

Article

An Unresolved Environmental Problem—Small-Scale Unattributable Marine Oil Spills in Musandam, Oman

Amran Al-Kamzari ^{1,2} , Tim Gray ^{3,*}, Clare Fitzsimmons ¹ and J. Grant Burgess ¹

¹ School of Natural and Environmental Sciences, Newcastle University, Newcastle upon Tyne NE1 7RU, UK; amran.alkamzari@ea.gov.om (A.A.-K.); clare.fitzsimmons@newcastle.ac.uk (C.F.); grant.burgess@newcastle.ac.uk (J.G.B.)

² Environment Quality Department, Environment Authority, Ministries Street, Al-Khuwair, P.O. Box 323, Muscat 100, Oman

³ School of Geography, Politics and Sociology, Newcastle University, Newcastle upon Tyne NE1 7RU, UK

* Correspondence: tim.gray@newcastle.ac.uk

Abstract

This article discusses unattributable small-scale marine oil spills, particularly focusing on their environmental and socio-economic impacts in Musandam, Oman. There is a research gap in the literature on unattributable small-scale marine oil spills that reflects the lack of attention paid to these minor yet frequent spills, whose perpetrators invariably escape detection and accountability. The research method combines a literature review with extensive fieldwork, including community mapping, key informant interviews, and focus group discussions, to understand the extent, causes, and challenges of untraceable spills. The findings reveal significant ecological damage, economic losses for local fishers and tourism, and systemic issues of untraceability, limited enforcement, and inadequate compensation mechanisms. The article recommends establishing a regional compensation scheme, deploying advanced detection technologies, improving spill reporting, and fostering regional cooperation to enhance spill traceability, upgrade remediation techniques, and obtain redress for affected communities. These recommendations aim to inform policy actions that mitigate environmental risks and uphold environmental justice in the Arabian Gulf region.

Keywords: small-scale marine oil spills; Arabian Gulf; Musandam; Oman; traceability; remediation; compensation; environmental justice



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1. Introduction

This article is an investigation into an unresolved environmental injustice: unattributable small-scale oil spills in the Arabian Gulf waters surrounding the Musandam Peninsula in northern Oman. In this Introduction we outline the environmental injustice of small-scale oil spills and draw on the literature to explain their cause, their nature and extent, the context in which they occur in Musandam, and the efforts of the Oman government to deal with them.

1.1. Environmental Injustice

Marine oil spills are a threat to the marine environment, with toxicity damaging marine life and habitats and impacting fisheries, desalination plants, and coastal amenities. While large-scale spills attract widespread public attention, small-scale spills from tankers do not, despite being the largest anthropogenic source of oil pollution, violating MARPOL

(International Convention for the Prevention of Pollution from Ships), and causing considerable ecological damage. According to the International Maritime Organization (IMO) and the International Tanker Owners Pollution Federation (ITOPF) there has been a reduction in reported large-scale tanker-related oil spills. For example, ref. [1] reported that the number of large-scale oil spills has reduced by more than 90% since 1970. However, these sources state that smaller, often routine discharges persist and are frequently underreported or poorly documented [1,2]. Small-scale spills are generally defined as below seven tonnes [2].

This situation raises environmental justice concerns because local coastal residents such as fishers suffer financial losses without compensation due to inability to identify the polluters. Advocates of environmental justice point out that poor, indigenous, and marginalized members of society often bear disproportionate burdens of environmental harms such as air and water pollution and hazardous waste [3–5]. Central to environmental justice is the polluter pays principle which holds that polluters should bear the full cost of managing and remedying the pollution they cause, including clean-up operations and compensation for affected parties. This is not happening with unattributable small-scale marine oil spills because the perpetrators escape detection.

The present study addresses gaps in the literature on unattributed small-scale oil spills, highlighting the limited research into detecting polluters, the evasion of liability for damages caused, the lack of funding for clean-up, and the difficulty of obtaining compensation. We use the case of Musandam to exemplify these issues.

1.2. Context of Musandam

It is important to understand the context in which marine oil spills near the Musandam Peninsula take place. Arabian Gulf states depend heavily on oil production and transportation [6]. A fifth of the annual global consumption of oil travels through the Hormuz Strait transported by more than 40,000 vessels which make over 200,000 port calls per year carrying >18 million drums per day [7]. As a result, coastlines in northern Oman and southern Iran regularly experience oil spills, though estimates of the amounts spilled vary widely [8]. According to [9] the Gulf is the most polluted marine basin in the world, partly because of its shallowness—36 m deep—and partly because of its warmth—higher temperatures increase oil toxicity. Tankers often flush out their tanks in the Sea of Oman before entering the Hormuz Strait to take on board cargoes of oil. Ref. [10] claim “About two million barrels of oil are spilled annually from the routine discharge of dirty ballast waters and tank washing”. According to [11] oil spills are the largest cause of marine pollution in the Arabian Gulf.

This research selected the waters around the Musandam Peninsula in northern Oman as a case study for marine oil spills in the Gulf because it routinely experiences unattributable small-scale oil spills which often reach the beaches. The Musandam Peninsula is the northernmost part of Oman situated in the southeast of the Gulf (see Figure 1).

Ref. [20]’s analysis of satellite radar monitoring data on oil pollution in the Sea of Oman from January 2017 to April 2020 concluded that the northern part of the Sea of Oman, particularly the Musandam coast, experienced small-scale oil spills at the rate of one to three times a month, mainly during the summer and early autumn. Numerous small-scale oil spills have been identified during the past years in Musandam waters through satellite imagery [21] (see Figure 2).

