with

dignity' was implemented by the former president (McNamara et al., 2016) which involves international agreements with other countries such as Fiji and New Zealand in taking people in and working with communities to make the relocation as smooth and less disheartening as possible. However, this strategy implemented by Kiribati came to be after years of discussions and preparations. Another study done by Kelman et al. in 2017 looked at the perceptions of climate change and migration from the residents of the Maldives and Lakshadweep and found that people are very reluctant to leave their homes and relocate to a new place even internally. This is partly because climate change is seen as a future problem despite seeing changes in their surrounding environment and partly because of the attachment that people have with their local region and culture (Kelman et al., 2017). Migration is seen as a temporary solution more so than a permanent one.

There is a reluctance on behalf of several communities themselves regarding adopting migration- internationally or internally- as a permanent adaptation strategy to climate change as this would mean leaving everything they own and have known behind (Kelman et al., 2017). Moreover, unless relocation is done properly and with dignity, just like in Kiribati, there is a risk of not belonging to the new place or of losing one's culture and identity. Furthermore, it does not help that many studies regarding climate induced migration have been portrayed as a security issue rather than a humanitarian and environmental issue (Boas et al., 2019). Therefore, instead of countries working together to solve the problems, we have an increase in border security instead, even when most of the migration due to climate disasters are

happening internally (UNFCCC, 2015) and many of the vulnerable communities impacted are left on their own

While some island nations such as Kiribati have officially adopted migration as an adaptation strategy (McNamara et al., 2016), it took years of planning and discussions with many other nations. Some island nations might hesitate to adopt this adaptation strategy as it is one that requires more planning and work than in situ adaptation strategies. The following chapters will look specifically at the Republic of Mauritius and its adaptation strategies implemented to deal with climate change. Systematic searches of online database for peer-reviewed articles and government reports were conducted and key themes searched were “Mauritius”, “Climate Change”, “Migration”, “Small Island States” and so on. Chapter 2 will talk about the geographic, social, and economic information of the island nation as well as its vulnerability to climate change and briefly go over some of the climate change adaptation policies implemented. Chapter 3 will look at the history of migration in Mauritius as well as point out some vulnerable communities that have been identified in the past and further analyze the climate change adaptation policies and strategies implemented in Mauritius. Chapter 4 will look at the adaptation strategies implemented by some other island nations such as Kiribati and the Maldives islands and then compare these strategies to Mauritius and assess the need for internal and external mobility to be officially implemented as an adaptation strategy in the Republic of Mauritius. Finally, Chapter 5 will contain some recommendations as well as some highlights regarding the climate change adaptation policy in the Republic of Mauritius.

CHAPTER 2

The Republic of Mauritius

2.1 Geographic, Economics and Social Overview

The Republic of Mauritius is a group of islands located in the Indian Ocean close to Madagascar. It consists of the main island of Mauritius as well as Rodrigues and other smaller islands namely Agaléga, St Brandon, Tromelin and the Chagos Archipelagos. It has an area of 2007.8 km² with Mauritius being 1,868.4 km² and Rodrigues being 110.1 km² (Government of Mauritius, 2019). However, its' small land area is compensated by its' vast ocean territory that is nearly 2.3 million km² (Figure 2.1). This ocean territory is the Exclusive Economic Zone for the Republic of Mauritius and is deemed important for the economy, even though most of this zone is still unexplored (Lalljee et al., 2018). The economy depends mostly on tourism, manufacturing, and agriculture but the fishing sector contributes 1% to the GDP and employs around 11,000 people (Government of Mauritius, 2020).

The Republic of Mauritius has a population of 1.27 million (Statistics Mauritius, 2019), with most people living on the main island of Mauritius itself. This makes Mauritius a densely populated island with a population density of 654 persons per km². Rodrigues and Agaléga have a population of 43,538 and 274 respectively while St Brandon and Tromelin are inhabitable except for a small transient fishing population on St Brandon (Government of Mauritius). Mauritius is a multiracial society, with people from Indian, Chinese, African and European

decent all living together. Most of the urban areas are found in the central region of Mauritius, except for the capital city Port-Louis, which is a port city, while the rural areas are closer to the coast. The coastline of Mauritius is around 322 km long and many of the villages in Mauritius are located in close proximity to the coastline, which makes them at risk to coastal erosion as well as sea-level rise.

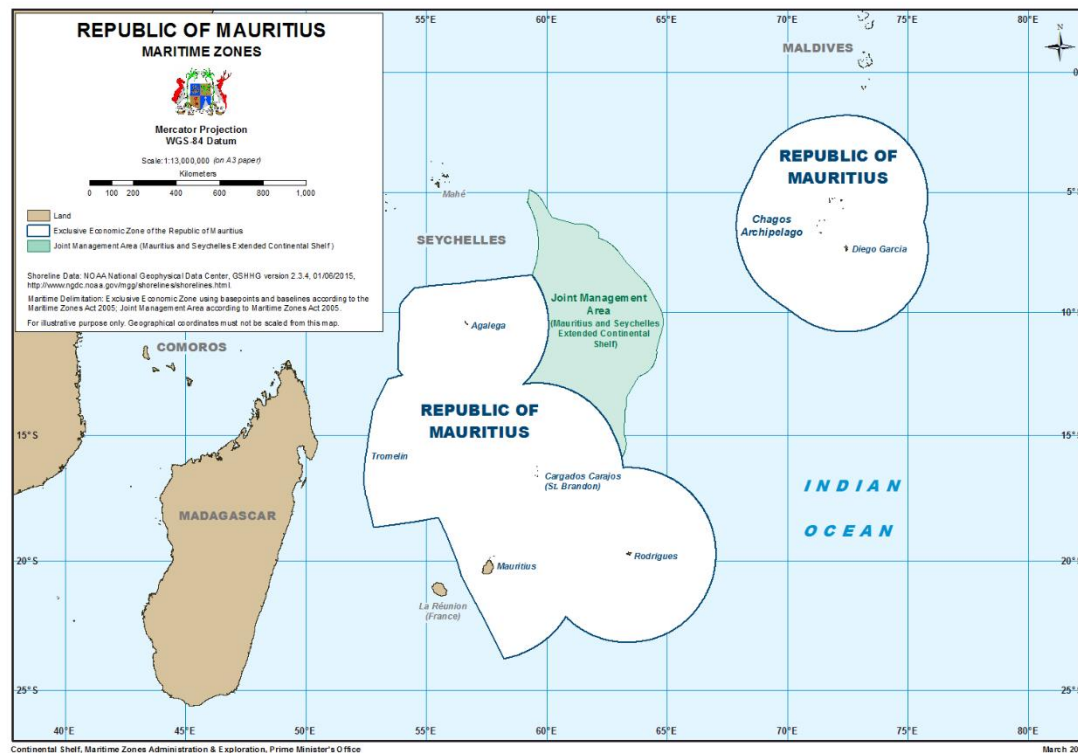


Figure 1: Map of the Republic of Mauritius showing the Exclusive Economic zone (Source: Prime Minister's Office, 2016)

