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Economic impacts of oil spills in island tourism destinations. An application to the Canary Islands.

(*Impactos económicos de los vertidos de petróleo en destinos turísticos insulares. Una aplicación a las Islas Canarias*.)

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ABSTRACT

In the last few years there has been a debate around oil prospections in the Canary Islands, with many stakeholders opposing to them amid fears of an oil spill harming the environment and the tourism industry. Although Repsol's exploration project has been scrapped, many doors have been opened and there are questions that still need answering. This paper tries to analyze the potential economic impacts of an oil spill on island tourism destinations, given their vulnerabilities, particularly analysing the case of the Canary Islands. We have conducted an extensive review of the literature on the topic to try and gather all existing information about how different oil spills have affected the tourism industry. Results show that the scope of economic impacts to be expected is wide, the methodology to measure impacts unclear and the specific impacts on the tourism industry need further assessment.

Keywords: oil, spills, tourism, islands.

RESUMEN

En los últimos años ha surgido un debate en torno al tema de las prospecciones petrolíferas en Canarias, con muchos actores oponiéndose al plan por miedo a que un vertido de petróleo pudiera dañar el medio ambiente y la industria turística. Aunque el proyecto de exploración de Repsol ha sido desechado, se han abierto muchas puertas y han surgido una serie de preguntas que necesitan respuesta. Este trabajo trata de analizar los impactos económicos potenciales de un vertido en destinos turísticos insulares, dadas sus vulnerabilidades, analizando particularmente el caso de Canarias. Hemos realizado una extensa revisión de la literatura para reunir toda la información existente sobre cómo distintos vertidos han afectado a la industria turística. Los resultados muestran que el alcance de los impactos económicos a esperar es amplio, la metodología utilizada para medirlos poco clara y los impactos específicos sobre el turismo necesitan ser evaluados más profundamente.

Palabras clave: petróleo, vertidos, turismo, islas.

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1. INTRODUCTION

On August the 13th 2014, the Spanish government announced in its official bulletin the approval for Repsol's exploratory work (BOE, 13 August 2014) off the shores of the Canary Islands. Many tried to fight the plan since they feared that the prospections could harm the environment and the tourism industry.

Even though Repsol's oil exploration was finally scrapped in 2015 allegedly due to the volume and quality of the deposits found being deemed insufficient to merit extraction, it is not the first time that the government has approved oil explorations in the archipelago (Real Decreto 1462/2001, BOE, 23 January 2002) and although it may very well be the last time, certain doors have been opened and a series of questions have appeared that need answering. Possible environmental impacts have been studied and positive impacts of the oil prospections have been evaluated, but to what extent would an accidental oil spill hurt the tourism industry?

The tourism industry is "one of the most susceptible and vulnerable to crises or disasters" (Pforr, 2009) since the success of a destination rests heavily on "its ability to offer tourists a perceived safe and pleasant place to visit" (Breda and Costa, 2006). It is known that in some cases specific destinations may see positive effects after crises and disasters due to the changes in consumers' travel patterns or an influx of emergency and media personnel (Ritchie, 2009). Keeping this in mind and seeing as many of the tourists arriving in the Canary Islands seem to have shifted from other direct competitors due to the effects of terrorist attacks and political instability (thus being deemed as *not pleasant* places to visit and affecting consumers' patterns), the possibility of an oil spill poses an even greater danger than could seem at first. Not only would the impacts be those directly derived from the effects of the oil spill, but also those that stem from the perception tourists have of the event.

The effects of different incidents, be it manmade crises or natural disasters, have been extensively studied before, but not much has been said about the effects that oil spills have, directly and indirectly, on the tourism industry.

This paper aims to find and analyze all relevant research on the subject and then gather all existing information about the impacts that past oil spills have had on tourism so that it can act as a stepping stone for further research, all while also focusing on the effects that such a disaster could have on especially vulnerable sites like islands highly dependent on tourism, specifically analyzing the case of the Canary Islands. As we will see later in this paper, islands have been extensively regarded as economically vulnerable in research and literature throughout the years (Britton, 1980; Wilkinson, 1989; Pelling and Uitto, 2001; Turvey, 2007). We wonder if these added vulnerabilities would play a significant role in the case of the Canary Islands.

In the next section we define the concepts of crises and disasters, to see how they have been understood throughout the literature and the differences between both terms.

In the third section we make a brief description of the oil production process, the steps it entails and the risks of oil spills along the process. We also state key findings about the main sources of oil input to the sea and the worldwide dependency on oil as an energy source.

In section four we analyze the impact that several oil spills have had on economic activities, especially focusing on tourism and drawing some conclusions from the case studies.

Section five presents and explains the economic impacts to be expected in different parts of the industry like tourism resources, accommodation and restaurants, destination image, etc., while also mentioning the impacts on destination economy as a whole.