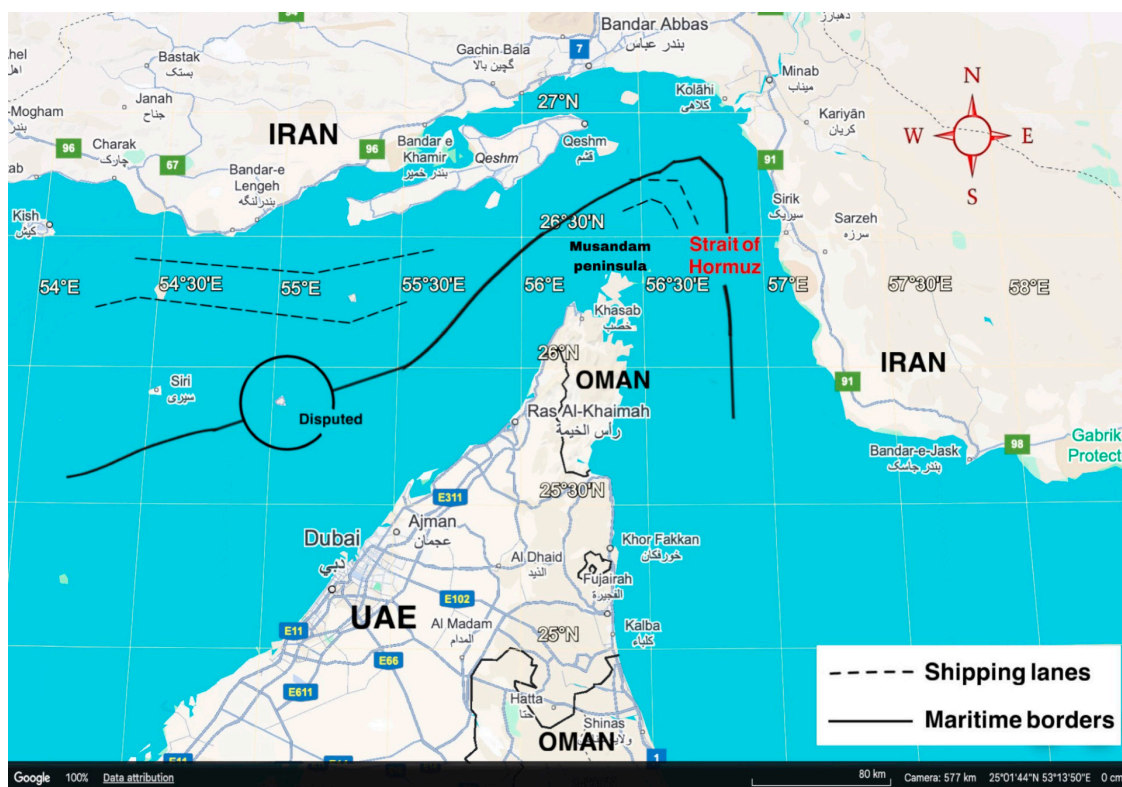


Figure 1. The geographical location of the Musandam Peninsula (Source: the lead author and Google Earth) Musandam is physically separate from the remainder of Oman, divided by the northeast region of the United Arab Emirates [12], which makes the peninsula politically isolated [13]. Because of the intensity of vessel movements in the Strait of Hormuz, the Musandam Peninsula is especially exposed to oil dumping by transiting tankers [14]. Typically, vessels discharge oil and chemical waste into the Sea of Oman under the cover of night or during rough seas instead of into legitimate port facilities [15,16]. Such deliberate discharge of oily material into the marine environment breaches MARPOL, which in 1978 made it illegal for ships to discharge oil. The ROPME Sea Area (often referred to as the “Gulfs area”), which includes the Musandam Sea, was formally recognized and designated in 2008 as a MARPOL “Special Area” by IMO Resolution MEPC.168 (56) in which all discharges of oil/waste are prohibited except in very specific circumstances [17,18]. Nevertheless, the peninsula continues to experience many oil spills. According to [19], spills caused by unknown vessels between 2008 and 2019 in Musandam’s waters averaged more than one spill per month (see Table 1).

Table 1. A time series line chart (2008–2022) showing the number of oil spills per year in the Musandam area (Source: an Oman Government official).

Year	Oil Spills
2008	12
2009	13
2010	4
2011	13
2012	7
2013	14
2014	10
2015	8
2016	14

Table 1. Cont.

Year	Oil Spills
2017	16
2018	7
2019	18
2020	12
2021	13
2022	15

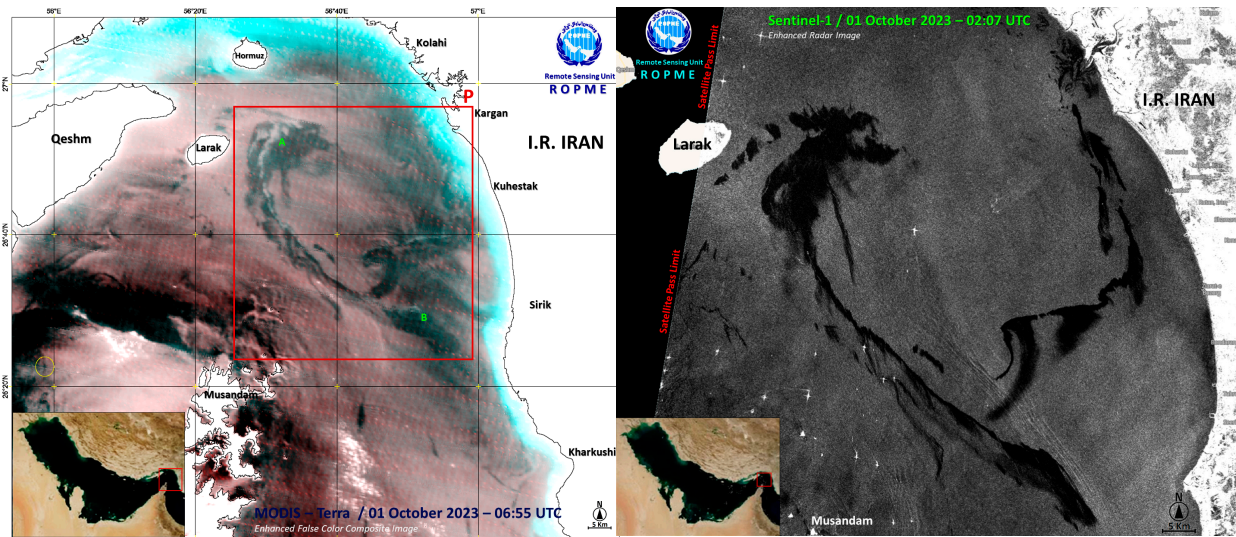


Figure 2. The spatial distribution of oil pollution observed in the inshore area of Musandam in October 2023. The contaminated area is within the red frame and covers approximately 186 km² (Source: [21]).

An earlier observation revealed three oil spills east of the Haffah, Limah, and Khatmah coasts (see Figure 3).

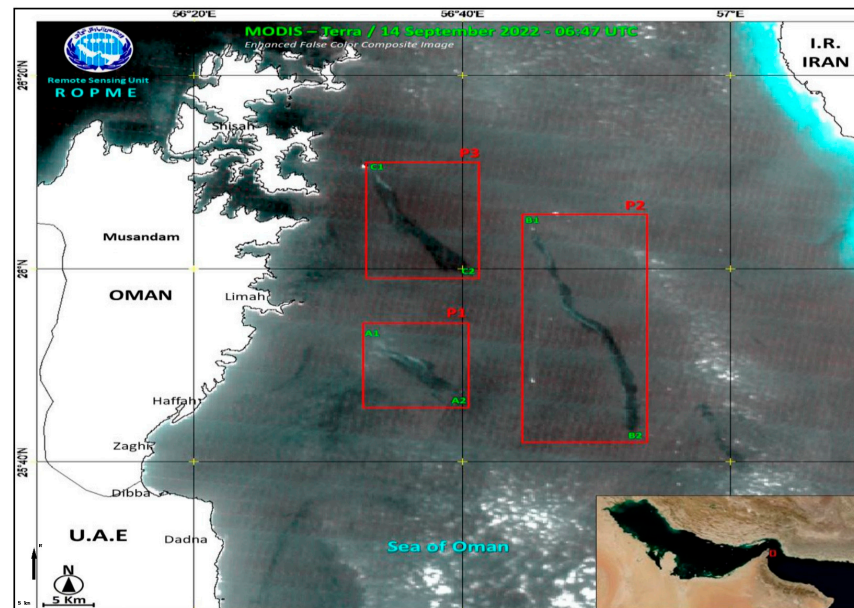


Figure 3. Satellite-detected oil pollution in Musandam waters on 1 October 2023 at 06:55 GMT located along the Haffah, Limah, and Khatmah coastlines. The affected area is within the three red frames and spans approximately 8 km² (Source: [21]).

The few studies that have been carried out on the effects of oil spills from unattributed vessels in the waters around the Musandam Peninsula reveal significant ecological and socio-economic damage, including clogging up commercial fishing gear, major bird fatalities [22], sea snake deaths [23], contamination of desalination plants [13] and oil slicks on beaches which have undermined the tourism and recreation sectors [24].

Some attempts have been made by the Governorate of Musandam's Department of Environment and Climate Affairs to deal with oil pollution from unattributable vessels transiting through the Strait of Hormuz. For example, ref. [25] reported efforts by naval and municipal authorities to transport clean-up materials to polluted areas (see also [26]). Ref. [27] said Oman's Environment Authority and Navy investigated the causes of oil pollution on Musandam beaches but were unable to identify the spillers. Moreover, ref. [27] criticized the Omani government for failing to secure compensation for affected communities. In most cases, residents were left with the responsibility and cost of cleaning up their own beaches [28].

The truth is that small-scale marine oil spills in Musandam go largely unrecognized by the Oman government, the media and academic researchers. This is symptomatic of a global focus on large-scale rather than small-scale spills, despite the fact that small-scale spills can wreak havoc on the well-being of coastal communities like Musandam. The current study was undertaken to fill this gap in oil spill research.

Section 2 outlines the two methods used to obtain data for the investigation—a literature search and fieldwork. Section 3 presents the results of the fieldwork from the perceptions of key informants and focus group discussants. Section 4 discusses the issues arising from these results. Section 5 concludes the article by summing up its findings and their wider implications.