2.2. Mauritius and Climate Change

The Republic of Mauritius is considered a Small Island States (SISs) and therefore more at risk to sea level rise and coastal erosion. Its location in the Indian Ocean also makes it more vulnerable to increased intensity of tropical storms as well as drastic changes to the rainfall patterns. The

World Risk Report placed Mauritius in 53rd place when it comes to having a high disaster risk (World Risk Report, 2020). Even though Mauritius has a high elevation where most of the population live, 20% of the population lives in coastal areas with 6% living within 5m above sea level which is roughly around 75,000 people. This put them significantly at risk as they are close to the shoreline (UN-OHLLRS, 2017). From the changes in rainfall patterns to more intense cyclones, the impact can be felt all around the island.

2.2.1 Temperature and Rainfall

The year 2019 was deemed as the second warmest year after 2016 by the World Meteorological Organization, but for Mauritius, it was the warmest year recorded since 1960s. Temperature is recorded by stations across the island and the mean temperature for 2019 was 1.1°C higher than the 1981-2010 normal with an average mean temperature of 24.5°C and a maximum temperature of 35.5°C recorded in December 2019 which is the highest temperature recorded since 1960s (Mauritius Metrological services, 2019). The mean temperature of the island has been increasing since the 1960s as shown in Figure 2 and both the days and nights experienced warmer temperature with nights warming faster than days. The central part of Mauritius also experienced warmer temperatures, which is unusual as it is usually the coolest part of the island.

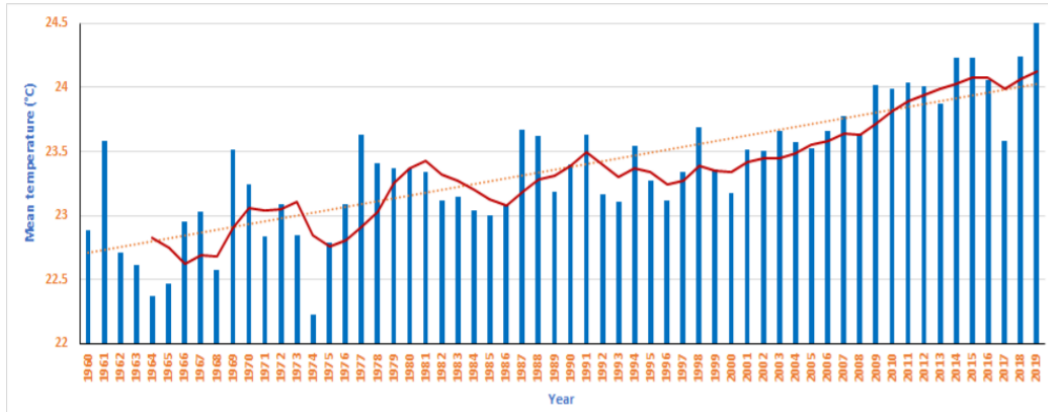


Figure 2. Mean Temperature trend for Mauritius from 1960 to 2019 (Source: Mauritius Meteorological Services, 2020)

The ocean temperature is also increasing, which is causing coral bleaching in the lagoons of Mauritius. In some regions of Mauritius, most of the corals have been bleached already, such as at Ile aux Benitiers with around 56% of corals that has been bleached which can lead to a decrease in fish population (Government of Mauritius, 2012; Japan International Cooperation Agency, 2015). Around 80% of the corals are predicted to be bleached as the ocean gets warmer and more acidic, which will cause a decline in fish population. This will have a big impact on the coastal communities who depend on fishing as their livelihood.

The rainfall patterns have also been changing over the past decades with a long-term decreasing trend in annual rainfall over Mauritius and Rodrigues. Mauritius experiences most of its rain during the summer season, which lasts from November to April, and while it usually experiences its first rain during the first week of November; in 2020, the first rain was expected to be in December and in some previous years, the first rain did not happen until January, which is well after the usual time (Gemenne & Magnan, 2010; Mauritius Meteorological

Services, 2015). There is also a longer dry period between the seasons with more consecutive dry days and decrease in rainy days (Mauritius Meteorological Services, 2015). Mauritius is predicted to be a water-stressed country by 2025 (UN-OHLLLS, 2017) with a decrease of 13% of the water resources by 2050, which has the potential for social unrests and will impact the various economic sectors such as agriculture and tourism.

Although there are less rainy days, there is an increase in heavy rainfall activities in the period of February to March, which often leads to major flooding and interferes with socio-economic activities. Mauritius experienced its deadliest flood on March 30th, 2013 in the capital city of Port-Louis, when unexpected high amount of rain led to flooding. The city received 152mm of rain within 3 hours that flooded many homes and roads and killed 11 people. Although the cause of flooding has been attributed partly to the mismanagement of the drainage system in the city (Jhinghut & Proag, 2014), heavy rainfall activities are becoming more frequent.

2.2.2 Tropical cyclones and storm surges.

Mauritius is located in the South West Indian Ocean Basin which on average experiences approximately nine to eleven cyclones every year (Gemenne & Magnan, 2010; Muthige et al., 2018). There has been no increase in the number of cyclones in the region in the past years, however, it is predicted that the number of cyclones will decrease in frequency but will become more intense (Muthige et al., 2018). The Mauritius Meteorological Services showed that more cyclones in this region are reaching tropical cyclone strength, having winds above 165km/h. The

increase in ocean temperature is also making it easier for cyclones to intensify, posing danger to the island (Mauritius Meteorological Services, 2015). Cyclones are the main natural disaster that have the highest impact on the island of Mauritius, and they disrupt the social-economic activities at least for five to six days per year. Cyclones not only pose a threat to the coastal population but to the general population in general as cyclones can cause a lot of damages to agriculture and buildings (Gemenne & Magnan, 2010; Government of Mauritius, 2012).