The sixth section analyses the special vulnerabilities that characterize islands, illustrating them with very simple case studies, and establishing a conceptual framework of sorts for the sixth and last section, the conclusions and implications for the Canary Islands.

2. TOURISM: CRISES, DISASTERS AND RISKS

The very first question we need to answer in this paper is, are oil spills crises or disasters?

Faulkner (2001:136) defines a crisis as "a situation where the root cause of an event is, to some extent, self-inflicted through such problems as inept management structures and practices or a failure to adapt to change" and a disasters as "situations where an enterprise (or collection of enterprises in the case of a tourist destination) is confronted with sudden unpredictable catastrophic changes over which it has little control", although he states that the line isn't always clear, since "even in the case of natural disasters the damage is often partially attributable to human action". Prideaux (2003) agrees with the aforementioned definitions and states that crises could be anticipated, since they are caused by a lack of management planning, whereas disasters can only be managed in a reactive manner after the incident has already taken place.

Although both terms are used interchangeably throughout the reviewed literature on oil spills, according to these definitions, it would seem like the proper word to use would be crisis. Even in cases when it would seem like the term disaster is more appropriate, like tanker spills due to bad weather conditions, the problem could probably be attributed to bad practices of sorts, like using old tankers with single hull structures or going into the sea ignoring the conditions. For this paper we are going to assume that most oil spills' causes can be traced back to human error. For example, the Deepwater Horizon was caused by cost-cutting decisions made by BP and its partners, added to the lack of an adequate well safety system, and thus this incident is clearly a crisis. Although oil spills themselves are mostly crises, they normally lead to environmental disasters that then have a series of impacts on different economic sectors, including tourism, which in turn may have had a crisis due to the destination's bad management or inept planning. The lines are indeed blurred, and the term used depends on the unit of analysis and the system used to analyze the impact (Ritchie et al., 2013). According to Sönmez et al. (1999:13-14), who uses the terms interchangeably, a tourism crisis is a situation that can "threaten the normal operation and conduct of tourism-related businesses; damage to a tourist destination's overall reputation for safety, attractiveness and comfort by negatively affecting visitors' perceptions of that destination; and, in turn, cause a downturn in the local travel and tourism economy [...] by the reduction in tourist arrivals and expenditure".

No matter what we call it, the truth is that both crises and disasters entail a series of risks for the tourism industry, as exposed in section six through very brief case studies.

3. OIL, SPILLS AND TOURISM

To understand the impacts that an oil spill could have on the tourism industry it is necessary to know how oil is obtained and in which moments of the production process they can happen.

Crude oil goes through a series of processes from the moment it is detected till the moment it is finally marketed. These processes are as seen in Figure 1.

Figure 1. Oil Production Chain

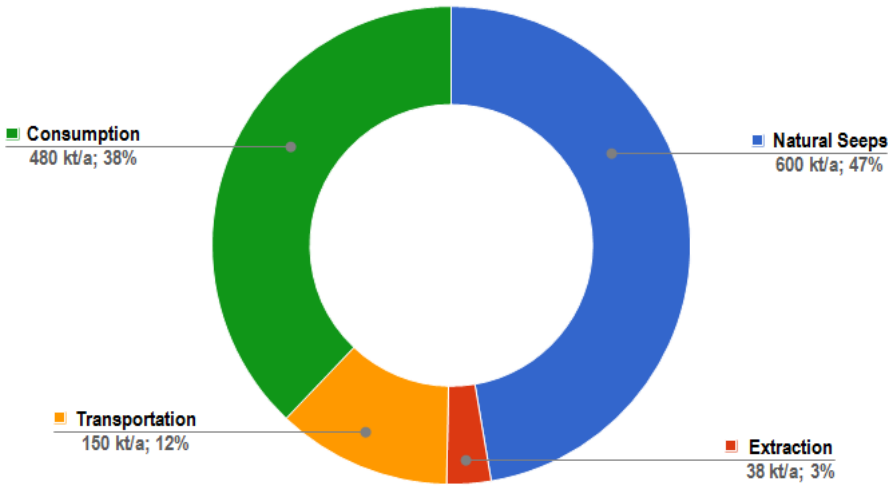
Source: Author, simplified representation based on Sigam and Garcia (2012)

During the first phase, exploration, several methods are used to try and locate viable sources of oil. The next step entails extracting the located oil and bringing it to the surface. After this, oil has to be transported to storage and refining facilities through tankers, pipelines, trucks or railcars. Once at the refining facilities, the extracted hydrocarbons are turned into the different final products that are then to be distributed and marketed to wholesale, retail, direct industrial clients, etc. In turn, this distribution requires further transportation and storage of the processed products.