2. Materials and Methods

Two qualitative research methods were used for this article: a literature search and fieldwork. The literature search used four databases (Google, Google Scholar, ScienceDirect, and JSTOR) to obtain peer-reviewed papers. The search terms of 'marine oil spills', 'recent unattributable oil spills', 'small-scale oil pollution', 'compensation for oil spills', and 'oil spills in Musandam' were used to retrieve relevant peer-reviewed items. In the grey literature, government documents and NGO reports were obtained. All retrieved items were deposited in EndNote 21, and an analysis was undertaken to identify key findings, including trends and gaps in the literature.

Musandam was selected as the case study area due to its repeated exposure to small-scale oil spills and its ongoing challenges in securing redress for spills caused by unidentified vessels, which are responsible for most incidents. With help from the Environment Authority, the Musandam Governorate, and local Sheikhs [29], 15 villages along the Strait of Hormuz were selected for the research, all of which heavily rely on small-scale fishing as a primary livelihood (Figure 4). The fieldwork comprised community mapping ("Community mapping" refers to a participatory method used to identify, document, and analyze local knowledge, experiences, and perceptions related to an issue within the community. Here it involves engaging community members—such as local fishers, residents, or stakeholders—in creating spatial or conceptual maps that highlight areas affected by spills, sources of pollution, or various socio-economic impacts. This approach helps researchers understand the local context, identify hotspots or patterns of untraceable spills from the perspective of those most affected, and incorporate community insights into broader environmental assessments.), transect walks with Musandam community residents, semi-structured interviews with 67 key informants (KIs) and 10 focus group

discussions (FGDs) with 29 participants. Taking advice from local officials, 15 fisheries dependent coastal villages in Musandam were selected for the fieldwork. (see Figure 4).

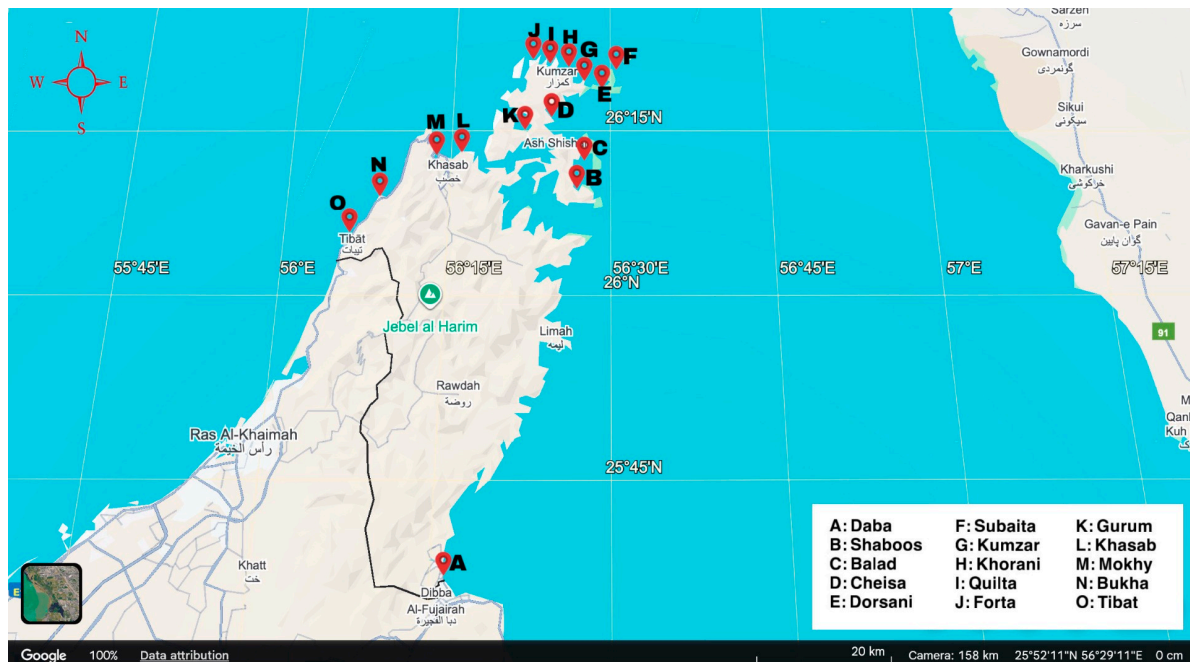


Figure 4. The symbols represent the locations of the 15 villages selected for the fieldwork in Musandam (Source: the lead author and Google Earth).

The fieldwork began with a pilot test in which four respondents participated in a survey of oil pollution issues. Their responses helped to determine the content of the semi-structured questionnaire later administered to the KIs and FGDs. For the main fieldwork, the 67 KIs (60 male and seven female) were interviewed person-to-person or via Teams. The 10 focus groups were made up of 29 local fishermen, each group consisting of two to three individuals. The discussions took place in various familiar settings—such as traditional Majlis gatherings, coastal areas, and aboard Dhows—to ensure participants felt comfortable and encouraged to share their insights. The researcher obtained a letter from the Oman Environment Authority to confirm to all respondents that the research was officially approved and to assure them that their identities and views would be kept confidential.

The sampling criteria for the selection of the 67 KIs were that they had a wide range of experience in the problem of marine oil spills, they were over 18 years of age, and they were willing to be interviewed. The following list of KIs' roles indicates their wide range of expertise: Omani public sector managers; officers in the Maritime Security Centre, the Royal Navy of Oman, the Royal Air Force of Oman and the Royal Oman Police and Customs; regional and international organization employees with experience in dealing with oil pollution; relevant academic experts and researchers; officials of governmental departments in Oman and adjacent states; private sector employees; and fishermen, divers, and local community members. Table 2 shows the categories of KI types/numbers/professional fields.

The interviews and FGDs followed a semi-structured format using open-ended questions designed to elicit participant experiences and viewpoints on oil spills. These questions were informed by existing literature and expert feedback [30] and were tailored to the background and role of each respondent group. They included the following questions: How much marine oil pollution do you perceive occurs in Musandam and what is its socio-economic effect? What are the steps (if any) you have seen taken to remove this pollution? Do you understand the problems of identifying the polluters? Do you know

whether the Oman government has obtained compensation from oil spillers? Do international organizations provide compensation for unattributable oil spills? A copy of the questionnaire is filed as Appendix A.

Table 2. The categories of the 67 key informants (KIs) (Source: the lead author).

Category	Number of Participants	Percentage
Oman Government Officials	22	33%
Private Sector (including private companies, industry reps)	8	12%
Regional cooperation and neighbouring countries	11	16.5%
International organizations	11	16.5%
Fishermen and divers	9	13%
Local community	6	9%
Total	67	100

The KI interviews and FGDs were recorded in Arabic and translated into English. Data from them were manually analyzed to identify recurring themes and shared patterns across different participant groups [31], and a coding process was used to reveal relationships between these patterns and themes [32]. Initially, twelve core themes were identified and coded manually, then organized using NVivo 11 software. Each main theme was further divided into three subcategories corresponding to local, regional, and international perspectives, enabling a multi-scale analysis aligned with the research objectives.

The following bullet points explain the coding rules and cross-validation process in the thematic analysis:

Coding Rules:

- Initial familiarization with transcripts was achieved by repeated reading.
- Identification of meaningful units such as keywords, phrases, or sentences that reflect participant views was undertaken.
- Initial codes were developed based on both inductive (data-driven) and deductive (theory-driven) approaches.
- Each meaningful segment was labelled with a code that captured its essence.
- Codes were consistently applied across data sets to enhance reliability.
- Hierarchical structuring with main codes and subcodes was used to organize themes at multiple levels.

Cross-Validation Process:

- Inter-coder reliability was achieved by having a second researcher review a subset of transcripts and codes.
- Discrepancies in coding were discussed and resolved through consensus meetings.
- Multiple rounds of coding refinements were conducted to ensure consistency.
- Visual tools (such as code maps or matrices) were used to examine relationships and ensure comprehensive coverage.
- Reflexivity and documentation were maintained to trace coding decisions and enhance dependability.