Furthermore, with an increase in storm intensity, rougher seas and increase in storm surges are predicted, which will further damage the coastline, the coral ecosystems present in the area as well as the economy (Government of Mauritius, 2012). For example, all port operations had to be stopped for 21 days in 2013 due to bad weather conditions which led to a loss of around MUR 3.9 Billion (Government of Mauritius, 2016)

2.2.3 Sea level rises

Small Island States are at extreme risks of sea-level rise and Mauritius is no exception. Both Mauritius and Rodrigues have indicated a rise of 5.6mm/year for the period of 1987-2014 which is well above the global average of 3.2mm/year (Government of Mauritius, 2016; Ragoonaden et al., 2017). Sea level rise plays a significant factor in beach erosion. Around 17% of the beaches around the island were found to be suffering from coastal erosion (Japan International Cooperation Agency, 2015). The erosion of beaches not only poses a threat to the various coastal communities present around the island, but it will also impact the tourism industry. The beaches play a significant role in the industry and their loss can cause a deficit of

\$50 million (Government of Mauritius, 2012) to the tourism industry which will then impact the economy. Moreover, this will also affect the agricultural sector as it led to the salination of the water use for irrigation as well as cause destruction of agriculture along the coast. However, with 6% of the population of Mauritius living within 5m of coastal area (UN-OHLLS, 2017), the impacts of sea-level rise and coastal inundation will be much higher with impacts on infrastructure such as roads as well as buildings (Government of Mauritius, 2016.) The projection for sea-level rise by 2050 is estimated to be between 1.38m - 1.62 m and between 3.28m - 4.48m by 2100.

2.2.4 Adaptation and Mitigation Strategies

Mauritius has not been idle regarding these impacts, however, and has dedicated lots of time and effort into developing adaptation and mitigation strategies. The government created the National Climate Change Adaptation Policy Framework in 2012 that aims to find solutions to the various problems that climate change will cause to the different sectors in Mauritius. The framework outlined the different sectors such as Agriculture, Fisheries, Tourism and so on and created a list of strategies and action plans for them. The Government of Mauritius has also created a National Disaster Risk Reduction scheme that outlines the various steps to take to respond to a disaster as well as pass the National Disaster Risk Reduction and Management Act in 2016 that set up a The National Disaster Risk Reduction and Management Council. Moreover, The Republic of Mauritius was among the first countries to sign the Paris Agreement and has outlined their Nationally Determined Contributions (NDCs) and work in collaboration with UNEP and UNFCCC for the development of strategies and report.

Several measures have already been implemented on the coastline to protect infrastructure such as roads by building wave breakers at sea and flood walls. Some coastal roads have also been elevated or relocated in order to adapt to sea-level rise or coastal erosion (Government of Mauritius, 2016). Sea walls have also been built in many coastal villages to prevent coastal erosion as well as encourage the planting of mangroves as natural defendant against coastal erosion. Moreover, new buildings being constructed on the coast need to be at a distance of 30 meters from the coastline which has changed from 15 meters. Mauritius is also searching to invest more in renewable energy such as solar, wind and tidal power and to develop this sector that can create a lot of jobs for different people.

However, despite all these adaptation and mitigation strategies in place, there is still a lack of information regarding the coastal communities. Most of the adaptation and mitigation strategies in place for the coastal areas has a huge focus on the buildings and, infrastructure such as roads as well as the beaches; there is not a lot of focus on the communities themselves. Although both the government and some of the coastal communities such as the one in Rivieres Des Galets, thought about relocation as a way to adapt to climate change (Gemenne & Magnan, 2010), this strategy is not included in their official plan and there are a lot of uncertainties for these affected residents. The next chapter will focus on the relationship between relocation, migration, and the environment in the context of Mauritius.

CHAPTER 3

Mauritius and Migration

3.1 History of Migration and Mauritius

Migration has always been a part of the history of the Republic of Mauritius. From being first discovered by the Arabs to then being colonized by the Dutch, French and British respectively, the population of Mauritius has been evolutionary. Mauritius did not have an Indigenous population and the first settlement was created by the Dutch in the 1630s, but the harsh weather conditions, such as frequent cyclones, made it hard to adjust and they eventually left the island in the 1700s (Floore & Jayasena, 2010; Miles, 1999). The island was then occupied by the French until 1810 when they then lost Mauritius to the British. During the French regime, enslaved people were brought in from the nearby African countries such as Madagascar and Mozambique, as well as artisans from India. When the British took over in 1810, they allowed many of the French residents to stay on the island along with the enslaved people. When slavery was abolished in 1835, the British brought over indentured labourers from India as well as merchants from China and the Middle East (Kothari, 2013). Due to the constant flow of people in and out of the island over the decades, the population ended up being a mix of descendants of indentured labourers, Africans, Malagasy, Europeans as well as Chinese and Middle Eastern people and became quite a heterogeneous population with inter-ethnic marriage happening frequently and an interconnectedness with the food, culture and religious beliefs (Boswell, 2006). However, despite the heterogeneity of the population, there is still a significant level of ethnic homogeneity with ethnicized politics and separate ethnic practices. Moreover,

the remnant of the colonial racial hierarchy is still present in the population as many of the wealthiest people on the island are descendants of colonial administrators while some of the most vulnerable communities are descendants of enslaved people and indentured labourers from India (Boswell, 2006).

In the years following Independence in the 1960s, population changes in Mauritius were mostly due to an increase in fertility rate and decrease in mortality rate rather than because of migration (IOM, 2014). However, internal migration and inter-islands migration started to happen within this period as well, with people either changing address within the island or moving from one island to another: mostly from Rodrigues to Mauritius as well as from the island of Chagos Archipelagos to Mauritius (Boswell, 2006). Moreover, to encourage development and attract investors, temporary status of residence or permanent residence were given to foreign investors who met certain requirements, which caused an increase in people moving into Mauritius. Mauritius also has several international work agreements with various countries such as Canada and Bangladesh that gives Mauritians the opportunities to work abroad as well as make it easier for migrant workers to come and work in Mauritius. Figure 3 shows the growth in the number of foreigners who came to stay and work in Mauritius between 1970 and 2020. This was due to an increased demand for skilled workers and factory workers in the 2000s, which was being met by foreign workers coming from India, China, Bangladesh and Sri Lanka, as many Mauritians were reluctant to work for them (IOM, 2014; Sultan, 2017). Moreover, Mauritius also attracted a lot of foreign investors who eventually stayed.

