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Research Article

CHALLENGES IN DEALING WITH OIL SPILL IN THE INDIAN OCEAN: CASE STUDY OF MAURITIUS WATERS

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Abstract

The oil spill remains a challenge in the current maritime security context. Such a case might occur due to natural disasters, human errors, and damaged engine systems. Mauritius is one of the archipelagic countries in the Indian Ocean that suffered from oil spills in its territorial waters. Although this country has developed large-scale projects related to maritime security cooperation and capacity building, it faces various challenges in handling the oil spill of MV Wakashio in August 2020. This article discusses the challenges an island country must face in handling oil spills from the maritime security perspective. This study uses a qualitative methodology and the oil spill in Mauritius water as a case study. The authors found that in dealing with the oil spill case, the Mauritius government needs more than a contingency plan, maritime capacity building, and rapid coordination at the national and regional levels. Regional and global communities' support in the form of sufficient financial and technical aids, sophisticated tools, and competent human resources is essential to assist Mauritius in handling the spill and its environmental impact. Therefore, Indian Ocean Rim Association (IORA) should also play a more significant role in such a situation.

Keywords: Indian Ocean, Oil Spill, Maritime Security, Mauritius, MV Wakashio.

INTRODUCTION

In the globalization era, the need for the sea is inevitable. The sea is vital both in terms of managing and utilizing resources. In addition, shipping activities are a significant part of international trade in the globalization era, maximized through sea routes. However, many accidents occur at sea due to various causes, ranging from natural factors such as bad weather and natural disasters, human error or carelessness, and damage to the navigation system or engine of a ship or marine exploration tool that is in operation. One of them is related to the case of oil spills that occurred at sea. It becomes more complicated to deal with if the case involves more than two parties, like the ship owners and the island state. Oil spills on land are common issues, and their management has long been patterned domestically. What about the oil spills at sea? What if the oil spill occurs at sea and engages two or more states? What is the impact on the island or archipelagic states, and how to deal with such cases? On the one hand, the rapid development of industry and global trading encourage trade activities that require higher international shipping access. On the other hand, activities at sea are prone to various incidents, including oil spills. The oil spills at sea hamper marine life and activities at sea, including fishing and sea-basis trading. The mapping of oil spill cases is diverse and can be discussed from various aspects. In 2021, one major spill (>700 tons) by tanker occurred in Asia, and five moderate spills (7-700 tons) occurred in Africa, Asia, and North America. This data performs a slight increase from the previous year but is insignificant compared to the spill cases in the last decade. The total volume of oil spills in this time reached a high number in the previous two years, where approximately 10,000 tons of the sea environment were polluted. The International Tanker Owners Pollution Federation (ITOPF) confirmed that such pollution is caused by significant spill cases (ITOPF, 2021).

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IOTPF recorded that the cases of oil spills in the world decreased until 2021. The rate of decline in cases of moderate oil spills has been managed to be below seven issues per year since 2008, while large oil spills reached the lowest points in 1982. However, the oil spill cases slightly rose from 1995 to 1996 and have fluctuated today (ITOPF, 2021). Even though the number of cases is low, oil spill cases remain problematic and bring negative environmental and ecological impacts. Similarly, according to Statista (2022), the amount of oil leaking due to tanker spills has generally decreased in the last two decades. Although 2018 and 2021 stand out as perilous years for oil shipments. In 2018, the collision of the tanker Sanchi resulted in the death of all crew members and spilled as much as 113,000 metric tons of condensate, polluting the East China Sea. There were six oil tanker spills worldwide in 2021. Five cases released volumes of less than 700 metric tons. The Indian Ocean is one of the busiest shipping lanes in the world. Carrying about 30 percent of total annual world oil production, the Indian Ocean needs particular attention, especially when it is vulnerable to oil spills. Several small island countries in the Indian Ocean have repeatedly become a place or locations for large ships to sink or experience accidents when passing through the Indian Ocean. Among them are the Mozambique Straits of East Africa and the waters of Mauritius, given by various tankers carrying oils. International Maritime Organization (IMO) noted the vulnerability of the Indian Ocean region to oil spill accidents. IMO raised the issue in its 1994 Report on the Regional Oil Spill Contingency Program for the Island States of the Indian Ocean Region. The report was funded by the Canada International Development Agency (CIDA) and the United Nations Conference on Nations on the Sustainable Development of the United Development of Small Islands. The IMO report further identified the need to protect marine native species and ecosystems, such as World Heritage Sites, turtle breeding grounds, and the region's extensive coral formations, coastal wetlands, and sandy beaches (IW LEARN, 2017). Mauritius, one of the archipelagic countries in the Indian Ocean, is very dependent on the tourism and fishing