3. Results

Data obtained from the fieldwork on marine oil spills in Musandam were divided into four themes: untraceability; remediation; compensation; regional action.

3.1. Untraceability

Untraceability means difficulty in finding the cause of the oil spill if the responsible party is unknown [33]. Most untraceable spills occur at night or during public holidays, taking advantage of reduced surveillance. Vessels often evade being traced by discharging oil on the high seas because of the vastness of the ocean and low chances of detection. Unfortunately, these spills often reach the coast, causing environmental harm.

There are numerous examples of untraceable oil spills around the world, exemplifying the complexity and persistent challenge these incidents pose to environmental management. They are sometimes termed “mystery spills” because their source is unknown [34]. It is intrinsically difficult to collect data on mystery spills and there are no reliable estimates of their number. One study claimed that, globally, the annual average of small-scale spills during the period 1974–2015 was 1815 [35]. Another study asserted there were around 3000 occurrences in European waters each year [36]. Specific examples of mystery spills include reports in 2012 of “Mysterious Oil Sheens in the Gulf of Mexico”, with observers noting multiple oil sheens appearing without any identifiable source or responsible party [37]. Despite investigations by the U.S. authorities, the cause of these sheens was never found, highlighting the difficulties in tracing such small-scale, dispersed spills [38,39]. Similarly, following the 2010 Deepwater Horizon spill, small lumps of oil regularly appeared years later on beaches in the Gulf of Mexico. Although these lumps were assumed to come from the Horizon spill, determining the precise sources proved challenging [40]. Oceanographic research has revealed that minor oil spills in the oil drilled northern area of the Gulf of Mexico were far more widespread than official reports indicated, as satellite images often failed to capture the full extent of these dispersed oil slicks. These findings confirm that small, seemingly insignificant spills are numerous and difficult to track accurately [41]. These examples illustrate the persistent problem of untraceability in small-scale oil spills globally.

With regard to untraceable small-scale oil spills in the Musandam area, many respondents referred to the large numbers of oil tankers transiting the Strait of Hormuz. For example, KI-28 (a MEMAC official in Bahrain) said “we have an average of 45,000 per year passing the Strait of Hormuz, about 60% tankers and the others 40% for cargo and others”. Figure 5 is a heat map which shows the location of eight oil leakage hotspot areas in the Gulf, one of which is in the Musandam area.

Figure 6 is a heat map which shows the location of ten oil leakage hotspot areas in the Musandam Peninsula.

Respondents claimed this large number of transiting vessels made it very hard to pick out polluters. KI-29 (a regional participant) said “the process of identifying the ship that discharged the oil into the water is difficult, especially when there is a gathering of a large number of ships”. KI-24 (a petroleum company executive in Oman) pointed out that “Gathering strong evidence such as photographic evidence or oil spill samples taken directly from the suspected vessel is necessary to determine the exact ship causing the pollution [but] the identification of the vessels responsible for oil pollution in Omani waters is challenging due to the high traffic of vessels crossing international waters.”

This problem is compounded by limited resources. Musandam is not a rich region and cannot afford costly technologies for tracking down oil spillers [42]. According to KI-10 (an Oman fisheries government official), “this is a significant challenge for the country to get the cost of human and financial resources”. Continuous monitoring is very expensive: for example, according to KI-16 (an Oman Royal Air Force official), “The cost [of aircraft surveillance] is

approximately between 2500 to 4000 OMR (US\$8000) per hour including the operational cost, fuel and maintenance”.

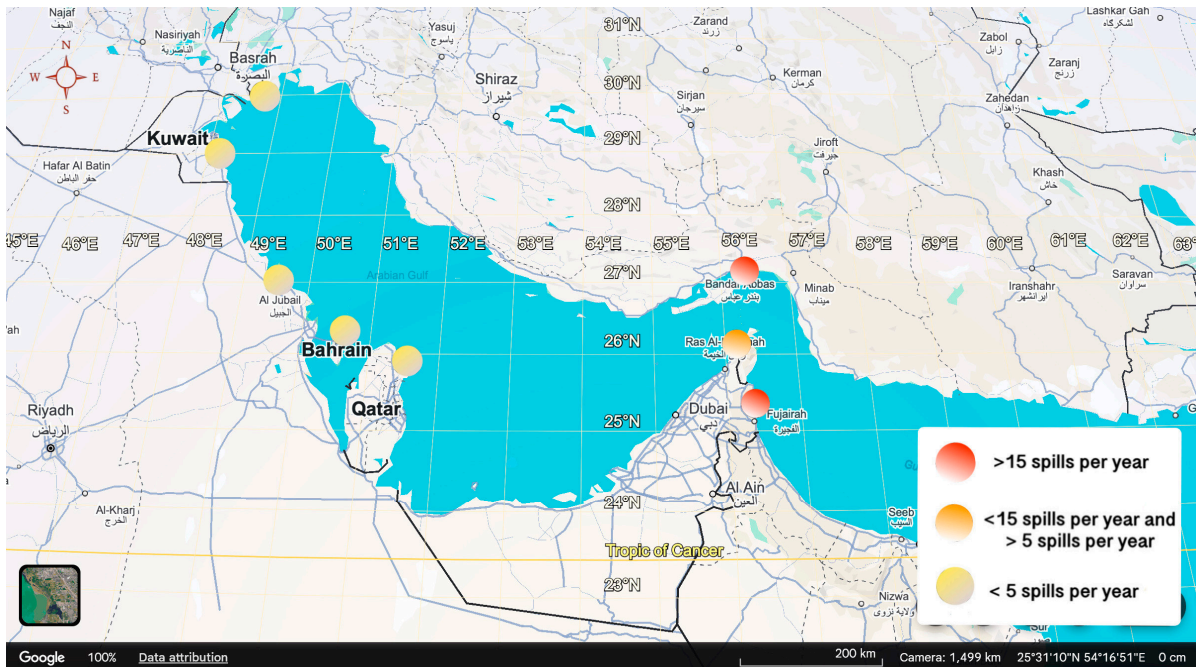


Figure 5. Oil leakage hotspot areas in the Gulf (Source; the lead author).



Figure 6. Identified oil leakage hotspot areas along the Musandam coastline (Source; the lead author) (The maps in Figures 5 and 6 were developed using qualitative data collected through interviews conducted in Musandam and other Gulf countries. Interviewees were asked about their perceptions of the frequency of oil spills in their respective locations. Based on their responses, estimates of the number of unknown-source oil spills per year were gathered for each area. These estimates were then used to categorize regions into three levels of exposure: high exposure areas (more than 15 spills per year); moderate exposure areas (between 5 and 15 spills per year); and low exposure areas: fewer than 5 spills per year.).

The speed of response is a further issue. The quicker an investigation begins after a spill event the better the prospect of identifying the culprit, but by the time a spill is noticed, it may be too late to trace its source. KI-17 (an Oman environmental government official) said:

“the identification of unknown oil spills is challenging, and the success of the operation depends on the response time. The quicker and more immediate the response, the higher the possibility of identifying the source of the spill. However, taking oil samples from affected beaches for comparison with crude oil from tankers passing through the Strait of Hormuz can be difficult. It is important to obtain fresh oil samples to be able to compare the oil spill characteristics with the tanker’s crude oil. Unfortunately, in some cases, the oil reaches the beach after several days, and the unique characteristics of the oil can be lost, making it difficult to determine the source”.

Strong wind and waves can quickly spread oil spills, obscuring their source [43]. Also, even if a spill is noticed early, the equipment to investigate it may not be immediately available. As KI-16 (an Oman Royal Air Force official) pointed out:

“time constraints present a significant challenge in dealing with oil pollution incidents. Although the pollution may be reported promptly, our resources may be occupied with other tasks, with national security taking precedence. In some cases, the delay in responding to the report may diminish our chances of identifying and apprehending the polluter”.