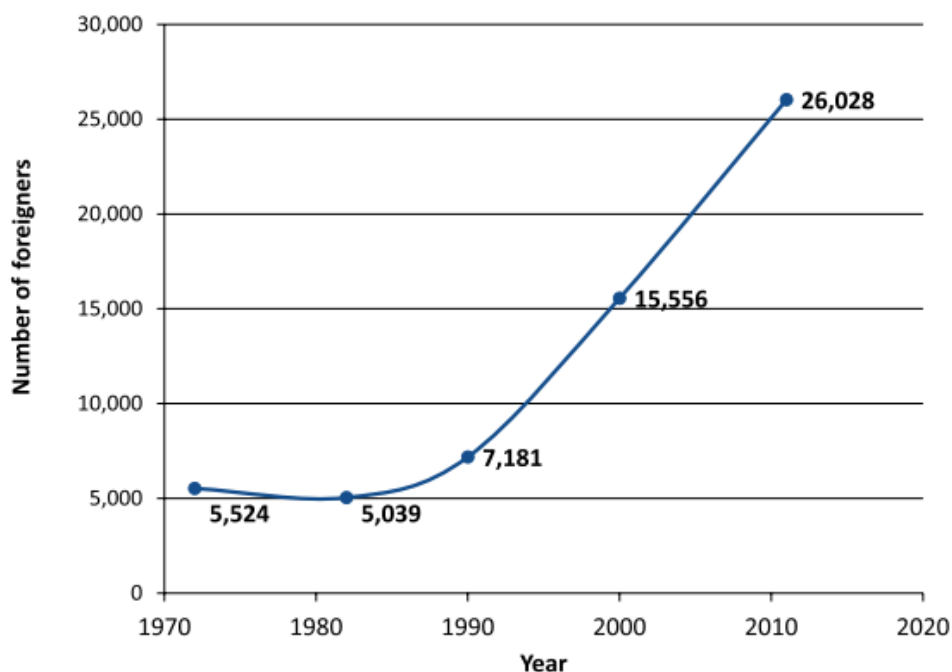


Figure 3. The growth of the foreign population from 1983 to 2011 (Source: IOM, 2014)

3.1.1 Emigration

However, Mauritius also went through a period where its citizens were leaving the island. There was an increase in net emigration prior to independence due to a fear of economic recession as well as political instability. Many people who were opposed to Mauritius gaining its independence, emigrated to other countries such as Australia, the UK, France and even Canada. The time period between the 1980s and 1990s also caused many Mauritians to emigrate which was partly encouraged by the State to reduce demographic pressure and due to the lack of employment opportunities (IOM, 2014; Sultan, 2017). This caused Mauritius to have a good part of its population living in the diaspora which kept increasing in the past 10 years. While even nowadays, many people still leave the countries seeking better job opportunities-

especially when there are work agreements between the Government and other countries such as France and Canada-many also leave to pursue higher education. There is a good portion of people who leave the island to either pursue higher education or for job purposes because of the unemployment rate being around 7% (World Bank, 2020; Gemenne & Magnan, 2010). While some of them eventually decide to return to Mauritius, others decide to stay where they are (Ramanan et al.,2018).

Migration has formed a large part of the history of Mauritius, and the reasons behind people migrating have always been attributed to educational and economical purposes and not much has been attributed to environmental reasons. There is not much focus on the ways that environmental degradation can cause people to migrate internally despite the fact that the coastal zones of Mauritius are highly vulnerable to climate change. The concept that environmental degradation can cause economic disruption and hence cause people to move has not been fully explored in the case of Mauritius. However, it was pointed out that the coastal communities are the most affected by environmental degradation, and that in most cases, they have no means to move. There are various adaptation strategies that have been implemented by the Mauritian Government to help coastal communities adapt to environmental changes and in some cases, relocating coastal communities' further inland is considered (Gemenne & Magnan, 2010).

3.2 The vulnerability/adaptation ratio of the Republic of Mauritius regarding climate change.

3.2.1 Vulnerable areas and communities in Mauritius

Being a Small Island State, Mauritius is highly vulnerable to environmental disasters and climate change impacts. Vulnerability is defined by the IPCC (2014, p. 5) as “the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt”. Several reports and studies conducted in Mauritius have helped identify the vulnerable communities across the island and document their experience and resiliency when it comes to climate change. While many of the vulnerable communities are found along the coast of the island due to higher exposure to sea-level rise and coastal erosion, it was found that some of the inland communities are also at higher risk to environmental disasters such as flooding and droughts. The four main types of disasters that mostly impact the communities in Mauritius are cyclones, flooding due to torrential rains, droughts and erosion.

3.2.1.1 Coastal Regions and Communities

A project undertaken in 2015 by Japan International Cooperation International Agency, in collaboration with Mauritius studied 20 coasts across the islands to come up with a coastal conservation plan. The project identified 12 coasts that are at high risks of long-term coastal erosion and in dire need of a coastal conservation plan as they have a coastal erosion rate above 0.2m/year. The coasts at risk are scattered across the islands and are Pointe aux Piments, Mon Choisy Pointe aux Cannoniers, Quatre Cocos, Trou d’Eau Douce, Ile aux Cerfs,

Pointe d'Esny, Saint Felix, Le Morne, Flic en Flac, Albion, and Pointe aux Sables (Japan International Cooperation Agency, 2015). It was also found that around 12.2 km² of land and around 60/80 km of road is exposed and at risk of inundation due to the coastal erosion and wave overtopping. Along with roads and infrastructure, around 22,000-63,000 people along the coast can be impacted by coastal erosion and inundation (Japan International Cooperation Agency, 2015; Sobhee, 2016).

Several studies highlighted the vulnerability of communities at Riviere Des Galets, Grand Sable and Quatre Soeurs when it comes to coastal erosion and flooding. This is because many of the houses and infrastructure are found in close proximity to the coast, as they were built before regulations were implemented (Duvat et al., 2020; Gemenne & Magnan, 2010). Hence, they are more at risk of wave overtopping, flooding, and coastal erosion. Moreover, many of these communities are comprised of low-income households which increase their vulnerability index and lowers their ability to adapt to disasters (Gemenne & Magnan, 2010; Sobhee, 2016). Many of the inhabitants in these regions which mostly comprised of African and South Asian ethnicities, are aware of the environmental changes and the increased risk they are facing by staying there. However, for many of them, moving is not an option as they have no means to do so and nowhere else to go (Sobhee, 2016; Sultan, 2017). Moreover, another problem that coastal communities are facing other than erosion and flooding, is saltwater intrusion, which can prevent crops from growing and lead to water being rendered undrinkable (Gemenne & Magnan, 2010). Some coastal communities rely on agriculture as a means of income instead of fisheries, as the region provides excellent conditions for crop growth. One such community is

the one at Petit Sable found in the south-east of Mauritius which mostly consists of planters. However, due to saltwater intrusion and coastal flooding, they find it harder to plant and maintain their livelihood (Gemenne & Magnan, 2010; Sobhee, 2016).

