Sea-Locked: The Cascading Effects of Seaborne Challenges to Human Security in Madagascar

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Abstract This chapter presents a 'wicked deadlock' between human insecurity, underdevelopment, and unsustainability against the background of a more turbulent ocean environment, which can be best illustrated with the ongoing seaborne challenges on the island of Madagascar, especially those engendered by sea-originated nature hazards and man-caused maritime disruptions. It first investigates what human security means in respect of Madagascar's position as both one of the least-developed island nations and the frontier of ocean sustainability. Then it examines how the worsening of human insecurity on the island has been accelerated recently in light of climatic and socio-ecological changes from the sea. The human security emergencies the island is confronting might have rooted partly in its oceanographic peculiarities, but they warn the world of a possible failing scenario of the sustainability-security nexus, which might have larger implications that go beyond Madagascar's coastlines and reach to other oceanic communities.

Keywords Madagascar · Sea changes · Natural hazards · Maritime disruption · Internal displacement · Vezo

1 Introduction

This chapter presents a complex, wicked deadlock between human insecurity, underdevelopment, and unsustainability. The concept of 'wickedness' has been extensively employed in social sciences as a descriptor for the intricate interplay between natural and social problems (Groeneveld 2020). These so-called 'wicked problems' are characterised by their inherent resistance to resolution, absence of immediate remedial measures, and potential to act as a symptom of another problem just as they themselves could be the result of precedent wicked problems (Peters 2017). Consequently, 'wicked problems' may manifest as either consequential or interconnected, thereby

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engendering an inextricable labyrinth of problem chains, aptly termed in this chapter as a 'wicked deadlock'.

This wicked deadlock can best be illustrated with the ongoing seaborne challenges in Madagascar, especially those engendered by sea-induced natural hazards and maritime disruptions caused by man. Natural hazards can vary from sea warming, extreme weather, to coastal erosion, though human activities should be responsible for the aggravation of these hazards (Andrews et al. 2021; Ovadia et al. 2020). In comparison, man-made challenges in the maritime sector, such as resource extraction, pollution, and disruptions to essential goods shipment, have adversely affected many marginalised coastal communities directly that depend on the endowment from the sea. Among these challenges, two major ocean sustainability issues are highlighted in this chapter because they have had an unchecked impact on human security in Madagascar in recent years, they are extreme climate events (i.e., droughts, cyclones) and resource extraction (i.e., overfishing, sand mining). The first issue speaks to the critical role the ocean environment plays in preserving the basic needs of human beings that depend on the stability of the sea (Zervaki 2018), which has now become an unpredictable source of danger and destruction. The second issue underscores the supposed sustainable use of ocean resources and the rights of indigenous sea peoples to these resources (Vierros et al. 2020).

As far as the first issue is concerned, it should be noted that Southern Madagascar has suffered an extreme drought for years. The crisis culminated in 2021, which drove more than one million people into food insecurity and consequent displacement. According to estimates the drought-hit population reached about two million by March 2023 as the distressing shortage of rainfall continued (World Bank 2022). The World Food Programme (WFP) declared the highest degree of humanitarian emergency in the region and warned that the drought "could spur the world's first climate-change famine" (United Nations 2021). According to the WFP, the changing weather systems in the Indian Ocean have interrupted the normal circulation of moisture air from the sea that brought rainfall to the island, usually in November. The disappearance of the rainy season has had severe consequences, with dried out lands and locust proliferation obliterating any possibility for the local communities to grow crops, access clean water, keep cattle, or simply preserve their traditional ways of life (Russo et al. 2023; Scroxton et al. 2023).

It should also be noted that the entire island of Madagascar has been a victim of a prevailing food crisis, resulting in extreme malnutrition among its population. The WFP reported that 33% of the 8.8 million people across Madagascar were food insecure by September 2022, and almost half of the children under five years of age were suffering from chronic malnutrition (World Food Programme 2022). Madagascar is the only country in the WFP's category that is on the verge of starvation without confronting a nationwide conflict. The alleviation, adaptation, and corresponding governance at both national and international levels facing these crises are limited (Faliarivola et al. 2022). This serious human underdevelopment problem has been a troubling source of insecurity in the Malagasy society, where internal displacement, armed conflicts, and violent crimes are becoming disturbingly pervasive.