industries. The country's dependence on the marine tourism sector leads it to the strategy on the ecological security of the sea from pollution, especially the oil spills from tankers passing through its territory. Mauritius' National Environmental Action Program (NEAP) in 1990 identified the lack of an institutional and regulatory framework for environmental management as a significant obstacle. NEAP emphasized the importance of preserving biodiversity and coastal ecosystems considering Mauritius's geographical location and characteristics, which are unique and essential for developing the tourism industry. As a form of seriousness, the Government of Mauritius has also ratified several international water conventions, including the CLC 69, FUND 71, and MARPOL 73/78. It has also expressed interest in ratifying the OPRC 90. Fortunately, the local oil industry also supported such ratifications as it is committed to providing ready-to-use equipment for cases of oil spills and, in general, supported government initiatives in the field of oil spill management. Mauritius keeps the tourism environment sustainable by actively promoting environmental programs, including the development of a national oil spill contingency plan under the authority of the Ministry of the Environment. It also provides additional equipment under the Maritime Authority and other equipment for the oil terminal. Nevertheless, the Mauritius government's policy in handling the oil spill case has yet to be seen carefully. The authors develop this research further to describe the challenges of oil spill management in Mauritius waters. In conclusion, the authors provide an overview and input to the regional organization and its member countries in dealing with oil spill cases in the Indian Ocean.

LITERATURE REVIEW

Several studies have explained how oil spills occur at sea and their impact. Etkin (2001), in his article, examines the trend of oil spills in American waters and the world. His study analyzes the frequency of oil spills and shows that the trend declined over the last two decades. The decline was associated with a decrease in the rate of ship accidents occurring at sea. He also mentions that the tightened tanker regulations also impacted decreasing the trend of oil spills at sea. From his article, we understand that oil spills mainly occur due to ship accidents and weaknesses in the oil tankers' system. Regarding the impact of oil spills, Gundlach and Hayes (1978) categorize the spill in the ocean and the effects on the marine coastal environment. Their article measures and classifies the environment's vulnerability level by examining the oil spill. Areas most vulnerable to oil spill damage include marshes, mangroves, tidal flats, and protected rocky zones. Coral reefs are possibly highly vulnerable, while rocky cliffs and wave-cut platforms are least likely to distract. By classifying the vulnerable areas, priority protection and treatment will be easier to decide from the highly vulnerable to the least. In addition, Blumer, Sanders, Grassle, and Hampson B.S (1971) confirm that oil spills in the ocean have a considerable impact and seriously damage the marine environment and human life. Oil spills cause pollution problems, putting fisheries used as human food in danger. Pollution occurs for a long time and continuously affects the normal processes of marine life and kills them due to high concentrations of toxins. As a result, fish and other sea creatures disappear and are followed by species of marine life that tolerate the poison. Such a condition indicates an unhealthy biological marine environment. Further, if humans eat fish and other sea creatures contaminated with oil spills, their health will be disrupted. Nevertheless, oil spill handling at sea remains problematic as it has not fully resolved the spill and its impact. Similarly, Teal and Howarth (1984) elaborate more on the ecological impacts of oil spills by looking at seven cases, namely the barge Florida, tankers Arrow, Argo Merchant, Amoco Cadiz, Tsesis, and blowouts from the Bravo and Ixtoc platforms. From these cases, they note that oil spills produce unpredictable ecological effects. The ecosystem-level interaction is impenetrable, even without the complication of oil spill effects. This condition is further complicated by oil spills, including the movement of oil to the seabed and impacts on benthic, zooplankton, fish, and fisheries. Such a situation worsened when it occurred in the deep sea. Beyer et al. (2016) particularly discuss the oil spills on the Deepwater Horizon offshore, causing damage to the deep-sea and the coastal environment. In this case, oil spreads at a depth of 1100-1300 m, polluting and affecting marine creatures, including deep-sea corals, turtles, and cetaceans. They need continuous attention and monitoring. To manage the oil spills in the ocean, Etkin (2001) notes that improved safety standards, contingency planning, training programs, and other measures have helped reduce the incidence of oil spills at sea. In addition, international conventions and national laws have also reduced oil spills around the world. Previously, Etkin (2000) also discusses the costs of handling oil spills, providing an overview of planning for mitigation. He concludes that the price depends on various factors, including the spill location, type of oil, spill size, and clean-up strategy, making it challenging to develop a universal unit cost factor.