3.2.1.2 Inland Regions and Communities

Other than coastal communities, some of the inland communities are also at risk due to flooding and droughts. Some of the regions highlighted by the studies consist of the suburbs of Port Louis – the capital city of Mauritius- namely Tranquebar and Cite La Cure where the residents are at high risk of flooding because of heavy rains (Chacowry et al., 2018). These regions consist of low-cost housing and are also occupied by squatters who live in homes usually made of metal sheets without the proper documentation. Flash floods from torrential rains and overflowing of the River Lataniers that goes right through Cite La Cure river are constant in these regions. While the authorities are aware that these areas are at high risk of flooding, they are neither equipped nor have the means to move the residents to another area nor are the residents able to move by themselves. While there are some other urban regions that also experience flooding due to river overflowing across the islands, these two regions are the main ones as they experience it more often than the other places. In some cases, some people have not yet recovered from the previous flood, that their space is flooded again (Chacowry et al.,2018). Moreover, there is a sense of abandonment felt by the residents of these regions as often in the case of disasters, the authorities show up after a long period of time and no solutions have been provided despite the frequency of the problem (Chacowry et

al., 2018; Sobhee, 2016; Gemenne & Magnan, 2010). The local authorities have been considering relocating the inhabitants despite the costs but there is a pushback against this idea, mainly due to a lack of trust in the authorities, but also a lack of communication between the authorities and the residents.

3.2.2 Government response to climate change

The Government of Mauritius is aware of the vulnerability of the Republic of Mauritius in regard to climate change and is very active in implementing mitigation and adaptive strategies in relation to climate change. It implemented the National Climate Change Adaptation Policy Framework in 2012 which established a plan and a set of actions that the island would take in order to combat climate change. The document highlighted the way the different sectors would be affected by climate change and the actions that should and can be taken by the government. This Framework set up a National Climate Change Adaptation Policy as well as a Climate Change Adaptation Strategy and Action Plan. Moreover, the Government of Mauritius, with the help of the Japan International Cooperation agency (JICA), worked towards identifying the coasts that are more at risk and developed a Coastal Conservation plan. This project highlighted the different problems that the coasts of Mauritius are facing (mainly coastal erosion and a lack of management and planning) and suggested solutions to the Mauritian Government, some of which were implemented such as flexible revetment at Grand Sable as well as planting corals along some of the beaches to prevent coastal erosion. This project also led to the creation of better beach management plans along with the provision of more technical guidelines to the government for the better management of the coastal zone.

A National Disaster Risk Reduction and Management Bill was implemented in 2016 to increase the government's ability to respond to natural disasters such as cyclones and flooding. The Bill aimed to prevent and reduce the risk of disasters and enhance the recovery and rehabilitation processes post disasters. Mauritius also signed the Paris Agreement in 2016 and worked with UNFCCC to establish its Nationally Determined Contribution (NDCs). The NDCs for Mauritius focused on being a more sustainable island by reducing the dependence on fossil fuel and investing in renewable energy as well as increase disaster preparedness and enhance the coastal infrastructure. There was also a Third National Communication Report that was prepared by the Government for the UNFCCC to highlights their progress regarding their mitigation and adaptation strategies, where more support is needed and identified the gaps that need to be filled. Coastal setbacks were also pushed to 30 metres from 15 metres for some beaches which means that any new buildings being constructed along the coast need to be at least 30 metres from the coast while for some the Coastal Setbacks were pushed to 50 metres (Japan International Cooperation Agency, 2015). The government has also implemented some sea walls along some coasts as well as planted mangroves to protect coastal zones. Moreover, they also constructed a refuge centre in the higher plains of the area of Quatre Soeurs to prepare for the need of people to evacuate the region if needed in the case of landslides or storm surges (Government of Mauritius, 2016). The government also implemented a Climate Change Bill in 2020 that will set up an Inter-Ministerial Council on Climate Change as well as set up a Department of Climate Change that will be responsible for developing policies and programmes related to climate change (The Climate Change Bill, 2020).

However, most of the studies concentrated on the impacts of climate change on biodiversity, conservation, and infrastructure and not much on the social and human impact. The project done by the Government of Mauritius and Japan International Cooperation Agency highlighted the physical impacts of coastal erosion such as loss of beaches, impact on coral reefs and damages to infrastructure but did not focus on the human and social impacts of coastal erosion. Nevertheless, the government recognised that some communities might need to be relocated and is considering it, but they are struggling to implement such strategy mostly because of the cost and logistics (Gemenne & Magnan, 2010; Sobhee, 2016). Moreover, some communities are reluctant to move such as the ones at Riviere Des Galets and Cite La Cure which makes it harder to relocate them. (Chacowry et al., 2018; Sobhee, 2016). Furthermore, a report done by the IOM in 2010 regarding the possibility of migration in Mauritius identified some uncertainties and questions from the communities regarding the relocation plan of the government which still that has not been addressed. Some communities noted that there is a lack of communication between them, and the government and they are not made aware of any relocation plans (Gemenne & Magnan, 2010; Sobhee, 2016).

However, the Government successfully relocated 11 households from Quatre Soeurs to Camp Ithiers because of landslides (Sobhee, 2016) and considered relocating the residents of Riviere Des Galets due to their high vulnerability risk but they were not successful in doing so. From the residents' point of view, they have a lot of questions and uncertainties about the possibility of relocation that has still not been answered such as if they will be compensated or not, where

will they be moved and what will happen to their livelihoods as they are mainly fishers (Gemenne & Magnan, 2010; Sobhee, 2016). The government did a perception survey asking the residents of Riviere Des Galets if they were willing to relocate to which 49% said they were willing to move without conditions while the other ones had some conditions that needed to be met and 8% did not want to be relocated and they mostly were elders (Sobhee, 2016). This showed that some communities are aware of the fact that they live in a high-risk zone and would want to move to a safer place but often do not have the means to do so unless assisted by the Government. The community at Rivieres Des Galets may be considered a trapped community which is defined as a community “who stayed in their current location even if they might have wished to move” (Sultan, 2017.p.31) and are involuntary immobile. Most of the people in Riviere Des Galets is aware of the dangers they are in by staying in this area but they cannot afford to move anywhere else. It is also good to note that these communities are also the ones that are mostly comprised of low-income Black households that remain that way due to the presence of ethnic hierarchy which may be influencing the way their relocation is being handled in terms that it may be deemed not important enough to allocate resources to it. Moreover, while most of the coastal communities consist of low-income household, there is a small portion of wealthy people who have better means to adapt and is able to relocate by themselves if needed. However, in some communities such as Cite La Cure there is resistance to the idea of relocating as they lived their whole lives in this region and would rather be compensated for the damage than move to another region (Chacowry et al, 2018). This resistance to move can also be sourced from a sense of abandonment that these communities have been feeling for a while and a lack of trust in the authorities to make it better as they have

suffered so much from disasters with very little being done (Chacowry et al, 2018). Despite the government thinking of relocating some communities, it is not mentioned as an official adaptation strategy to climate change. The focus is still on physical ways to adapt to climate change such as building of sea walls and implementing better coastal management practices and planting mangroves. The government has recognised the need for some communities to be relocated but has not been successful in doing so largely due to financial challenges and lack of planning (Duvat et al, 2020; Sultan, 2017). Relocating residents is seen as a last resort and not many studies have been done regarding communities that need to be relocated. Moreover, it does not help that most of the communities that need to be relocated are already economically vulnerable, feel abandoned by the authorities and do not feel that they are involved in any of the adaptation strategies that the government is implementing (Sobhee, 2016).