In sharp contrast to the drought, the island has meanwhile repeatedly been a victim of increasingly powerful and destructive cyclones that strike its coastlines and flood the inland, causing massive losses in agriculture, infrastructure, and human life. In early 2022, the deadly cyclone Batsirai, like its predecessors, swept the entire island and wiped out Mananjary, a town on the eastern coast, with at least 20 people killed, 55,000 displaced and 3000 buildings destroyed (Aljazeera 2022). In the national capital, Antananarivo, students from there and from further south have been complaining about a climatic conundrum that they had been witnessing year after year. This is especially the case for the marginalised clinging to life in the island's peripheral coastal regions, who are the most vulnerable to hazards, yet receive the least assistance. Relief work for the perennial drought was also interrupted because of road closures due to the drought-hit areas also being struck by the cyclone.

As a result of the prolonged ecological, economic, and humanitarian crises, young people in Madagascar have popularised the phrase "tsy misy fika intsony" ("there is no solution to the problem") to express their disappointment, fear, and anger over their seemingly doomed fate, even those living in the geographically high-risen capital city, as well as over the incapability of their government to offer them protection and take action against the turmoil that they face. They seem to be equally aware of Madagascar's unfavourable position in the ocean, susceptible not only to transport interruptions of essential bulk commodities (e.g., food, seeds, fertilisers, and fuel), but also to foreign exploitation of the island's marine resources. They worry about their future, as they feel powerless in confronting a crisis that could erupt due to unsustainable changes in the global ocean.

Droughts, cyclones, and the outcry from the youth highlight the devastating effects of climate change and unsustainable exploitation of marine resources in Madagascar's oceanographical setting. These factors further afflict the livelihood sustenance of the island's people, destroying their ancestral habitation, and depriving their traditional maritime culture and way of life.

In terms of the second issue confronting the island, Madagascar's unfavourable position in the global maritime system further exacerbates the problem of overfishing, maritime transport disruptions, and coastal enclosures along its coastline. Consequently, local aquatic food, which could have mitigated hunger and malnutrition, has become increasingly inaccessible for local consumption. The degradation of human life and dignity, fuelled by starvation and deprivation, can potentially worsen existing national security issues by escalating displacement of peoples and conflicts. This emphasises the intricate interplay between human security and ocean sustainability. Rather than being a simple cause-and-effect relationship, it can manifest as complex causal chains or loops, as discussed in the conceptual chapter (Chap. 2 of this volume). This complexity challenges traditional security thinking and underscores the far-reaching, terrestrial impacts of maritime changes.

Methodologically, this chapter combines oceanographic and ethnographic data from Madagascar to present a scenario in which human security and marine sustainability can be intimately and complexly entangled. While oceanographical data was

mainly acquired from existing climatological and ecological studies on the hydroclimate variations, marine-atmospheric exchanges, and fisheries resources around the region, two field trips in Madagascar were conducted between April and July 2022. The capital city and two ports (Majunga on the western coast and Tamatave on the eastern coast) were visited. Maritime and fisheries professionals, seafood traders, and local fishers from these two coastal regions were introduced to the study and questioned. These interlocutors were obtained through connections in the capital city or the author's transnational network. This led to eight formal interviews and 13 informal conversations. The discussions revolved around topics such as fishing, the seafood industry, and the export–import business. Additionally, their understanding and personal experiences of climate change on the island were explored. Some participants offered valuable insights into the racial and regional undercurrents that underpin the security dilemma on both Madagascar's mainland and surrounding seas.

The remainder of this chapter will thus delve into this security dilemma within an island context. It will outline the specific maritime challenges that Madagascar confronts, which pose threats to both the Malagasy people in particular and the state as a whole. The chapter will conclude by emphasising the complexity of these challenges and the implications they hold for human security.

2 Security and Sustainability in an Island Context

The analysis begins with what human security means in respect of Madagascar's position as both one of the least-developed island nations and the frontier of ocean changes. For almost three decades, the concept of 'human security' has been used to frame and analyse problems and threats to human life and dignity. It refers to the condition in which people and communities have the capacity to respond to the threats to their basic needs and rights, so that they can live with dignity (O'Brien and Barnett 2013; United Nations Office of the Special Adviser on Africa 2005). Conditions for a life in sustenance and dignity are being threatened by new socioecological challenges, and new risks to the security of human beings are rising. Academic research on the relations between human security, development, peace and conflict, and global environmental change has mushroomed since the 1990s (Ide et al. 2023; Nef 1999), among which climate-related human security risks and their impact on violent conflicts and displacement are centred in many discussions (Coning and Krampe 2020). Human security provides a lens into the risks environmental and social changes pose to human well-being, with a special focus on risks to the basic human rights of the most vulnerable people and communities. In other words, it securitises these risks, adding them to the existing environmental, economic, and political frameworks of human development and national security. Because of its high relevance to the existing domain of national security, the key to human security falls back eventually on the enhancement of the physical security and economic welfare of people under new socio-ecological challenges (Peoples and Vaughan-Williams 2021).