In managing oil spills, Solber (2012) proposes monitoring oil spills on the sea surface using satellite and aircraft surveillance. The combination uses satellite-based Synthetic Aperture Radar (SAR) images and cost-effective aircraft surveillance. Moreover, such a combination enables the official to distinguish the spills based on features describing the contrast, shape, homogeneity, source, and affected environment. The consequences of the environmental damage caused by the oil spill have led to an increase in the development of controlling spill methods. For this reason, Al Majed, Adebayo, and Hossain (2012) advanced using natural sorbents, which are believed to be the cheapest and safest method. Their study examines the limitations and environmental impacts of existing cleaning methods taking them to propose sustainable cleaning technologies using date fiber for the technique. They also offer guidelines in their study, particularly for the Middle East states with abundant dates. The above studies performed the perils of oil spill incidents at sea and the methods to deal with such incidents. The spill negatively impacts the environment and marine ecosystem. Further, it harms the human and national blue economies due to ecosystem damage and a significant decrease in fisheries. In this article, the authors show the challenges the government of archipelagic states had to manage when an oil spill occurred, specifically in a small island country, like Mauritius.

METHODS

To understand the challenges in handling the oil spill case in the waters of Mauritius, the authors used the qualitative research design. Such a methodology gives a detailed description, colorful detail, and a neutral tone with statistics in concrete social events. Neuman (1997) noted that qualitative

methods involve documenting actual events, recording what people say with words, gestures, and tone, observing specific behaviors, studying written documents, or examining visual images, which the authors conducted. By utilizing this methodology, the authors relied primarily on an interpretive approach to social science (Neuman, 1997; Hendarso, 2006). Such an approach allowed the authors to describe the challenges of oil spill handling from the Mauritius government's perspective. Therefore, in this study, the authors carried out an in-depth interpretation of several previous similar studies. In addition, the authors sharpened and enriched the analysis of the previous research on oil spills. The authors used a case study approach to go into more profound detail on the oil spill case faced by the Mauritius authorities, as the primary purpose of the case study approach is to reveal the unique characteristics of an issue. By case study, the authors looked for a specific pattern in Mauritius' oil spill management, policy, strategy, and implementation in the context of the complete case. The case study researchers also examine a particular event's meaning, process, and sequence (Creswell, 1994; Neuman, 1997). The authors collected and analyzed primary data from officials' papers and statements at conferences and secondary data from various works of literature. Therefore, in this study, the authors described the policies and strategies the Mauritius government has prepared and conducted nationally and globally. The authors also described the chronology of the oil spill incident, especially in the case of MV Wakashio. This study further explains several challenges based on the Mauritius authorities' statements to attain a complete picture of Mauritius' oil spill management as a small archipelagic state with all its limitations.

RESULTS AND DISCUSSION

The Essence of Maritime Security

To understand the challenges in handling the oil spill case in the waters of Mauritius, the authors used the concept of maritime security. Klein (2011) defines it as "*the protection of state's land and maritime territory, infrastructure, economy, environment, and society from certain harmful acts occurring at sea.*" However, Klein's definition is ambiguous in answering the essence of maritime security from an international relations perspective. Moreover, contemporary studies today are required to broaden the scope of security so that it is relevant to non-traditional security, such as terrorism, damage to marine life, and human trafficking. This is not to mention the Sustainable Development Goals for oceans, seas, and marine resources.

Bueger (2014) confirms that maritime security has a standard definition yet. He accordingly proposes three conceptual frameworks to explain the meaning and scope of maritime security. Firstly, he suggests understanding other concepts such as maritime safety, sea power, blue economy, and resilience to describe maritime security. Secondly, the securitization framework makes it possible to study how maritime threats are created and how different political claims are required to expose other political interests. Thirdly, the theory of security studies allows the study to understand what actors do when they claim to improve maritime security. These frameworks enable maritime security mapping. Basil Germond (2015) explains that maritime security refers to a set of policies, regulations, actions, and operations to secure the maritime domain to understand the concept in a particular geopolitical dimension. In its dynamics, maritime security is increasingly used to describe preventive measures to respond to illegal activities at or from the sea. This includes the protection of shipping and ports. Germond notes that terrorism and piracy, rampant attacks, arms and drug trafficking, people smuggling, illegal, unregulated, unreported fishing (IUU), and pollution constitute a large part of illegal and disturbing activities at sea. Therefore, states and international actors have adopted a more comprehensive and proactive approach to maritime security. Such a mechanism is centered on applying the legitimate use of force at sea to maintain security, safety, and good governance in the maritime domain with preventive measures such as security regulations and counter-piracy operations.