CHAPTER 4.

Small Island States and Migration as a climate change adaptation strategy.

4.1. Migration as an Adaptation strategy in other islands

Small Island States are at great risk of climate change. As mentioned previously, small island states are more at risk of sea-level rise, coastal inundation and coastal erosion (IPCC, 2014). Many Small Island States also have limited resources available, which affect their ability to adapt and mitigate the impacts of climate change. This has been recognized and funding is often made available to Small Island States to implement projects that will help increase their ability to adapt to climate change (UN-OHRLLS, 2017). While some in-situ adaptation strategies such as construction of seawalls have been implemented in many islands, many of them had to veer towards migration as an adaptation strategy because these in-situ adaptation strategies were not enough (Luetz, 2017; McNamara et al., 2016). The idea of relocating and migrating for many islanders is sometimes seen as a must such as in Kiribati and the Maldives (McNamara et al., 2016; Luetz, 2017) while for some migrating is the last thing, they want to do such as in Tuvalu and Lakshadweep (Constable, 2016; Kelman et al., 2017). Migration as an adaptation strategy is not easy to implement and requires a lot of planning to be done right. However, Small Island States have been pointing out that migration may be the only option for them as the risk that some atolls will disappear completely because of climate change is high. Moreover, for some islands, migration may also be the most cost-effective option for them instead of in-situ adaptation strategies solely because these in-situ strategies may not be enough to mitigate and prevent the damage caused by climate change.

Kiribati is one of the Small Island States that has the most structured migration strategy and has implemented a “Migrate with Dignity” policy where they give their population the option to move to other places such as New Zealand for work purposes and eventually stay there (McNamara et al., 2017). Kiribati is also one of the first islands to buy land in another place, in this case in Fiji, to allow their citizens to relocate there if needed. These initiatives taken by Kiribati provide the population with a choice as well as allows for the gradual and planned relocation of people instead of a rushed and unplanned migration. Even though the migration pathways implemented by Kiribati may be a little restrictive such as only a number of people can migrate to New Zealand and Australia per year, at least they have a plan and give the population the choice (Constable, 2016; McNamara et al., 2017).

The Maldives have also been relocating people but these relocations have mostly been happening within the atolls themselves (Luetz, 2017). The population of the islands of Faridhoo, Kunburudhoo and Maavaidhoo were moved to Nohivaranfaru in 2011 after 6 years of preparation. All of these people were moved after 6 years of careful planning into government funded houses which allowed them to adapt more easily to their surrounding as well as provide a smooth transition (Luetz, 2017). However, in another case, the Maldives Government had to quickly move people from the Hathifushi island in 2007 after storm surges made the island inhabitable and they were not prepared to do so. The people from Hathifushi island have been requested to be moved for years because of how vulnerable they felt but there was no plan in place for it until 2007 where they had to move quickly without being able to take a lot of their belongings with them because of storm surges. This incident further pushed the Maldivian

Government to look at migration and relocation as an adaptation strategy so that there is no need for a rushed and unplanned relocation. The Maldives is also considering buying lands in other countries, but so far nothing has been finalized.

On the other hand, for the island of Tuvalu, migrating is the last thing they want to do, and this comes from both the government and the population. The government is investing more on in-situ adaptation strategies such as coastal walls as well as exploring other strategies such as the possibility of raising the land (Constable, 2016). However, emigration is very common in Tuvalu and mostly happens for education or work purposes and not so much for environment reasons (Milan et al., 2016). Despite Tuvalu experiencing some drastic environmental changes such as salt-water intrusion, coastal erosion and storm surges, there is still a general feeling of not wanting to leave the island behind mostly generated from a desire to keep their land and culture (Constable, 2016). It is the same thing on the island of Lakshadweep which is a group of islands located off the coast of India (Kelman et al., 2017). The people are aware of the changes but there is a general sense of not wanting to leave the island behind. While some islands are actively implementing migration as an adaptation strategy, some other islands are choosing not to do so yet and instead are investing more on in-situ adaptation strategies (Constable, 2016; Kelman et al., 2017). However, even the islanders who do not want to move know that there is a risk that they might not be able to fully adapt to these climate change impacts and may have to move but they want to try everything else before being left with no choice but to move (Constable, 2016; Kelman et al., 2017).

4.2 Mauritius vs other island states

4.2.1 Similarities between Mauritius and other Island States

Mauritius forms part of the Alliance of Small Island States, a coalition between 44 Small Island States regarding impacts of climate change on Small Island States but also looking at sustainable development and ocean conservation for Small Island States. As mentioned previously, Small Island States are more vulnerable to the impact of climate change despite contributing the least to this phenomenon (IPCC, 2014). In the case of the Republic of Mauritius, it only emits about 0.01% of global greenhouse gases (Government of Mauritius, 2020) compared to other highly industrialized countries such as the United States or China. However, unlike them, the resources and knowledge available for the Republic of Mauritius to adapt and mitigate to the impacts of climate change are limited and international help is often required. This is the case for many Small Island States where there is a lack of knowledge and a need for more financial resources regarding implementation of mitigation and adaptation strategies for climate change (Alliance of Small Island States, 2019). The Paris Agreement acknowledged this issue and included that extra support and funding are to be made available to help Small Island States. Moreover, Small Island States need to be proactive in their mitigation and adaptation strategies otherwise it can cost them even more money. A report done by the Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN-OHRLLS) in 2017 looked at the cost of inaction for Small Island States and estimated that it can cost up to US\$46 billion annually by 2100 in the Caribbean alone. Therefore, it is necessary for Small Island States to be proactive and for the necessary help be provided to them.

The impact of climate change is quite similar for most of the Small Island States. In Mauritius, just like in Kiribati and the Maldives, they are all affected by sea-level rise and coastal erosion, which forces them to invest in sea walls or revamping of beaches (Japan International Cooperation Agency, 2015; Luetz, 2017; McNamara et al., 2016). Many of the islands have also noticed a decline in the ocean fish stocks which then impact the livelihood of the coastal population. Coral bleaching is also something that Small Island States have to face and eventually invest in Reef Conservation programs to help protect the ocean biodiversity which adds to their climate costs (Japan International Cooperation Agency, 2015; UN-OHLLS, 2017). However, sharing of knowledge and expertise has been made easier by the Alliance of Small Island States as it allows for better communication between the islands. Plus, this coalition is specific to Small Island States and hence makes it easier to discuss the problems and try to find solutions and findings to address them.