While the importance of land-based ecosystems in addressing these challenges has been widely recognised (Clover and Eriksen 2009; Pulhin Inoue Shaw 2021), an emerging understanding of the complex and intimate relationship between sustainability and security in the ocean setting offers us a novel direction in combatting the existential threats many sea-dependent communities are facing. Whereas the livelihood of sea peoples and their traditional ways of life are now being challenged by non-traditional problems originating from the sea, the global islands are at the frontline of such changes. It is well known that extreme climate events and disruptions at sea bring about severe impacts on islands due to their unique oceanographical characteristics, such as low-lying banks, frequent shoreline changes, vulnerable marine habitats, and dependence on importation by sea (Kelman 2014).

Across islands, several key sectors, including agriculture, freshwater access, fisheries, transport, health, biodiversity, and independently evolved archipelagic cultures, are interconnected and easily affected by the threats of increasing ocean temperatures, sea-level rise, rainfall fluctuations, and changes in the severity and frequency of extreme weather systems (Duvat et al. 2017), as well as inadequate aquatic food supply due to overfishing and degradation in marine ecosystems (Maire et al. 2021). As a result of long isolation from the mainland, the unique, fragile endemic species and ecosystems on islands, just like island cultures, are more susceptible to variations in weather and habitat loss. This has further compromised the resilience of island societies and ecosystems to sea changes (Weiskopf et al. 2021).

As the climatic types of islands are mostly oceanic and island societies are separated from other parts of the world geographically and socio-ecologically, sea changes have usually more direct, unchecked effects on island inhabitants in terms of physical, biological, and psychological shocks (Gibson et al. 2020; Thomas et al. 2020). This status of islandness and oceanness makes the UNDP's interpretation of human security ('freedom from fear', 'freedom from want', and 'freedom to live in dignity') highly pertinent to the deadlock of unsustainability and insecurity confronting many island societies (Peoples and Vaughan-Williams 2021, p. 172), such as Madagascar's.

Human security in an island context should be able to free islanders from fear, not only from the deadly aftermath of natural disasters in isolated and marginalised communities, but also from subsequent violence against humanity as an indirect consequence of an unsustainable (marine) environment. Human security for islands should also free them from want, from the hunger, poverty and destitution caused by changes in both the marine environment and maritime industry. Failing to achieve these two fundamental aims of human security, while ocean sustainability is being continuously undermined, could continue to bring about a chain reaction of insecuritisation and destabilisation in island societies, including loss of habitat and water access, food insecurity, internal displacement, increased social violence and armed conflicts (Heslin et al. 2019; and see author's compilation in Table 1).

Table 1 Examples of seaborne challenges to human security

Variables from the ocean	Impacts to human security	Long-term consequences
Natural causes: • Increasing ocean temperatures • Sea-level rise • Precipitation fluctuations • Extreme weather systems **Man-made causes**: • Shipping disruption • Overfishing • Coastal pollution and enclosure	• Disruption of marine food chains • Climate-induced migration • Escalation of maritime disputes • Degradation of coastal ecosystems	**Individual level**: • Persistent nutritional deficiencies • Prevalence of waterborne diseases • Psychological distress **Systemic level**: • Social and political instability • Biodiversity and ecosystem collapse

Author's compilation

2.1 Madagascar, as a Big Island Facing Seaborne Challenges

Madagascar represents an alarming example of the vulnerability of islands to climate change and maritime disruptions, which impacts on almost every department of the society. Due to the loss of much of Madagascar's marine habitat, especially the mangrove system surrounding the entire island, communities, biodiversity, and ecosystem services are more vulnerable to both natural and human disturbance than they were in the past (Chowdhury et al. 2017; Scales et al. 2018). The governance capacities in dealing with climate change and maritime disruptions in Madagascar have also been rated as moderate to low (Weiskopf et al. 2021). Moreover, under tough socio-ecological pressures, Madagascar's population is still growing rapidly, with an annual growth of 2.4% by 2021 (World Bank 2024). The country's economy is predominantly rural, facing an annual loss of 9–10% of the GDP due to environmental degradation (Rakotondravony et al. 2018 in Weiskopf et al. 2021) and 81% of the entire population living below the latest international poverty index of $2.15/capita/day by 2021. Abject poverty, low agricultural productivity, recurring climate shocks, social instability, and foreign exploitation have all contributed to the worsening human security status on the island.