Recently, maritime security has been increasingly linked to economic and environmental considerations. Voyer et al. (2017) elaborate on the inter-related relationship between maritime security and the blue economy. Maritime security is vital as it becomes a driver of the blue economy through securing navigational routes, providing critical oceanographic data to the marine industry, and protecting rights to valuable marine resources and activities within maritime jurisdictional zones. Maritime security has also become a source of development and economic growth. An expanded blue economy accordingly creates more significant demands for maritime security capabilities.

Therefore, their study concludes that maritime security ideally includes four components covering national security, marine safety, economic development, and human security. National security applies to the national sea power in protecting the state, including patrolling and protecting sea lanes, claimed maritime zones, and delimited maritime boundaries and rights of coastal states within maritime space. Marine safety refers to the ability to address threats to ships and maritime installations and assets, which includes responding to maritime disasters and accidents at sea and participating in search and rescue activities. Economic development indicates the enforcing laws and regulations related to the use of resources in the oceans. This includes combating piracy and providing a safe maritime environment that enables and supports economic development. Human security refers to food security and sustainable livelihoods, focusing on IUU and human trafficking. To explain in a broader context, Rahman (2009) defines the terminology by looking at three dimensions of maritime security, ranging from marine environmental security and governance to marine security arrangements and transportation systems. In his report, we can see three dimensions of maritime security. The first dimension places the protection of the marine environment and the conservation of living and non-living marine resources at the forefront of maritime security issues. Marine environmental security is perceived as part of environmental security. It has an ecological bias based on understanding the importance of a healthy marine environment for quality of life on land and the ocean's vital role in regulating global climate. The 1987 World Commission on Environment and Development (WCED) Report confirms such an approach. The second dimension covers the maritime governance issue. It is an approach to maritime security with a solid marine environment bias. Unlike fundamentalist views, it is firmly placed within the international political and legal framework that establishes the context for ocean management (Moran, 2007). At its core, this dimension lies in promoting a

"stable maritime regime" based on the principles of the United Nations Convention on the Law of Sea (UNCLOS), upholding and implementing existing conventions (Bateman, 2007). The third dimension connects to the regulation of the security of the sea transportation system. It is a relatively new dimension conveyed after the tragedy of 9/11. Such a dimension involves all sectors of the maritime transport industry, lawyers, and others dealing with public international shipping law. Here "maritime security" is defined as a term denoting the safety and security regulations of shipping, ports, and all aspects of the international system for trans-sea trade – and offshore installations - especially those related to threats from or exploitation by piracy and other maritime crimes, and terrorism, the direct drivers of the new security regime (Rahman, 2009).

Yang et al. (2021) perceive maritime security as a national, regional, and international security manifestation. Such a perception comes from the idea that the ocean gives birth to live, connects the world, promotes development, and shapes communities with a shared future. People from all countries share peaceful, healthy, and sustainable marine development, which is essential for human survival that makes the global governance of maritime security and order necessary. Therefore, countries that want to strengthen their maritime security should establish maritime cooperation, actively fulfill their international responsibilities, ensure the safety of international shipping routes, increase efforts to provide public services and marine security facilities, strengthen the construction of marine ecological structures, and realize the goals of Sustainable marine development.