Another untraceability issue is that Musandam’s coastline is not very accessible, and this slows down response exercises. Finally, the Hormuz Strait is an international waterway, access to which is governed by the principle of freedom of navigation and the right of innocent passage for ships across the world [44]. Any attempt to stop transiting tankers to check the oil type of their cargo would violate international maritime law.

3.2. Remediation

There are three key oil spill remediation approaches—mechanical, chemical, and natural—each with its distinct mechanisms, benefits, and limitations. Mechanical methods are widely used for oil containment and recovery and include tools such as booms, skimmers, sorbents, and in situ burning [45,46]. These approaches are most effective when deployed rapidly and in favourable environmental conditions. However, their efficiency depends on many factors: timing, oil type, weather, and the scale of the spill [47]. For instance, calm waters enhance the effectiveness of containment and skimming, while rough seas pose significant challenges. Chemical methods are primarily dispersants which break oil into smaller droplets to accelerate natural degradation in the water column [48]. These are especially useful in offshore conditions where mechanical recovery is difficult. However, dispersants are less effective on heavy or weathered oil and may pose ecological risks to marine ecosystems [49]. Natural methods, or natural attenuation, rely on environmental processes such as wave action, sunlight, evaporation, and microbial degradation to break down oil over time [50]. This approach is often favoured by international organizations for being less intrusive and more cost-effective than mechanical and chemical interventions.

With regard to remediation in the Musandam area, in 2019, a major oil spill occurred near the village of Dorsany Khawr in Musandam. The source of the spill was never found, and the Oman government carried out extensive clean-up operations without any compensation from the spiller. According to KI-12 (an Oman environmental government official):

“In October 2019, fishermen informed Environment Authority (EA) via the hotline number of the Pollution Operation Monitoring Centre complaining about oil pollution in their village “Dorsany Khawr” beach in the form of black oil spread across the sea in several locations. This beach is considered one of the most important fishing areas, with an

abundance of fish. Cleaning the affected areas involved employing the Royal Air Force of Oman and the Royal Navy of Oman to monitor the quantities of pollution and to identify the source of these pollutants by using a CASA plane and Navy ships. Unfortunately, the source of the spill was not found. Samples of pollution were taken for analysis in order to discover the type of oil and the carbon footprint. Then, EA coordinated with Khasab Municipality and volunteers to provide equipment to clean the affected beach and coordinated with the Royal Oman Navy to transport equipment and individuals to the beach, as there is no road, but only sea access to that beach. A diving exercise was carried out by volunteer divers to extract bitumen from coral reefs and get rid of oil pollutants in the surrounding area. However, Oman did not find out which vessel was responsible for this oil pollution and therefore has been unable to obtain compensation for the costs of its clean-up operation. So, the cost of clean-up operations and environmental rehabilitation was paid by Oman government”.

The remedial action taken the Oman government to clean up after the 2019 Dorsany spill was effective since it was a large-scale event. But small-scale spills are not given the same priority. These spills are typically seen as minor events that evaporate or disperse offshore [51]. But although classified as “small” under international definitions (less than 7 tonnes according to MARPOL 73/78), these spills can be just as damaging as larger ones, particularly in ecologically and economically vulnerable areas like Musandam [52]. It is true that some efforts have been made to deal with small-scale oil spill incidents in the Musandam region [53]. For instance, in collaboration with the Musandam Navy and Khasab Municipality, environmental specialists facilitated the transport of clean-up equipment by sea [25,26,28]. Also, marine investigations were carried out by the Environment Authority in coordination with the Oman Navy to identify the sources of pollution along the Musandam coastline [27]. Reports indicated violations by tankers and commercial vessels, including the illegal discharge of oily waste, especially in the eastern Strait of Hormuz near Dibba and surrounding villages. However, no responsible vessels were ever identified or penalized [23].

Although KI-11 (Daba Municipality official) said, *‘Daba Municipality had specialized equipment around 20 years ago to clean beaches from oil pollution’*, most respondents said small-scale oil spills in Musandam were left to nature. KI-16 (an Oman Royal Air Force official) explained two of the reasons for this differential: *“all the major accidents [were] cleaned quickly and effectively, but the minor ones especially in Musandam haven’t been cleaned as it required budgets to do it. Also, the repetition of spills in Musandam makes it difficult to clean up these spills”*. A third reason is that because most oil spills in Musandam are unattributable, the government is not likely to obtain compensation from the spillers, so it has limited financial incentive to carry out clean-up work. KI-12 (an Oman environmental government official) said *“untraceable oil spills are left to natural forces to clean up unless they threaten the beaches, presumably because no compensation for clean-up can be expected”*. As a result, communities have to bear the cost of clean-up themselves.

3.3. Compensation

Numerous international organizations have addressed the legal and financial responsibilities associated with marine pollution, particularly concerning liability and compensation [54]. Central to these efforts is the polluter pays principle, which places the financial burden of pollution and environmental restoration on the responsible party [55]. Although the enforcement of this principle is inconsistent, various international legal frameworks have been developed to handle compensation claims against oil polluting vessels [56,57]. These frameworks involve two key mechanisms: international organizations and private insurance bodies. The International Maritime Organization (IMO) has played a leading

role in creating key legal instruments such as the 1969 Civil Liability Convention (CLC) and the 1971 International Fund Convention (IFC). These agreements laid the foundation for a global compensation system in response to oil pollution incidents, particularly during the late 1960s and early 1970s (KI-39). In parallel, Protection and Indemnity (P&I) clubs—mutual insurance associations—provide essential third-party liability coverage for shipowners, supporting claims related to oil pollution and other marine liabilities. However, neither of these mechanisms offers much compensation for untraceable oil spills.

With regard to compensation for oil spills in the Musandam area, the damage caused by small-scale oil spills can be considerable because the local population heavily depends on marine resources, particularly fish, as a primary protein source [13]. The area's fishing activities rely entirely on traditional artisanal practices, with over 3500 fishermen operating more than 2100 fibreglass boats and 93 dhows [58]. Oil contamination harms fish health by entering through their gills, affecting growth, metabolic functions, and reproduction, especially by damaging eggs and larvae [59,60]. Human health is also at risk through the consumption of oil-contaminated seafood [61]. Additionally, fishing equipment is often rendered unusable due to oil fouling engines and nets [62,63]. KI-64 (a Gassa village resident) stated

“We lost lots of money when oil spills occurred for engine maintenance and boat painting, it took about OMR 300 [US\$780]. The nets usually last for three years, but when polluted with oil, they are damaged directly. Their cost ranges from OMR 500 to OMR 6000 [US\$1300 to 15,600]”.

Hotel owners suffered losses from tourists cancelling their bookings. KI-62 (a hotel owner in Daba) said

“oil spill impacts are too much for my activities either the hotel or diving center and my tourism trip as we don't have a place to complain and no compensation... We paid many tourists groups compensation when their trips were cancelled due to oil spills in the region—about 100,000 US dollars but we didn't get the total benefits due to the oil spills”.

In Musandam, Sheikhs are the official conduit for passing on residents' complaints to the government, but fishers and other residents are generally ignorant of the formal procedure in Oman for submitting compensation claims. FGD-1 (Kumzar fishermen) said, *“This is the first time we hear about oil spill compensation”*. Even some officials were unaware of compensation schemes. For example, KI-3 (an Oman environmental official in Daba) said *“I have never heard about oil spill compensation”*, and KI-5 (an Oman fisheries government official) said he did not *“have any idea about compensation”*. People affected by oil pollution who sent their complaints to the sheikhs reported that their pleas were ignored. KI-50 (a Khasab fisherman) said *“We have not received any compensation for economic loss to our fishing at all, when spills occurred, I paid from my pockets. We always made complaints to the Sheikh but no benefit”*. KI-60 (a Dabba resident) claimed there is no government agency that deals with marine oil spill compensation claims

“There is no government sector authorized to submit a request for compensation as a result of oil spills...there is no clarity for any specific authority to deal with it to sue in the event of compensation for damage resulting from oil pollution...the damages affect several aspects such as the economic aspect for the fisherman, hotel owners, marine activities and the amateur health side, [but] we were not ever compensated”.