In addition, worldwide, extreme climate events are a significant driver of persistent poverty and food crisis, especially in rural and coastal areas (Hasegawa et al. 2021), whereas drought has been a significant destabiliser especially in southern Madagascar while storm-led flooding is more of a concern in the eastern part of the island. The fishing communities also have to contend with foreign competition over Madagascar's precious marine proteins, such as tuna, shrimps, and lobsters.

As a general picture, Madagascar's geographical location between the African continent, the Indian Ocean, and the Southern Ocean has endowed the island a highly endemic oceanic climate and marine ecosystem. Its abundant marine resources have fed generations of seafaring peoples and have supported a distinctive maritime culture, most famously represented by the Vezo, a characteristic fishing people on

the island.[1] On the other side of this uniqueness, Madagascar's insularity in the ever increasingly turbulent marine environment has left the island in an ecologically, economically, and culturally disadvantaged position, susceptible to sea-originated nature disasters and man-caused maritime disruptions (see Fig. 1). The island, together with its archipelago and coastal neighbours, has suffered a plethora of such hazards in recent years—destructive cyclones, perennial droughts, overfishing, loss of habitat, to name but a few. These seaborne challenges pose direct, existential threats to the security of human life, economic activities, social stability, and biodiversity in Madagascar, plaguing this already least developed island further into an insolvable spiral of underdevelopment and insecurity. Unfortunately, addressing these challenges is an enormous and complicated undertaking. Madagascar alone would not be able to address these challenges, meaning that sea-originated incidents that are directly endangering the human security situation of the island are not likely to disappear anytime soon.

The lesson in Madagascar demonstrates how 'ocean unsustainability' can often unexpectedly and uncontrollably spill over to many other sectors on an island, along the coast, and even reaching far onto the mainland. Unless all aspects—ocean governance, humanitarian relief, resilience building, and a 'bluer' agenda in economic development—are effectively and simultaneously addressed, the deadlock between human insecurity, underdevelopment, and unsustainability for an oceanic country, like Madagascar, seems insolvable under current social and technological conditions (de Salas et al. 2022). On the other hand, Madagascar's human security emergencies might be rooted partly in its oceanographic peculiarities, the world's failing scenario of the unsustainability-insecurity nexus, which might have larger implications that go beyond the island's coastlines, could reach other oceanic communities as well.

From a people's perspective, Madagascar's efforts to confront these problems have failed to live up to its own people's expectations in many areas, who are struggling with the trade-off between the development of a blue economy and the sustenance of small-scale fishing communities and the continued sale of exclusive fishing rights to foreign entities. Global attention has also failed to provide sufficient humanitarian relief and resilience building to the disaster-stricken Malagasy society. The resolution of these dilemmas and difficulties will require a long-term commitment from the international community in the light of the common crises of mankind vis-à-vis the sea. As a result of severe climate events, their interrelated oceano- and anthropogenetic links, and the subsequent cascading effect, island societies like Madagascar will need a clear and coordinated programme that involves all participants to reach out closer to the affected populations and guarantee accountability and transparency, especially for those highly marginalised, often forgotten communities among the indigenous Malagasy society.

[1] For the oceanic history and culture of the Vezo, see Astuti (Astuti 1995), Cripps and Gardner (Cripps and Gardner 2016), Grenier (Grenier 2013).