The Oil Spill Case in Mauritius Waters

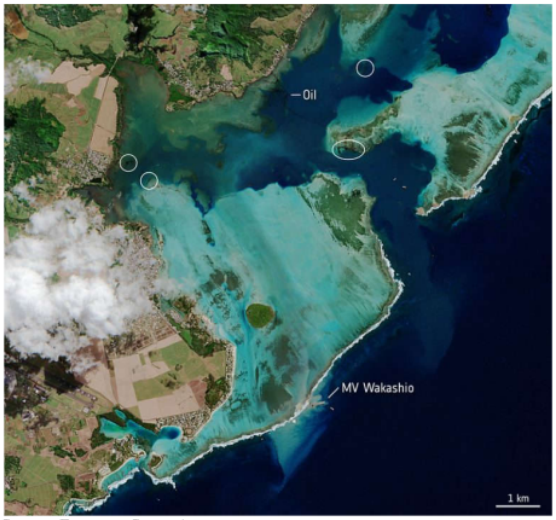
To study the detailed risk and impact of oil spills in the Indian Ocean, Western Indian Ocean Islands Oil Spills Contingency Planning proposed a project preparation to evaluate related things. This included two main things, namely: (a) the likelihood of an oil spill occurring, from minor operational spills to oil handling facilities (Level 1) to more significant and more severe spills occurring in waters far from the harbor and port oil handling, requiring a significant response (Level 3); and (b) damage that will result in an oil spill. Their study showed a real risk of small operational spills in all island states and that there have been many such incidents in recent years, including the island states in the Indian Ocean region (World Bank, 2005). Each island government in the Indian Ocean, such as the Comoros, Madagascar, Seychelles, and Mauritius, has the same aspiration to develop the ecotourism potential of their respective countries. The plan is in addition to the fishing industry contributing to the national GDP. Therefore, the potential for economic development depends heavily on protecting their common resource, the Indian Ocean. Oil spills in the ocean surely damage beaches and marine and coastal ecosystems. In a more severe condition, such cases would seriously damage two of the archipelagic nation's leading economic sectors: tourism and fishing. As an archipelagic state in the Indian Ocean, Mauritius has developed its diversified national economy from marine resources, primarily based on tourism, shipping, and fisheries. With its Exclusive Economic Zone of 2.3 million km^2 and a continental shelf of 396.000 km^2, the Mauritian government has declared its intention to develop its marine economy since 2012. In line with the vision of "Blue Economy," a key term in the 2012 UN Conference on Sustainable Development, Mauritius established a Ministry of Blue Economy, Marine Resources, Fisheries, and shipping. It perceived Blue Economy as a driver for national growth. The Mauritius government accordingly adopted various World Bank recommendations for the country. With this vision, Mauritius' Ministry of Blue Economy, Marine Resources, Fisheries, and shipping planned to double its national blue GDP to 20 percent (Ministry of Blue Economy, Marine Resources, Fisheries and Shipping, 2020). To realize the plan, the Mauritius government focuses on protecting its marine resources and accelerating the development of its blue economy. As mentioned by the President of the Republic of Mauritius (2020) in the Government Program 2020-2024, the program includes restoration of beaches, reinstated underwater flora and fauna, cultivation of coral and algae, development of sustainable aquaculture and fishing industry, reinforcement of marine cultural tourism, and better management and protection of their waters. However, the government seems to lack recognition of the gaps between the policies and practices (Moolna, 2021). The Wakashio oil spill was an illustration of such discrepancy. The Wakashio case is one of the worst oil spills in the Indian Ocean that occurred on July 25, 2020. It was when the Japanese bulk carrier MV Wakashio was stranded on a coral reef near Pointe d'Esny off the coast of southern Mauritius. Two weeks later, on August 7, the ship owner planned to refloat the ship and pump 4,000 tons of diesel and failed, causing oil spills. Another spill happened on August 10, when about 1,000 tons of fuel spilled from the ship, threatening the Blue Bay marine park, one of Mauritius' marine treasures and a sensitive ecological site. The below figure describes the incident (Abadie, 2020).

Source: WMO

Figure 1. MV Wakashio

Shortly after the incident, the Mauritius government announced a state of emergency to handle it quickly and precisely. Mauritius Prime Minister Pravind Jugnauth internationally declared that the state was in an environmental crisis and asked for international assistance. Worried about the oil spill, hundreds of Mauritius residents subsequently built barriers out of sacks filled with straw and other materials to contain the spill. Some countries rushed to help Mauritius to solve the oil spill case. French Navy sent reconnaissance planes and the Champlain, overseas aid and support ship, from nearby La Reunion. India sent experts, as did Japan and the International Maritime Organization (IMO). United Nations (UN) organizations based in Mauritius offered assistance, as did other donor agencies, including the European Union. As a result of such alertness and the participation of several countries and international organizations, only about a quarter of the toxic fuel on board was leaked. The worst-case scenario of a ship breaking and releasing all its fuel was avoidable. However, the leaks were enough to cause an environmental catastrophe (IW LEARN, 1997).

About 3,900 tons of very low-sulfur fuel oil (VLSFO), 200 tons of diesel, and 90 tons of lubricants have been removed from the ship. Mauritian authorities estimated the number of pollutants released into the sea at 800-1000 tons. Such runoff affected sensitive areas, covering the Blue Bay Marine Park, the Ramsar wetlands, and the Ile aux Aigrettes nature reserve, home to the last remnants of Mauritius' dry coastal forest and the endangered species depending on it (Abadie, 2020).