4.2.1 Differences between Mauritius and other Small Island States.

However, even though Mauritius faces many of the same problems as the other island states, it is also unique. Mauritius is less at risk of sea level rise than other island states such as Kiribati, the Maldives or Tuvalu. This is mostly because many of the other Small Island States consist of atolls that are flat and do not have much height difference with the highest peak of Kiribati being 87 meters above sea level whereas Mauritius has elevation that varies between 270 to 828 meters above sea level. However, sea-level rise is still a risk for Mauritius, but it is not expected to cause mass migration from the island (Gemenne & Magnan, 2010) like in the

Maldives but rather some specific coastal communities will have to be relocated internally. Moreover, the main risks that have been identified for Mauritius regarding climate change is an increase in cyclone intensity, stronger storm surges and increase in flash floods (Government of Mauritius, 2012). In addition, its high population density of 654 people per km² also increases its' disaster risk. Mauritius' main priority is to invest more in its disaster risk management than creating a migration plan like Kiribati or the Maldives (Republic of Mauritius, 2016). However, migration and relocation of some communities is not out of the picture as some communities live in places prone to flooding (Gemenne & Magnan, 2010; Chacowry et al., 2018) but there is no structured plan for this. There are a lot of studies done by the Government of Mauritius that looked at the physical impacts of climate change such as damages to buildings and the ecosystems (Government of Mauritius, 2012; Japan International Cooperation Agency, 2015) but there is a lack of studies that looked at the social impacts of climate change on local communities (mostly coastal communities). It was also pointed out that there is a lack of communication between the communities that might have to be relocated and the Government of Mauritius (Gemenne & Magnan, 2010; Chacowry et al., 2018) while in other island states such as in Kiribati and the Maldives, there seems to be better communication and a lot more focus on the local communities. There is also a need to differentiate the different type of immobility or mobility present on the island such that some coastal communities are involuntary immobile community which means they want to move but are not able to while some are voluntary immobile which means they do not want to move even if provided with the option to and we have the voluntary mobile which have the means and are able to move

(Mallick & Schanze,2020). These different categories need to be identified and studied for better implementation of policies regarding internal migration.

While Mauritius is considered a high migration state due to a high in and out migration flow (Sobhee, 2016), migration is not officially part of its official mitigation and adaptation strategies like it is for Kiribati and the Maldives. The government is considering relocating some communities such as the ones at Riviere Des Galets, but there are a lot of uncertainties that this community has regarding the relocation that are not being addressed (Gemenne & Magnan, 2010; Sobhee, 2016). The government is investing more in disaster risk management with the building of a refuge center at Quatre Soeurs and developing an Early Warning system to help warn communities about disasters.

4.3 Small Island States, Climate Change and Migration

Climate Change is causing many Small Island States to adopt migration as an adaptation strategy on top of all the in-situ adaptation strategies they are implementing such as sea walls. For many Small Island States such as Kiribati and the Maldives, migration is deemed necessary as sea-level rise and coastal inundation is making it difficult and dangerous to live in the region (McNamara et al., 2017; Luetz, 2017). The governments of these islands are actively working on policies and program such as the 'Migrate with dignity' program in Kiribati to enable their population to migrate to other places. However, for some other Small Island States such as Tuvalu and Lakshadweep, migration is not being considered despite all the climate hazards the

islands are facing and will face in the future. Both the government and the general population do not want to move and leave their land behind (Constable, 2016). However, despite how different Small Island States feel about adopting migration as an adaptation strategy, there is consensus that climate change will have a lot of impacts on Small Island States. The Republic of Mauritius shares a lot of similarities with the other Small Island States but is also unique in its own way. Just like any other Small island States, Mauritius is very aware of its vulnerabilities when it comes to Climate Change and is active in implementing mitigation and adaptation (The Republic of Mauritius, 2016). However, unlike other Small Island States Mauritius has higher elevations and is not as much at risk to sea-level rise as the other Small Island States like the Maldives who are at risk of completely disappearing under the sea (Luetz, 2017). Sea-Level rise will still cause a lot of damage to the coast of Mauritius and will affect a lot of people; however, the damage will not be to the same extent as it will be in the Maldives. This could potentially explain the reason why Mauritius is not feeling pressured to officially adopt some aspects of migration in their climate change adaptation strategy despite the need for some communities to be relocated internally. Similarly in Tuvalu, migration as an adaptation strategy is not being talked about because there will likely be resistance to the subject. Mauritius is focusing more on their disaster risk management when it comes to temporary relocation due to cyclones or storm surges than focusing on permanent relocation. However, no matter what adaptation and mitigation strategies Small Island States implement, the fact remains that they are more at risk to climate change despite contributing very little to the crisis.

CHAPTER 5

Conclusions and Recommendations

5.1 Summary of actions taken by the government

The Government of Mauritius has been very active in implementing adaptation and mitigation strategies related to climate change. They are investing in research, producing reports as well as implementing new bills, some of which are shown in Table 1 below.

Table 1. Adaptation strategies implemented in the Republic of Mauritius.

Adaptation Strategies implemented in the Republic of Mauritius
Created the National Climate Change Adaptation Policy Framework in 2012
Signed the Paris Agreement in 2016
Developed a Coastal Protection Plan in collaboration with Japan International Cooperation Agency in 2015
Built sea walls along the coast to combat coastal erosion
Planted mangroves to attenuate waves
Set coastal setbacks to 30 metres or 50 metres
Built a refuge center at Quatre Soeurs in June 2017

Several reports produced by Mauritius have outlined the ways the different areas such as the agricultural sector, the tourism industry and coastal areas will be affected by climate change. These reports have also outlined the ways that these impacts can be mitigated, for example encouraging sustainable land use practices as well as investing in green technologies to help the agricultural sector and setting up coastal walls as well as better beach management to protect the coastal areas (Government of Mauritius, 2016). Mauritius is also investing a lot in enhancing their preparedness in dealing with the temporary displacement of people due to disasters. The National Disaster Risk Reduction and Management Act was implemented in 2016 in order to increase preparedness regarding climate disasters such as cyclones and flooding that could cause people to leave their area temporarily. As such a refuge center was built at Quatre Soeurs to provide refuge in case people had to evacuate their homes during a storm or flooding (Government of Mauritius, 2016). The government is also investing into an Early Warning system that will make it easier to warn people of disasters such as cyclones and storm surges and inform them if they have to evacuate the region (Government of Mauritius, 2016). However, there is not a lot of investment nor focus regarding the permanent relocation of people despite the fact that permanent relocation of some communities such as the one at Riviere Des Galets have been recognized to be the best solution for them (Sobhee, 2016; Gemenne & Magnan, 2010). Mauritius is focusing more on the temporary relocation of people due to sudden onset disasters rather than on permanent relocation of some communities due to the slow onset impacts from climate change, despite the need for it. This is a serious shortcoming.