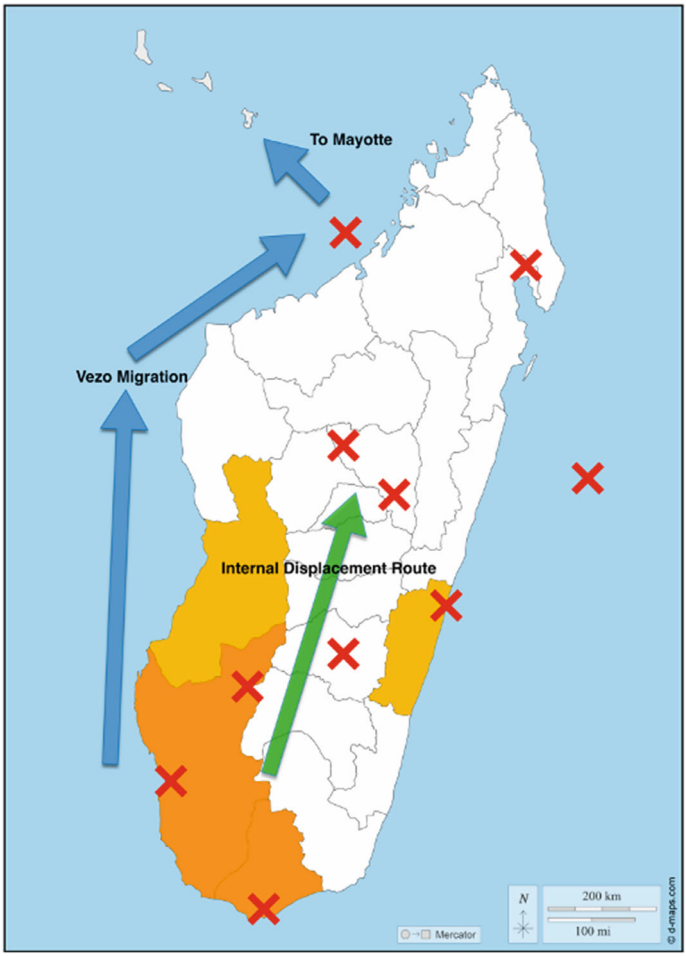

Fig. 1 Food crisis, internal migration, and seaborne hazards in Madagascar (author's compilation; free map source: D-maps n.d.)
Coloured regions on the map: regional levels of food crisis in 2019; Blue arrows: migration routes at sea; Green arrow: internal displacement route; Red Xs: locations of *dahalo* attacks, cyclone destruction, coastal enclosures, and overfishing (directions and locations are indicative only).

2.2 Cascading Seaborne Challenges to Human Security in Madagascar

Seaborne changes that matter gravely to sea peoples, first and foremost, occur in ocean climate systems. These less-stable systems pose a fundamental risk to the predominantly rainfall-reliant agricultural sectors. For the problems of Madagascar's perennial drought, there is no conclusive scientific explanation so far as to why the oceanic climate in the Western Indian Ocean region has become more extreme. A

general understanding is that, because of sea warming that has occurred for years, the usual land-sea vapor exchange in the wider Indo-Pacific area, commonly termed 'La Niña', rainfall has been shifting eastwards. This explains the abnormal wet weather and floods in winter on the Australian Continent, which coincide on a planetary scale with the droughts that have devastated many countries on the western side of the Indian Ocean Rim, such as Somalia, Kenya, and Madagascar (World Meteorological Organization 2021). Other complementary scientific evidence suggests regional climate variations that may have induced drought in East Africa, including Madagascar's southern region that has been in the process of withering for millennia due to its unfavourable latitude, geography, and human activities (Burney 1993). All the findings point to a recapitulation of the frailness of island and coastal environments in the wake of radical climate change at sea. Communities like those drought-hit in Southern Madagascar have struggled for centuries for survival in a semi-arid region, where small variations from the sea could have broken up their precariously maintained balance of livelihood.

Livelihood for the most vulnerable communities is by and large synonymous to food security. The extreme variations in rainfall have put traditional ways of self-sustaining agricultural production at stake. In the past two decades, an increasing number of Least Developed Countries (LDCs), including islands and coastal countries in Africa, have reported declining crop yields due to a decrease in rainfall and even droughts. Over 43 million people of the 11 Southern African Development Community (SADC) member states, including the coastal states of Tanzania and Mozambique, and the island of Madagascar, are reported to have been experiencing severe food insecurity (FAO et al. 2022). Another factor, namely the war in Ukraine has at a precocious time, disrupted food supply chains that are heavily dependent on bulk shipping and has inflated the prices of imported commodities, such as wheat, fertiliser, and petroleum products. These conditions have further strained the humanitarian crises in the hunger-stricken SADC countries (SADC-RVAA 2022). In Madagascar, for example, the prices of the main imported goods relating to food security—rice and fuel—have increased by up to 100% in 2022, not even to mention the shortage of imported fertilisers and other essential chemicals for agriculture and aquaculture.

While Madagascar is currently facing its worst drought in over 40 years, exacerbating the humanitarian crisis in the region (OCHA 2021), frequent floods and tropical cyclones are also disrupting the society and deteriorating livelihoods across Madagascar. To quote one of the students interviewed from Southern Madagascar, when asked what was happening on the island, he referred to the 'extremisation of climate', that is, it is becoming drier in the dry season and wetter in the wet season. Without adequate responses to these climate-related security challenges, the ocean will bring even more threats and damages to the people dependent on it.

The escalating desperation within the oceanic ecosystems is also leading to a growing number of sea people forsaking their traditional livelihoods. In their quest for survival, they are turning towards land-based resources, thereby exacerbating the strain on the already overpopulated terrestrial sectors and ecosystems. Such heightened stress has frequently culminated in violent conflicts. This, in turn, worsens

the security condition for the wider population in the island country, including the more vulnerable women and children. Especially when women from the coastal communities lose their traditional roles, for example as octopus hunters, foragers, and fish handlers, due to extreme weather conditions (Brown 2023), they become more exposed to sexual exploitation, gender-based violence, and violence against their children (UNICEF 2021). Therefore, the selling-off of children and child marriages are more common among coastal communities as they are the first victims of ocean environment change (Asadullah et al. 2021).