Source: European Space Agency

Figure 2. Mauritius Waters Map, Shipwreck Spots, and Oil Spread

The Governor of Reunion Island, the South Indian Ocean Defense Area, and the French Government Delegation for State Action at Sea decided to activate the Crisis Task Force following the request from the Mauritian authorities for personnel and material support from the French government. The French government then involved Météo France (MF), its national meteorological and climatological service, to monitor marine pollution and sea surface surveillance in the Mauritius water. To meet this commitment, MF developed a high-resolution pollutant drift model, MOTHY, to roughly calculate the track of oil spills moving in the direction of local winds and ocean streams. Such a model has been in operation since 1994 and was extensively used during the Erika oil spills in December 1999, Prestige oil spills in November 2002, and more recently, for pollution caused by the sinking of Grande America in March 2019 in the Bay of Biscay. The MOTHY system operates approximately 20 times weekly for oil slicks, hovering, and search and rescue operations at sea. The environmental data required for the operation of MOTHY is updated several times a day. The MF shares the results with CEDRE, which advises the authorities on the decision-making process. The MOTHY model has also been able to simulate the satellite-observed trajectory of the sargassum algal bank and measure grounding risk in Guyana and the West Indies since 2019. To operate this model, MF utilizes several Copernicus Marine products. Initially, oil spill shifts can only be accurately measured using ocean currents. The key to accurately predicting the course of an oil spill is the Copernicus Marine Global Ocean product, manufactured by Mercator Ocean and referred to as Global Ocean Forecast Model 001_024. Through data assimilation, the latter product incorporates in-situ observations (133-030) and satellite observations with sea levels 008-044 and sea surface temperature 010-001. This is essential to reduce forecast uncertainty and guarantee the accuracy of oil spill responders. With these devices' assistance, MF can estimate the MV Wakashio oil spills' potential course and predict its repercussions hours or days in advance. In addition, MF's Copernicus Global Ocean Wave Forecast is also used to analyze and provide expert forecasts of the sea conditions in the area of operation. To lessen forecast uncertainty, the final product incorporates observations of satellite waves through data assimilation.

The meteorological service has a vital role in this case. The Mauritius Meteorological Service (MMS), within minutes of learning of the accident, provided all relevant authorities with information on the state of the sea at the time of the accident and a 3-day weather forecast for the crash area, which included wind and wave parameters. Coupled with Météo France, they utilize Copernicus Marine Service products to estimate potential oil spill trajectories in their respective marine areas. Not only are they free of charge, but these products also allow MF to assess the likely course of the MV Wakashio oil spill and predict its subsequent consequences hours and days in advance. Mauritius authorities also activated a national anti-pollution plan and alerted neighboring countries, including France, which oversees the Reunion Island. The first oil drift calculations, using the MOTHY drift model from Météo-France, showed that the leak reached the coast of Mauritius very quickly. However, the risks to Reunion Island appear to be limited. MMS continued to report daily to relevant authorities with 3-day forecasts for sea, wind, and wave conditions. Wave observations from wave rider buoys in Blue Bay, which lies a few km from the wreck, are closely monitored and regularly communicated to all relevant parties (Copernicus, 2019).

Mauritius Government's Responses and the Challenges

The Mauritius government's appeal to the international community regarding the oil spill in its waters shortly after the incident performed its unpreparedness to deal with such a case. It seems that all this time, at least until the incident, Mauritius was only campaigning to prevent regional oil spills with all its training programs and workshops. Indeed, Mauritius was one of the first African countries to complete the 1990 oil spill contingency plan with support from the International Maritime Organization (IMO) and United Nations Environment Program (UNEP). Mauritius is one of the beneficiaries of the 'West Indian Ocean Oil Spill Contingency Planning project, funded with US$ 4 million and run by the World Bank from 1998 to 2003. Through this project assistance, the Mauritius government updated its national contingency plan. Workshops and pieces of training were conducted, and regional agreements were signed. The 'Marine Highway Development and Prevention Project,' which ran between 2007 and 2012, continued this work. Funded by the Global Environment Facility with US$11 million, the country received more training in oil spill prevention and reviewed the plan. When the project ended, Mauritius received another training under the UNEP Regional Ocean Program and the Nairobi Convention (Nature, 2020). The Mauritian government is also one of the primary beneficiaries of the EU MASE project, where a maritime security structure is developed for the region. As part of these projects, between 2003 and 2012, the country held five