5.2 Gaps in the adaptation strategies of Mauritius.

The Government of Mauritius themselves have already identified several gaps present in their mitigation and adaptation strategies in their Third National Communication Report to the UNFCCC in 2017. They identified that more research is needed regarding the socio-economic impact of climate change on local communities, since despite identifying the different communities most vulnerable to climate change impacts, there are still a lot of gaps regarding their social and economic vulnerabilities. There needs to be more research on the potential loss of livelihoods as well as the possibility of relocation and its effect on the cultural and social aspect of the community. The Government of Mauritius is aware of the possibility that some local communities will have to be relocated but they do not have a specific process set in place for their relocation yet and face some logistical and financial problems when it comes to relocation, despite having successfully relocated 11 households from Quatre Soeurs (Sobhee, 2016; Japan International Cooperation Agency, 2015). Mauritius should consider adding internal migration as an adaptation strategy in its official climate change adaptation plan as there is a high risk of internal migration happening due to climate change (Gemenne & Magnan, 2010). This is further endorsed by the fact that the Mauritian Government is considering relocating some communities but there is no official plan for it yet (Gemenne & Magnan, 2010; Sobhee, 2016).

There is also a need for more transparency and better communication between the government and some vulnerable communities, such as Riviere Des Galets and Cite La Cure. As

mentioned in Chapter 3, these communities are some of the most vulnerable communities in Mauritius where relocation is being considered but the local communities have a lot of unanswered questions about the process (Gemenne & Magnan, 2010; Sobhee, 2016). The people living at Riviere Des Galets and Cite La Cure, have been thoroughly affected by coastal erosion and flooding respectively and while some of them are opposed to being relocated- mainly elder people- most of them want to move, but this is not possible as they do not have the means to do so and can be considered as a trapped population (Sultan, 2017). Moreover, a framework needs to be created in order to assist trapped populations regarding climate change impacts, which was also mentioned by Sobhee in 2016. This framework can help set out in-situ adaptation strategies for trapped populations and the involuntary immobile and take a proactive stance when it comes to internal migration instead of waiting for it to happen (Sobhee, 2016).

5.3 Conclusion

Revisiting one of my objectives, the vulnerability of Mauritius in regard to climate change has been assessed where we have determined that Mauritius is not only vulnerable to sea-level rise but will also face stronger cyclones and storm surges, more flash flooding and a decrease in precipitation. This will cause a lot of disturbances in the social and economic sectors. However, Mauritius is aware of these vulnerabilities and has overall well-planned climate change adaptation and mitigation strategies in place to address them. However, there is a need to integrate an internal migration plan into their adaptation plan which ties to my second

objective which was to assess the need for human mobility to be included in their adaptation strategies. The climate change adaptation strategies in Mauritius address multiple issues but fail to mention human migration and relocation as an adaptation strategy despite the need for it in some areas of the island. Gemenne & Magnan determined in 2010 that climate change impacts will not cause mass migration out of the country, but they stated that there is a high risk of internal migration happening due to environmental changes and an increase in disasters. Moreover, with Mauritius having a population density of 654 persons per km², areas available for relocation may be limited, and in order to prevent unplanned and forced internal migration due to climate change, Mauritius will be required to integrate some aspects of internal migration into their climate change adaptation strategy. Even though migration as an adaptation strategy is not as critical in Mauritius as in other Small Island States (such as Kiribati) (McNamara et al., 2016), there will be an increase in internal migration due to sea-level rise, coastal erosion and storm surges (Gemenne & Magnan, 2010) and hence the government needs to take a more proactive stance. Moreover, there can be an increased in social tension if an unplanned and forced internal migration happen without the proper strategies in place. This is because, despite the heterogeneity of the Mauritian population some communities are very homogenized and an influx of people in the community without any structure to support them can create some tension.

Mauritius can learn how to integrate human migration in their climate change adaptation strategies from many other Small Island States such as the Maldives and Kiribati which have fully implemented migration as an adaptation strategy to Climate Change. The Maldives have

relocated the communities of Faridhoo, Kunburudhoo and Maavaidhoo to Nolvivaranfaru after years of preparation (Luetz, 2017) while Kiribati have implemented the 'migrate with dignity program' (McNamara et al., 2016). There are many lessons that can be learned from other Small Island States that implemented human migration as an adaptation strategy but the most critical one would be that good planning is needed to prevent forced and unplanned migration from happening (Luetz, 2017). Nonetheless, despite the bare mention of migration or relocation in their adaptation strategies, Mauritius has a well-planned climate change strategy, and the government is aware of the possibility of permanently relocating communities. Therefore, my research suggests that in order to prevent forced and unplanned migration from happening, Mauritius will be required to officially implement an internal relocation plan in the climate change adaptation strategy plan.

5.4 Recommendation for Future Research

There is still a lot of research that is required in order to know to what extent migration is needed in Mauritius. Moreover, more research also needs to be done regarding the social and cultural impacts of climate change in Mauritius mostly concentrating on identifying the involuntary immobile and the voluntary immobile communities and the reasons behind that. There is also a need to ensure that any strategies implemented are done with a 'mobility justice' lens such that the ethnic social hierarchy that is still present in the society is not reproduced. There are lot of research and projects that looked at the environmental impacts of climate change, such as impacts on the biodiversity and ecosystems in Mauritius but not many

on the social impacts of climate change on local communities. Some of the research recommendations stemming from this thesis, therefore include more work on:

- The social, cultural, and economic impacts of Climate Change on coastal communities.
- Identifying the involuntary immobile and voluntary mobile communities.
- Understanding the racial hierarchy that may be hindering the implementation of more inclusive climate change strategies.
- The logistics of integrating migration as an adaptation to climate change in the Republic of Mauritius.
 - o Defining the amount of people that will have to move because of Climate Change
 - o Locating suitable areas to relocate the people
 - o Ensuring that the social and cultural values of the relocated community is maintained.
- Reasons as to why some communities such as the one Quatre Soeurs were able to be moved but not others such as the one at Riviere Des Galets.
- Impacts of Salt-water intrusion on underground water and agriculture.

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[To add: differentiation between wealthy and some not and some people will be more available to adapt than other](#)