Furthermore, sea-originated disasters drive internal displacement and migration. During 2019's infamous cyclone season in Southeast Africa, over 2.5 million people were displaced, including one million in Madagascar (UNHCR 2022). While many other neighbouring countries are recovering from the aftermath of the natural disaster, the number of the displaced in Madagascar continued to grow in the following years due to an unrecoverable loss in fishing grounds, land, and freshwater sources (Anyadike 2019; Internal Displacement Monitor Centre 2022).

The ever-increasing internal displacement and the rudimentary slash-and-burn method to clear bushes, especially along the coast, could place further pressures on the island's fragile biodiversity and the continual degradation of its erosion-prone soil that is geologically connected to further coastal erosion (Randrianarijaona 1983; Styger et al. 2007). Diminished access to primary productive sources, such as water and fishing grounds, has also spurred migration from rural, coastal areas on the island to urban, central areas, as people seek alternative livelihoods and sources of income. The growing, crowded central towns could then face the cascading effect of coastal environment change that heightens competition for basic services, resources, employment opportunities and other livelihood options. This type of internal migration from the drought-hit southern region to other parts of Madagascar has been a painful normality in the Malagasy society. The displaced often move in sizable groups, and the most recent spectacle turned up in November 2022, when more than 100 starving families from Bekily, south Madagascar, walked over 1000 kms before they were found aggregating in the capital city. In order to reach the promised land that could feed them in the north, these families sold everything they had to pay for the journey (120,000 Ariary, roughly $30) (Rakotobe 2022). On the other side of the island, in the Mozambique Channel, the number of boat refugees from Madagascar to Mayotte, a neighbouring French territory, has reportedly increased in recent years, which is repeatedly causing severe tragedies of human loss on this frontline of Europe's oceanic southern border (UNHCR 2012).

Many of these displaced refugees end up without jobs and land in their new home, worsening the existing tensions of domestic security. Also, the rise in violent extremism has been found correlated with the increase in climate impacts such as cyclones (Meek and Nene 2021). In times of such distress, people can be forced to seek help from armed groups, or they can be lured into joining these groups and the conflict itself. In Madagascar, many incidents of extreme violence are notoriously linked to the loss of traditional livelihood. Drought-led cattle rustling is becoming worryingly rampant across the country, often coupled with violence against humanity. For example, on 29 July 2022, at least 32 people were killed when bandits burnt the

village of Ambolotarakely just on the outskirt of the capital city. The attack was blamed by security officials on cattle rustlers, known locally as *dahalo* (Ross 2022). Prior to this shocking incident, in 2016, 13 people were killed as police and villagers clashed with armed cattle rustlers near Isalo national park in the country's Southwest. Over 160 people were reportedly killed in cattle rustling incidents in 2015, including nearly a dozen soldiers (Ògúnmọ́dẹdé 2022). For many Malagasy people, the threat from *dahalo* has been real, and, in addition to the government's incompetency to combat these crimes, they understand that Madagascar's cattle economy has been under increased stress due to mutually reinforcing factors. Therefore, the extreme climate in the south is blamed for the increase in *dahalo*, many of whom were former cattlemen that lost their cattle in droughts or cyclones.

Rising poverty, a booming population, marginalisation of the country's southern communities, foreign involvement in cattle trafficking, land enclosure, and Madagascar's deepening climate change crisis are all responsible for the country's woes. Even though climate change may not have been the initial and ultimate culprit for Madagascar's prolonged drought (Tandon 2021), the link between its worsening socioeconomic conditions, increasingly extreme weather, and deepening distrust among different members of society is obvious. Combined, these factors exacerbate the violence associated with cattle theft in Madagascar, resulting in enormous consequences both for the security of the cattle economy and of the Malagasy people.

Biomass loss and resource theft do not only happen on land though. Fish resources in the region are also threatened by increasing sea temperatures and overfishing activities. As a general trend, the projected increase in temperatures and the frequency of droughts will continue to threaten the availability of resources under water (Swain 2011). For example, a 1°C rise in sea temperature over a decade could result in a severely reduced fish production in South Africa (de Suarez et al. 2014), by the year 2100, the total biomass in the ocean will decrease by 5–17% under different warming models (Kerr et al. 2022). The decreased availability of fish stock has already been noticed by local fishers in Madagascar, who have been benefiting from the rich fishing grounds particularly within the Mozambique Channel thanks to the confluence of Mozambique and East Madagascar currents and the Agulhas current. However, the warming of this system, together with other anthropogenic factors (Currie et al. 2020; Jury 2011), is expected to drive fish away from the region, and Malagasy fishers would therefore be forced to sail further into the sea to look for their daily catch. By doing this, they may expose themselves to turbulent stormy weather in a region replete with cyclones, or they may just not be able to deliver the catch in time due to the distance they will be covering. For them, climate changes at sea are not a distant possibility, but a real and dangerous reality.