According to KI-49 (a Khasab fisherman), *“Fishermen have never been paid when oil spills occurred in Musandam, they paid from their pocket when the spill occurred”*. KI-51 (another Khasab fisherman) said, *“No compensation has ever been paid to fishers [in Musandam]”*. All the

fishermen in focus group discussions confirmed they had not obtained compensation. As a result, no one bothered to send a claim, and residents cleaned up the oil themselves with the help of paid divers.

3.4. Regional Action

Some regional action has been taken to deal with oil spills in the Gulf in the form of legal instruments and institutional frameworks. For example, in 1978, at a Regional Conference of Plenipotentiaries held in Kuwait with UNEP's support, the eight Gulf coastal States adopted three cornerstone legal instruments. These were: (1) the Kuwait Regional Convention for Cooperation on the Protection of the Marine Environment from Pollution; (2) the Protocol on Regional Cooperation in Combating Pollution by Oil and Other Harmful Substances in Cases of Emergency; and (3) the Kuwait Action Plan (KAP) for the Protection and Development of the Marine Environment and the Coastal Areas [64]. The Kuwait Regional Convention together with the KAP established a regional coordination mechanism obliging signatories to jointly “combat, abate, and avert marine environment contamination” (Art. III) through harmonized strategies and response plans [65,66]. Building on the KAP, three further protocols were later adopted to address pollution from continental-shelf activities (1989), land-based sources (1990), and hazardous wastes (1998), reinforcing cooperation on oil-spill prevention, preparedness, and response [67,68].

To give effect to these instruments, the Regional Organisation for the Protection of the Marine Environment (ROPME) was established in 1979 as the Convention's secretariat, with its Marine Emergency Mutual Aid Centre (MEMAC). In the ROPME Sea Area, oil spill compensation is managed through a cooperative framework involving ROPME, its operational arm MEMAC, and international mechanisms such as the IOPC Funds and Protection and Indemnity (P&I) Clubs. Based in Bahrain, MEMAC coordinates incident verification, data exchange, joint exercises, and technological cooperation among its Gulf member states, and since 2003 has operated a satellite-imagery receiving station for early oil-spill detection and tracking of hazards such as algal blooms [69–73]. While MEMAC does not provide direct financial compensation, it plays a vital role in coordinating regional response efforts, assessing damage, and supporting member states—like Oman—in preparing and submitting claims. MEMAC also facilitates training and expert support to help countries navigate the claims process and ensure preparedness for marine pollution incidents. Compensation is typically provided in two tiers: first by the shipowner's P&I Club, and if the costs exceed the shipowner's liability, by the IOPC Funds, established under the 1992 Civil Liability and Fund Conventions. These funds can cover extensive costs related to cleanup, property damage, and environmental restoration.

However, access to compensation depends on prompt reporting, proper documentation, and adherence to international protocols. Moreover, implementation of ROPME measures by MEMAC has been hindered by financial constraints, divergent national priorities, and uneven technical capacity, and compensation mechanisms remain limited. Only around ten Gulf incidents have secured payouts through MEMAC-facilitated arrangements with the IOPC Fund (The International Oil Pollution Compensation Fund) and P&I Clubs (Protection and Indemnity Insurance, Clubs) since 1998. KI-29 (an official in Bahrain's supreme environmental council stated: “Since 1998, there have been numerous oil spill incidents in the Gulf waters which were communicated with MEMAC. However, out of these, approximately [only] 10 incidents have received compensation through arrangements facilitated by MEMAC, involving both the IOPC and P&I club”.

Complementing ROPME/MEMAC, the GCC Emergency Management Centre (EMC), overseen by the GCC Secretariat, was created to enhance regional emergency preparedness and response—including oil-spill contingency planning, training, and policy

harmonization—across Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE [74]. KI-25 (a regional interviewee) said the EMC is an effective body:

“The effectiveness of the GCC Emergency Management Centre (EMC) in managing oil spills in the Gulf is underscored by its multifaceted approach. It plays a key role through various mechanisms, beginning with its function as a hub for seamless communication and information exchange among GCC member nations during oil spill emergencies. This platform facilitates swift sharing of crucial data, knowledge, and expertise regarding oil spill incidents. Furthermore, in response to oil spills, the EMC aids in consolidating resources, specialized equipment, and technical expertise from member countries, assisting in the deployment of response teams and providing guidance on optimal containment strategies for efficient cleanup operations. Beyond immediate response, the EMC focuses on enhancing member states’ capabilities through targeted training sessions and workshops, effectively equipping emergency response personnel and agencies to manage oil spill incidents adeptly. Additionally, the EMC contributes to the development of comprehensive policies, guidelines, and standardized procedures related to oil spill response, ensuring a unified and cohesive approach among GCC member nations. Moreover, through active collaboration with key stakeholders, including regional and international organizations, environmental agencies, and industry partners involved in oil spill management, the EMC fosters a collaborative and comprehensive strategy, further strengthening collective efforts in efficiently handling oil spill incidents within the Gulf”.

However, while the EMC excels at resource coordination and capacity-building, direct responsibility for compensation for oil-spill damage lies outside its mandate, instead falling to broader legal and financial frameworks within the GCC.

Table 3 numericalises respondents’ perceptions about the four themes.

Table 3. Respondents’ perceptions about the four themes (Source: the lead researcher).

The Responses’ Themes	Key Points from Respondents	Oman Government (23 respondents)	Private Sector (3 respondents)	Regional Countries (12 respondents)	International Organization (10 respondents)	Fishermen and Local Community (19 respondents)	FGD (10 respondents)
Untraceability	The difficulty of tracing mystery oil spills stems from technical, logistical, legal, political, and financial problems.	18	2	12	8	19	10
	Technology and Innovation: Stakeholders emphasize the importance of advanced technology like satellite imagery, fingerprinting, drone surveillance, and AI to detect spill sources more effectively.	15	3	11	9	12	7
	Perception: Government officials, researchers, and international organizations recognize these technological solutions as promising, but acknowledge current limitations in applying them effectively.	16	3	10	8	10	6

Table 3. Cont.

The Responses' Themes	Key Points from Respondents	Oman Government (23 respondents)	Private Sector (3 respondents)	Regional Countries (12 respondents)	International Organization (10 respondents)	Fishermen and Local Community (19 respondents)	FGD (10 respondents)
Remediation	Respondents criticize the current response efforts as inadequate and delayed, especially for mystery spills.	14	1	6	9	19	10
	Coordination: Better coordination among local government, communities, and regional entities is seen as critical.	20	3	12	10	15	8
	Technological and Collaborative Solutions: Recommendations include investing in monitoring, early warning systems, and community involvement.	23	3	12	10	16	7
	Legal and Policy Frameworks: Strengthening laws and establishing clear responsibilities are emphasized for effective remediation.	17	3	11	10	12	7
Compensation	Justice and Fairness: The empirical data highlights that compensation for victims is often inadequate or unavailable, especially for small-scale spill victims.	20	3	8	10	19	10
	Environmental Justice: Recognizing spill impacts as environmental injustice, disproportionate burdens are borne by local communities.	12	1	5	4	19	10
	Laws and Mechanisms: Current compensation mechanisms, including international funds, are insufficient; only a few victims have received compensation.	7	2	7	5	19	10
Regional Action	Coordination: Both regional organizations and neighbouring states play vital roles.	18	3	9	10	3	2
	Proposed Regional Organization: The paper advocates for a dedicated regional body in the Gulf to handle mystery spills and establish joint response protocols.	22	3	10	10	19	10

Table 3. Cont.