larger drills and exercises on oil spill prevention. The government has benefited from substantial UN and international community capacity-building assistance. In addition, the Mauritius representatives regularly participate in workshops and exercises in other countries. Mauritius authorities are aware of disaster risks once they occur. On their voyage between Asia and the Cape of Good Hope, several wrecked ships were in Mauritius waters. The country is also a beneficiary of several large-scale capacity-building projects to develop regional oil spill responses and advance national preparedness for environmental disasters at sea. This includes a US$4.9 million project under the West Indian Ocean Island Oil Spill Contingency Planning between 1998 and 2006 (Nature, 2020). Such a project aims to build appropriate national and regional oil response capacities in Comoros, Seychelles, Madagascar, and Mauritius. It also highlights that Indian Ocean Islands are at risk of spillage and environmental disaster. While this project primarily addresses national-level responses, the successor projects are more ambitious. The US$ 26.7 million West Indian Ocean Highway Development and Prevention of Coastal and Marine Contamination Project ran from 2007-2012. This project aimed at developing and implementing a regional strategy. Kenya, Tanzania, and South Africa are included in the project. Capacity-building work continues under the auspices of the UNEP Regional Ocean Program and the Nairobi Convention (Bueger, 2020). The program also organized a workshop on oil spill prevention where Mauritius provided an update on the status of its national preparedness. Nevertheless, from the MV Wakashio case in Mauritius waters, we can see that capacity building and national planning programs are insufficient to cope with natural disasters. The Mauritius government deals with other challenges.

In March 2020, the UNEP organized a "Cooperation in Preparedness and Response to Marine Pollution Incidents" workshop in Zanzibar. Representatives from the Mauritius Ministry of Environment and Fisheries attended the workshop and presented the country's report on "National Oil Spill Preparedness Status." Their presentations contain critical notes regarding their challenges, particularly in handling oil spills (The Africa Report, 2020). Firstly, officials in Mauritius understand that their country is one of the world's busiest shipping routes as it locates in the Indian Ocean and at a crossroads with Asia and Africa. However, this county is also at high risk of ship accidents and stranded due to its vulnerability to severe weather events and natural disasters such as cyclones, storm and tidal surges, torrential rains, flash floods, landslides, and tsunamis. According to the World Risk Report in 2016, Mauritius is the 13th country with the highest disaster risk and the 7th most exposed to natural hazards (Republic of Mauritius Official Statement, 2017). Such conditions make it difficult for a small island nation like Mauritius to bear all the consequences of natural disasters on its waters.

Secondly, the island and archipelagic states, including Mauritius, need more sophisticated disaster planning, response, and assessment tools to maintain their strategic position for the sea-basis trading system. The Mauritian government has put effort into implementing critical disaster risk reduction and management projects. This includes setting up and executing the early warning and emergency alert systems for storm surges, a Doppler radar system to provide a more accurate forecast of heavy rainfall, and regular conducting disaster response simulation exercises at national and local levels. Nevertheless, the country has limited funding, poor technology, and low human capacity to implement such a strategy effectively (Republic of Mauritius Official Statement, 2017).

Thirdly, Mauritius officials highlighted that not all strategy elements are efficient. In 2016, the Mauritius government set up the National Disaster Risk Reduction and Management Council and the National Disaster Risk Reduction and Management Centre (NDRRMC), in addition to the Local Disaster Risk Reduction and Management Committees. These councils represent the cross-cutting institutional instruments to integrate disaster risk reduction management across all levels and sectors. The same year, the Mauritius government also promulgated disaster risk reduction and management legislation. However, some components are missing, such as the wildlife response plans and monitoring program to track the impact of oil spills on the potential contamination of fisheries, coastal sediments, and habitats (WWF, 2020). Most importantly, as noted by the Mauritius officials, regional cooperation in dealing with oil spills in the Indian Ocean worked ineffectively. Regional and international community support should be provided to the state and people most affected by the oil spill. Bueger (2020) noted that Mauritius prepared the oil spill contingency plan nationally, regionally, and globally. After the MV Wakashio incident, The Mauritius government issued a National Oil Spill Contingency Plan in February 2022. It was drafted collaboratively with the International Maritime Organization (IMO) and the UN Environmental Program. As mentioned earlier, the Mauritius government had also been involved in at least three large-scale maritime security capacity-building projects with regional and international organizations. Firstly, the Mauritius government signed the Djibouti Code of Conduct, initiated by IMO in 2008. This agreement was initially made to address the piracy cases at sea. However, since 2017, it has been developed into technical cooperation to deal with marine environmental problems. Secondly, the EU-funded MASE Project enables countries in the region to create an accurate picture of their maritime domain and develop rapid coordination when dealing with marine domain problems. Thirdly, the Nairobi Convention focuses on preventing marine pollution and oil spills. However, various maritime capacity-building projects, regional and global prevention mechanisms, and contingency plans have not allowed the Mauritius government to prevent or minimize the oil spill's impact on its waters. From the oil spill case in Mauritius waters, it is obvious that a good plan and capacity building alone is insufficient in natural disaster response, particularly at sea. Practical experience and global support are essential. Mauritian authorities have dealt with oil spill incidents previously. On a smaller scale than the MV Wakashio incident, the authorities managed two significant oil spill cases in 2005 and 2016.