Overfishing further exacerbates the situation. Madagascar's unique fish resources, such as tuna and shrimps, have attracted several major fishing countries, such as France, India, Japan, and China. In 2022, the Malagasy government granted an exclusive tuna fishing licence in its eastern exclusive economic zone (EZZ) to a Japanese company, which stirred a massive backlash among the Malagasy people. They could still recollect the protest in 2018 when the stepping-down president of the country sold an even more ambitious fishing plan to a Chinese company. If the said plan had

materialised, it could have wiped out the entire artisanal fishing community on the island with the arrival of more than 200 fully equipped, modernised fishing vessels from China.

Loss of habitat and water resources, similar to loss of fishery resources, equally affects the security and socioeconomic development of coastal communities. Seaborne challenges could further exacerbate these tensions by reducing the availability of coastal fishing sites as well as access to clean water.

In Madagascar, foreign investors have been accused of appropriating fishers' sacred lagoons and beaches for mining titanium dioxide (TiO_2), an expensive metal for manufacturing solar cells. Conflicts between the fishing communities, the Malagasy governments and an Australian company led to the imprisonment of local protestors and the discontinuation of delivery of essential goods to villages. Villagers also claimed that the extraction of the ore has released heavy pollution into the water and air. The related sand mining issue remains until now (Carver 2020).

Another similar story occurred in 2022 when QMM, a subsidiary of Rio Tinto, that operates several mines in the dry south of Madagascar, was forced to cease its operation due to protests from the local communities over pollution. The company's processed water, rich in aluminium and with a low PH value, was accused of killing the fish in the region, depriving local communities of an important source of protein that could have helped them to combat the drought-led food crisis (Orengo 2022). Yet, the company managed to resume its operations as it apparently provides a significant revenue for the state, yet at the cost of coastal communities' essential livelihood.

2.3 The Journey of a Vezo Family

One of those unfortunately marginalised and afflicted communities is the Vezo people. For centuries, the Vezo people who live along the southwestern coast of Madagascar have developed their own sea culture, most famously represented by the unique fishing and boat building techniques they employ. Because their entire livelihood depends on the sea and their society is organised around a maritime economy, they are immediately exposed to the unfavourable and destructive changes from the sea, including, but not limited to, diminished fish availability, loss of traditional fishing grounds, loss of mangroves that provide timber, coastal erosion and pollution, as well as the enclosure of their sacred oceanic sites. As a result, the Vezo decided to migrate (Cripps and Gardner 2016).

The consequence of such maritime migration can be uncertain as the main goal of migration is to search for marine resources. The Vezo fishers were initially able to sustain themselves and also trade with foreign businessmen selling tuna, swordfish, shrimps, octopus, lobsters, and sea cucumbers. An increase in unpredictable weather and currents not only drove them to migrate, but also delayed their return as the sea became more turbulent for the small pirogues to navigate. To learn more about their life facing uncertain oceanic changes, the author interviewed stranded Vezo family members in April 2022 on Coco Beach, north of the city of Majunga, a major fishing

port on Madagascar's northwestern coastline. This family, along with another five other families, had stayed in the makeshift shelters on the beach for the past three years. Their shelters, pirogues, and racks for drying clothes and fish stand in stark contrast to the hustle and bustle of local rich guests of nearby beach clubs.

The Vezo's life story was simple by its own definition. They sailed from Toliara, a southwestern port and where their ancestors' fishing grounds were. Unfortunately, the drought on land had impoverished that region and, as a result, locals could not afford to buy Vezo fish. To make things worse, the Vezo fishers noticed a certain decline in fish stock in recent years, which could not even be compensated by risking fishing in deeper oceans. The disappearance of fish reserves had occurred before during their oral history, when fishers would be instructed by their ancestors' spirit to migrate north to find fish. In the past, this migration had been seasonal, and the outgoing fishers would be able to return to Toliara, with fully loaded pirogues, at least twice a year, based on the switch of trade wind and currents.