The Responses' Themes	Key Points from Respondents	Oman Government (23 respondents)	Private Sector (3 respondents)	Regional Countries (12 respondents)	International Organization (10 respondents)	Fishermen and Local Community (19 respondents)	FGD (10 respondents)
Regional Action	International Cooperation: Emphasis on collaboration through existing regional forums like ROPME and GCC; sharing resources and information.	19	3	9	10	15	7
	Community Involvement: Local stakeholders desire more involvement in decision-making and spill management.	20	3	10	10	19	10

4. Discussion

The theoretical framework of environmental justice outlined in Section 1.1 and the fieldwork explained in Section 2 are linked in that respondents confirmed that they were victims of unattributable small-scale marine oil spills that damaged their coastal environment, destroyed their fishing and diving equipment, and undermined their economic livelihoods. The perpetrators of these spills were never apprehended or forced to pay for their pollution, and respondents said they never received compensation from any other source for loss of income and assets. Moreover, many respondents said the Oman government authorities did not carry out remediation of the spills and the residents were not reimbursed for their efforts in cleaning up the contaminated coastal areas themselves. Such experiences are clear breaches of the environmental justice principles of the polluter pays and due compensation for damage inflicted. In Musandam, mystery spills disproportionately affect low-income coastal communities [75].

All this raises the question of why the issue of small-scale oil spills in Musandam has been sidestepped by both the government of Oman and the academic community. Government and academia have focused mainly on large-scale spills, largely ignoring the distinctive challenges posed by small-scale spills. There are institutional, economic and technical reasons for this neglect. The institutional reasons include lack of political will. The Oman government has historically prioritized action against large-scale, traceable spills while downplaying the significance of smaller, untraceable 'mystery' spills, which are more prevalent in Musandam. The governorate's limited population (approximately 1.1% of Oman's total) and modest political influence contribute to the perception that investing in cleanup and compensation efforts in Musandam yields minimal political returns. Moreover, many minor spill events go unreported due to a lack of public awareness, limited accessibility to reporting mechanisms, and a widespread belief that authorities are unlikely to respond. The absence of systematic data collection reinforces the impression that the problem is neither frequent nor severe. Also, unlike dramatic, high-impact spills that generate headlines and attract NGO campaigns, small-scale oil pollution receives little media attention. The absence of visual spectacle or a clear 'villain' reduces its salience in both public discourse and policy agendas. Notably, no national environmental NGOs or social media campaigns have taken up the cause, despite clear indications of environmental injustice.

The economic reasons for neglect include economic marginalization. The residents of Musandam, primarily engaged in traditional fishing and tourism, lack the resources and economic influence to advocate effectively for their rights and needs. Their relatively low socio-economic status contributes to their marginalization in decision-making processes,

resulting in inadequate attention to their plight regarding oil spills. The technical reasons include physical isolation and logistical challenges. Musandam's geographic separation from the capital—over 600 km north of Muscat—and its rugged terrain make it logistically expensive to deploy environmental response teams or monitoring equipment. These operational difficulties serve as a practical deterrent to sustained government engagement in routine or small-scale spill incidents.

This analysis reveals a systemic imbalance: actors with high power and high legal responsibility (e.g., the government and shipping companies) face few consequences for inaction, while those most affected (local communities) have minimal power to demand change.

Is Musandam unique in experiencing the harm inflicted by untraceable small-scale marine oil spills? The literature suggests that other comparable areas such as the Mediterranean and the Strait of Malacca suffer similar damage. The Mediterranean Sea is a critical maritime hub with dense shipping routes, where small-scale and mystery oil spills frequently occur due to high vessel traffic and ageing infrastructure. Governance here involves a combination of regional agreements such as the Mediterranean Action Plan (MAP), coordinated by the Barcelona Convention Secretariat under UNEP [76]. However, despite this regional cooperation, challenges persist, including limited enforcement capacity for small and unreported spills and difficulties in source attribution, especially for mystery spills [77]. The Strait of Malacca, one of the world's busiest shipping lanes, encounters frequent small spills due to high vessel congestion and substandard vessel maintenance [78]. Governance relies heavily on the Malacca Strait Sea Patrols, ASEAN–IMO Memoranda of Understanding, and regional cooperation frameworks [79]. Nevertheless, the region faces persistent issues related to illicit discharges and inadequately enforced regulations, especially for small or unidentified vessel discharges [78]. The integration of real-time surveillance technologies has been a recent development aimed at improving spill detection, but operational challenges remain [80]. It seems therefore that the problem of untraceable small-scale marine oil spills may be widespread across the world.

To protect marine ecosystems and coastal populations, small-scale spills must be taken seriously and addressed with the same urgency as major pollution events [81,82]. The present paper makes five recommendations to improve the situation in Musandam. First, the Omani government should take the initiative in setting up an organization to provide compensation for unattributable spills in the Arabian Gulf and Sea of Oman. A levy to fund this organization could be imposed on vessels transporting oil through the Strait of Hormuz [83]. Following [84], a proposal to increase port tariffs by \$5 per gross tonne for visiting merchant vessels that are equal to or larger than 500 gross registered tonnes (GT) could be adopted. A service charge of 5 US cents per 1 GT would be imposed on all such ships upon arrival at the first port of call (loading/unloading facility, jetty, terminal, SBM, etc.). The levy would be collected by the ship's agent upon arrival at the first port of call. It would cover the maintenance and continuous improvement of the maritime safety and environmental protection infrastructure and services—the same criteria that were proposed for Marine Emergency Response Coordination Unit (MERCUCU) which is yet to be established. They are also consistent with the criteria utilized in the Middle East and North Africa (MENA) region, thereby providing an indication of feasibility and regional applicability [84].

There are no regional organizations across the world that provide compensation for unattributable spills, but there are some national schemes that do so, including systems in place in Canada, New Zealand and Australia, which work well. The present paper's recommendation for establishing a Gulf Compensation Fund for marine oil spills is modelled on the comprehensive Ship-source Oil Pollution Fund (SOPF) in Canada. A SOPF official said "*the SOPF compensates victims of oil pollution for damages caused by any type of oil, from any ship*

or boat and anywhere in Canadian waters whether traceable or mystery or major or minor . . . We compensate these types of damages; preventive measures, clean-up costs, costs for reinstatement of the environment, property damage, economic loss, fisheries losses, tourism losses and loss of subsistence living". SOPF is funded through a tax levied by the Canadian government on all vessels, not only oil carriers but also cargo and container ships, tugs and barges, cruise liners, passenger ships, ferries, pleasure craft, fishing vessels, as well as abandoned, derelict, and wrecked vessels, including abandoned ones [85]. Similar financing schemes are in operation in Australia where the service charge value is determined by the type and size of the vessel and is based on the net registered tonnage of the ship [86,87] and in New Zealand where the charge is applied to offshore oil installations, exploration wells, and oil pipelines that are 24 m or longer in length [88]. The main reason why these national schemes work effectively in dealing with unattributable small-scale oil spills is because their national governments invest heavily in them.

Second, the reporting of small-scale spills should be improved by establishing robust monitoring systems [89] with collaboration between governmental agencies, local communities, and research institutions to ensure accurate reporting and data collection. Third, advanced technologies such as satellite surveillance, aerial monitoring, AI-driven analysis, and spaceborne optic and radar (SAR) sensors [90] should be employed to enhance the detection and tracking of oil spills. Fourth, protocols should be put in place by the Gulf states for rapid response to, and investigation of, spills to improve accountability [91]. Fifth, community involvement should be strengthened by public awareness campaigns to educate local communities about their rights and the importance of reporting spills [42].

If implemented, these measures would make a significant difference to the ecological, economic, and social sustainability of coastal communities in Musandam. Without such measures, small-scale oil spills will continue to undermine marine ecosystems, blight livelihoods and erode social cohesion—all of which retard progress towards the much-needed sustainable development of a marginalized governorate.

There are, however, four limitations to this paper. First, the study relies much on respondents' memories, which can vary in reliability. Second, the method of selecting respondents may exclude certain groups like children, women, and the elderly, which could affect data quality and representativeness. For example, there is a potential bias in community participatory mapping whereby gender imbalance may weaken the impact assessment of oil spills on the tourism sector. Third, the fieldwork data was obtained in 2022, which may not fully reflect the situation today. Fourth, the study barely touches a deeper polluter accountability dilemma in Oman's system of environmental governance—that it focuses more on reactive than preventive measures.