In April 2005, a collision occurred in Port Louis between MSC Katie and MV Nordsun. MSC Katie had a fracture and was caged on a rock to avoid drowning. At that time, Mauritius authorities prevailed in preventing the oil spill. Another incident occurred in June 2016 when the MV Benita ran aground not far from the location of the MV Wakashio oil spill site. While the ship was damaged, a rescue company immediately came to the scene. The contractors pumped fuel off the ship, and there was only a small oil spill on the waters. The ship owner company then pulled MV Benita to India.

However, the ship sank back in India (The Africa Report, 2020). From several incidents of ship damage, collision, and accidents due to natural disasters at sea, the Mauritius government is fully aware of the risks and has developed a planning mechanism accordingly. Nevertheless, the MV Wakashio oil spill tells us that contingency plans might fail and go wrong. Capacity building and training also have imperfections. Support from the regional and global community is urgently needed to assist archipelagic states in overcoming oil spills. In such a case, we can say that the Mauritius government has put significant efforts into preparing for an oil spill emergency under various programs on paper. Adequate capacity and contingency plans appeared to be in place. Surprisingly, the containable incident escalated into a full-scale environmental crisis. Further investigations provided details of where, when, and how mistakes were made, including by the Mauritius government, the owner of MV Wakashio, and industry experts brought in to respond. However, the incident also demonstrated some of the difficulties of capacity building more generally, despite the millions of dollars spent on it (Observer Research Foundation, 2020). In the end, support from other governments and institutions is essential. Financial, technical, and competent human resources are vital to help small island states like Mauritius.

CONCLUSION

Critically, regional maritime security mechanisms appear to be largely absent during emergencies. One reason may be that too many projects, organizations, and platforms are dealing in one way or another with maritime security in the region. Fragmentation and the resulting overlap and coordination problems can lead to action and commitment problems. Questions about which organizations should act, when and how, and who should lead the regional response remain pressing. These problems are challenging to overcome, especially since this area is far from a collective identity or shared regional plan. However, as explained earlier, significant countries in the region, like India and France, have the power to steer the area into more organized waters. Forums like the Indian Ocean Rim Association (IORA) or the Indian Ocean Naval Symposium might provide a discussion platform. The fact that no regional mechanism can respond to an oil spill and that Mauritius is not considering switching to such a mechanism cast doubt on its effectiveness. The failure and fragmentation of capacity building will not be easy to overcome. Regional powers, such as India and France, responded quickly to the incident and assisted the Mauritius government. Their contributions will be needed for a long time to tackle environmental disasters, piracy, and other forms of blue crimes. There is an urgent need to tailor capacity building over the long term to recognize local country circumstances, constraints, and priorities to develop sustainable solutions over time. Apart from the IORA forum, regional maritime cooperation mechanism also needs to be developed within the framework of Indo-Pacific collaboration and must be supported by global ocean governance that emphasizes the strategy and significance of the Indian and the Pacific oceans and aligns with various countries' interests. Given the importance and vulnerability of the Indian Ocean, coupled with its management, it is a common concern for Indo-Pacific countries. Regardless of differences in positions, especially regarding regional sea management, all countries are essential in maintaining peace and handling maritime problems, including oil spills, based on mutual interest and security. It is also essential to recognize the importance of international legal principles, one of which is regulated in the UNCLOS. The convention is essential in providing regional security and maritime cooperation framework. This includes overcoming the problem of overlapping claims between island countries and handling the oil spills, such as in the case of Mauritius.

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List of Abbreviations

CIDA	: Canada International Development Agency
IMO	: International Maritime Organization
ITOPF	: International Tanker Owners Pollution Federation
MF	: Météo France
NEAP	: National Environmental Action Program
NDRRMC	: National Disaster Risk Reduction and Management Centre
SAR	: Synthetic Aperture Radar
UN	: United Nations
UNCLOS	: United Nations Convention on the Law of Sea
UNEP	: United Nations Environment Program
VLSFO	: Very Low-Sulfur Fuel Oil

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