However, now, the head of the Vezo family lamented that "… the god of the sea seemed to have abandoned them and their ancestors whose spirit residing 1500 kms away in Toliara could not hear their prayer anymore". They were not able to return home using the same route along which they came as the currents and wind had not been on their side for long. They were not able to afford to return any more as the legendary rich fishing grounds in the north were not abundant anymore. For most occasions, their daily catch was merely enough for the daily consumption for the family, as their pirogues were not capable of adventuring as deep into the outer sea as the 'metal boats' which are owned by the *vazaha* (white foreigners) or *sinoa* (Chinese).

The Vezo fishers also expressed their confusion about the way foreign vessels fished, i.e. through bottom trawling and deep diving without protection. As a sea people, the Vezo have their own understanding of balancing the catch and fish population, as they know, "the sea repays". Bottom trawling that "damages the body of the sea" would only beget the "wrath of the god of sea and ancestors", causing the continual decline of fish. What is worse, the impoverished Vezo fishers have been employed by foreigners to dive without protection in the outer sea searching for lucrative large sea cucumbers and sea horses. As stated by an interviewee: "Every year we lost a few brothers from this diving. Although we are good at diving and we can hold our breath longer than an ordinary person, we are not supposed to dive in those forbidden locations." He continued: "I don't do this. I have a living here. When I am lucky enough, I can find lobsters to sell to the hotels and restaurants nearby. But that's it. I hope by respecting the god of the sea, my family will go back home one day."

A sad fact about Majunga's seascape, perhaps beyond the Vezo fisher's perception, that coastal erosion has already invaded many parts of the peri-urban area, including where their beach is located. The only paved road connecting Majunga's city centre to its airport has been inundated by a rising tide from time to time because of mangrove degradation. Meanwhile, the beaches nearby are becoming unfit for tourism and small-scale fishing boats, due to sea-level rise and irresponsible human disturbance. Therefore, the unfortunate Vezo family could face displacement again, as the

path towards safeguarding their maritime economic welfare and cultural heritage—just as the path toward unlocking the wicked deadlock between human insecurity, underdevelopment, and ocean unsustainability on this big island—remains in limbo.

3 Conclusion: A Wicked Deadlock Requiring an Integrated Solution

So far, this chapter has presented a wicked deadlock between human insecurity, underdevelopment, and unsustainability in the context of Madagascar's increasingly unfavourable position in the changing ocean environment and maritime industries. As demonstrated here, the deadlock scenario in which the Malagasy society has found itself has resulted from a series of chain events originating from sea warming and, ultimately, mankind's greed for the sea. The most 'wicked' part is that either increasing ocean temperatures, sea-level rise, rainfall fluctuations, extreme weather systems, shipping disruptions, or inadequate aquatic food supply are exogenous to the underdeveloped Madagascar that has made little contribution to global greenhouse gas emissions or ocean pollution. Nevertheless, the country must confront the cascading effects of these seaborne challenges on a domestic level. The tragic situation of ecological, economic, and human insecurity, as well as the subsequent humanitarian crisis and social instability caused by these challenges, is further compounded by the fact that many of the victims are unaware that their suffering is a result of the sea on which they depend.

Among all the seaborne human security challenges facing Madagascar, drought could be a decisive hazard that locks the island in an unsolvable situation of unsustainability and underdevelopment, as it has been a direct cause of many cases of human insecurity. In this regard, sustainability and the management of development and security are inextricably linked, and consequences of unsustainability could underdevelop and insecuritise a society, or vice versa (as conceptualised in Chap. 2). There have been a number of drought-related resource problems, including food shortages, agricultural decline, bush and forest degradation, and cattle, land, and water conflicts. To the surprise of many, sea-dependent people are vulnerable to these livelihood and security threats, which, in turn, leads to demographic, political, and environmental stresses in the Malagasy community as a whole.

Time is running out, therefore, to address these challenges, as it is also not possible to address the underlying causes of these challenges effectively and simultaneously. What is urgently needed is a more comprehensive programme that joins the forces of marine sciences and social sciences to investigate, interpret, and intervene in the entanglement of sea changes. Marine sciences produce hard knowledge for a path towards ocean sustainability. Yet transdisciplinary research can provide approaches that integrate marine ecosystems and social systems in an appropriate relationship, innovate methodologies most suitable to engage external and indigenous stakeholders for the co-production and co-design of possible solutions for a way out of the current

deadlock, and reconcile the country's socio-economic needs for the Blue Economy and the often-divergent interests attached to them, allowing a ethical, fair, and equitable share of the ocean. The wicked "*tsy misy fika intsony*" situation young Malagasy have complained about, powerlessly facing seaborne challenges, can only be addressed when a common understanding of ocean sustainability is achieved among all parties of interest across the globe.

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