5. Conclusions

The paper makes several new contributions to the literature. It is the first study to examine oil spills in Musandam waters. It highlights that the number of small-scale spills has not decreased, unlike large-scale spills. It demonstrates the link between small-scale and untraceable marine oil spills. It shows the damage to coastal areas caused by small-scale oil spills. It depicts untraceable marine oil spills as environmental injustices. It underlines the need to get local stakeholders engaged in making decisions about oil spill responses. It is the first to report the limited extent of compensation for untraceable marine oil spills provided by national and international organizations. And it uniquely advocates establishing a regional organization in the Gulf countries to address untraceable marine oil spills.

If the five recommendations outlined above in the Discussion section were to be implemented, they would ensure that affected communities in Musandam receive the

support and compensation that they deserve, promote environmental justice, and protect vulnerable marine ecosystems from the scourge of untraceable small-scale marine oil spills.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study [the consent form is attached in Appendix B].

Data Availability Statement: The original contributions presented in this study are included in the article. Further inquiries can be directed to the corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A. Questionnaire for Coastal Residents, Tourists and Hoteliers

Participants in this part of the study were people who had experienced at first hand oil pollution on the beach areas of the Musandam peninsula coastline. They included residents of coastal communities, tourists, and hotel staff. The questions asked were semi-structured and open-ended, and the researcher encouraged respondents to expand on their initial answers by asking follow-up questions. The questions are grouped into seven sections: (1) first-hand experience of marine pollution in the Musandam coastal areas (2) knowledge of clean-up operations; (3) view of the long-term harm inflicted to the coastal ecosystem (4) perception of the economic impact of the oil spills (5) description of any compensation received (6) ideas and suggestions on how to prevent such pollution happening in the future and (7) personal information.

(1) First-hand experience of marine pollution in Musandam coastal areas

- (a) Have you experienced at first hand marine oil pollution in Musandam’s coastal areas? If so, please give details of the times, places and extent of the oil spills you have experienced.
- (b) Are marine oil spill incidents common in your area? If so, how common?
- (c) Were the culprits of those oil spills identified? If so, who identified them and how?
- (d) What aspect of your life would you say has been mostly affected by oil spill?
- (e) Has your health or that of your family been harmed? If so, please give details.
- (f) Have such incidents seriously reduced your enjoyment of the coastal area? If so, in what ways?
- (g) Have oil spills prevented you from visiting the coastal area? If so, for how many days? Were you forbidden access by the government or did you choose to stay away?
- (h) Have you noticed an increase or decrease in the number of oil pollution incidents in Musandam Area in recent years? If so, please give details
- (i) Have you noticed any quality issues in seafood from Oman waters due to oil pollution? If so, please provide details

(2) Knowledge of clean-up operations

- (a) Have you seen clean-up operations in progress? If so, what forms of clean-up operation have been undertaken? Did the government take charge? Approximately, how many people were involved in the clean-up operations?
- (b) Do you think volunteers should be involved in clean-up operations? If so, why?
- (c) Did you take part? If so, what was your role?
- (d) Do you approve of stakeholders helping with clean-up operations? If so, why? If not, why not?
- (e) Have clean-up operations prevented you from visiting the affected area? If so, how, for how long and how did that affect your everyday essential needs?
- (f) Have you been negatively affected economically or socially by oil spills? If so how and to what extent?
- (g) Were clean-up operations timely, quick, and effective?
- (h) Do clean-up operations themselves damage the marine ecosystem? If so, how?
- (i) Do you prefer to allow natural processes such as rain and tidal movements to remove and disperse the pollution rather than have clean-up operations? If so, please explain why.

(3) View of the long-term harm inflicted to the coastal environment

- (a) Have you noticed any long-term effects of oil pollution on the flora and fauna in the coastal area? If so, please give details of these effects on particular species
- (b) How serious have these impacts been?
- (c) Do you think these impacts on flora and fauna can be minimized? If so, how?

(4) Perception of the economic impact of the oil spills

- (a) Has the oil spill affected the tourism sector such as hotels for a long-term period? If so, please give details. How serious have these effects been?
- (b) Have oil spills/clean-ups had a negative impact on your livelihood? If so, please explain what that impact has been
- (c) Is the health of the marine environment important for your organization's profitability? If so, have oil spills and clean-up operations reduced your profits? If so, please give details?

(5) Description of any compensation received

- (a) What aspect of your life would you say has been most affected by oil spillage?
- (b) Have you applied for compensation for the loss of income caused by oil spills/clean-up operations?
- (c) Have you been granted any compensation? If so, would you please say when, why, from whom, what amount, and whether you regard it as adequate?
- (d) Do you know of any international laws that require compensation for oil spills, and any international organizations established for paying out that compensation? If so, please provide details.

(6) Ideas and suggestions on how to prevent or deal with such pollution happening in the future

- (a) Which government or agency in Oman is responsible for dealing with marine oil pollution?
- (b) Does this agency do a good job? If so, in what way? If not, why not?
- (c) Should local residents/tourists/hoteliars participate in decisions on how to prevent/mitigate damage from oil spills and clean-up operations? If so, why?
- (d) Should Oman increase its citizens' knowledge and awareness of the importance of a clean marine environment? If so, how?

- (e) Should stricter laws, both national and international, be enacted to punish perpetrators of oil spills? If so, what kinds of laws would you recommend?
 - (f) Who should pay for clean-up? (the vessel's owner? an international compensation fund? The vessel owner's government? or the Oman government?). Explain the reasons for your choice
 - (g) What proportion of oil pollution incidents in the Musandam Sea are from known and unknown sources?
 - (h) Are new forms of international organization needed to identify and fine vessels that either accidentally or deliberately discharge oil into the Musandam Sea? If so, what kinds of organizations?
 - (i) Do you know of any policy tools that can be applied to deal with oil spills caused by unknown sources? If so, please describe them
 - (j) Do you think new kinds of international agreements are needed to provide compensation for oil pollution caused by known and unknown sources, or both? If so, what kinds of agreements would you recommend? How should they be funded?
- (7) Personal information**
- (a) Are you a resident in the coastal area of Musandam? If so, how long have you been living there?
 - (b) Are you a tourist? If so, where do you come from? Do you often visit Musandam coastal areas?
 - (c) Are you employed in the hotel industry? If so, how long have you been working worked in Musandam? Are you in a junior or senior position?
 - (d) Circle gender: 1. Male 2. Female 3. Other
 - (e) Circle your age group? 1. 18–25 2. 26–45 3. 46–60 4. Above 60
 - (f) What is the highest level of education you have achieved? 1. Primary school 2. Secondary school 3. Tertiary 4. Other (please describe)

Appendix B. Consent Form for All Respondents

Al-Kamzari.A. Consent Form for all interviewees.10.9.20

My name is Amran Al-Kamzari and I am currently studying for a PhD in Natural and Environmental Sciences at Newcastle University, the UK.

I am conducting interviews in connection with my doctoral research on the topic of 'Investigating barriers to the effective international management of untraceable oil pollution: towards greater protection of the Musandam Peninsula Coastline, Sultanate of Oman', and I am contacting you to invite you to take part in this research study by agreeing to be interviewed.

In the interview, I will ask you questions related to your knowledge and experience of oil pollution affecting the Musandam Coast. The interview will last approximately 60 min and will take place in a mutually agreed location. All your responses will be kept anonymous, and no one will be identifiable in the research. This study has been approved by the Newcastle University ethical committee.

I would like you to answer the following questions:

Are you happy to answer questions on this topic?

Are you happy for me to tape-record the interview?

Are you happy for me to transcribe the recording and send you the transcript to check its accuracy?

Are you happy for me to use your words in my thesis and any subsequent publication, on the strict condition that the words will be anonymized so that you cannot be identified as the source?

Once completed please email this form back to me at a.al-kamzari@newcastle.ac.uk

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