Oil spills can occur on each of these steps, for example accidents during extraction like oil rig explosions (Deepwater Horizon, Ixtoc 1), oil tanker accidents (collision like the Hebei Spirit, grounding like the Exxon Valdez) or pipeline fractures during transport, etc.

The U.S. National Research Council conducted a study about the main input of oil to the sea between 1990 and 1999, categorizing them in natural seeps, extraction of petroleum, transportation of petroleum and consumption of petroleum, as shown in the following chart.

Figure 2. Average annual kilotonnes of petroleum by source (1990-1999)



Source: Author, based on figures from Ocean Studies Board & Marine Board reports

Natural seeps, which happen when crude oil seeps from geologic strata beneath the seafloor into the water, accounted for 47% of the total input of oil to the sea.

While the percentage of oil coming from natural seeps may make consumption and transportation seem of less significance, it is important to keep in mind that the rate of addition of oil to the environment in natural seeps is relatively slow and chronic, allowing the ecosystems to slowly adapt, while oil spills mean a sudden change to the environment.

Extraction of petroleum meant only 3% of recorded oil input to the sea, including spills from accidental discharge on offshore platforms, volatile compounds that escape to the atmosphere and produced waters (water from the oil reservoir pumped to the surface), which accounted for the vast majority of the extraction input (95%).

As for the oil spills during transportation, they accounted for 12% of all input, with the main source being tanker vessel spills (67%) and operational discharges (cargo washings, 24%), followed by pipeline spills (8%).

Around 38% of all oil input to the sea happened during oil consumption, which includes operational discharges (56%), land-based spills (29%) and atmospheric deposition (11%).

Operational discharges include bilge oil discharge, fuel oil sludge (particles of solid chemical compounds) and oily ballast, and land-based spills are municipal wastewaters, industrial discharge (including refineries), urban runoff, river discharges and ocean dumping.

Although this can make oil sound like a very dangerous source of energy, and it is, truth be told we have a serious dependency on oil for power generation, heating and transportation, not to mention the petrochemical industry.

This dependency isn't going to change any time soon, the International Energy Agency Oil Market Report forecasts a worldwide average of 96 million barrels of oil and liquid fuels per day for 2016, with the Medium-Term Oil Market Report foreseeing a demand of over 100 million barrels per day for 2021.

Although the risk of oil spills is still a very real danger, even more with raising forecasts of oil usage in the following years, it is true that the oil production industry has definitely made some steps in the right direction in regards to safety in the process, like with the introduction of the double hull and other safety measures in transport. The number of oil spills from tanker ships has decreased significantly, with the average number of spills per year in the 1970s being three times those for the 1980s and 1990s, and more than sixfold the number of spills in the 2000s, despite the steady increase in seaborne oil trade since 1985 (Huijer, 2005).

Nonetheless, it is of utter importance not to forget that oil spills do happen and when they do they normally have severe consequences on the economy, the environment and the population of the areas affected. Oil spills are accidents, and as such they are unpredictable and difficult to anticipate. Therefore, the best we can do to limit them and keep their impacts to a minimum is studying past cases and working on prevention of future instances.

4. OIL SPILL IMPACTS ON TOURISM: CASE STUDIES

In this section of the paper, we analyse the impact that several oil spills have had on economic activities, especially focusing on tourism, through the study of past oil spills and their particularities.

As a first step, we proposed a study timeframe of 30 years and made a list of all oil spills that have happened since 1986. This time frame was selected specifically to include the Exxon Valdez incident, which has been extensively researched. War related events were then excluded from the list, since it would be difficult to separate the impacts derived from war from those derived from the spills. The list was then edited to include only offshore and inshore incidents, since, not only are they the most studied cases, but our final objective is to have a better understanding of the economic impacts of oil spills in coastal and island tourism destinations. The resulting list can be found in the annex.

After gathering the details of the incidents, each and every one of the spills was researched to assess which ones had the most available information and should be selected as case studies.

Several of the listed incidents had been studied for impacts on the economy, and in some cases, the specific impact of these occurrences on tourism has been researched, although mostly not in depth. Only some cases have been extensively documented, with a lot of studies focusing on very specific aspects (Chang et al., 2014).

The selected cases and their economic impacts are described below.

4.1. EXXON VALDEZ, 1989

On the 24th March 1989, the Exxon Valdez struck a reef and tore open the hull, releasing 37,000 tonnes of crude oil in Alaska's Prince William Sound and affecting approximately 15% of the total shoreline (around 2100 km). Cleanup operations costed $3,100 million, and active cleanup lasted for approximately two years, although recovery projects were still going on more than 20 years later (Bjarnason et al., 2015).

The greatest damages were associated to fisheries, at $287 million (Cheong, 2012). The National Oceanic and Atmospheric Administration (NOAA) estimated the total damages to tourism and sport fishing to be $55.8 million. Visitor spending in the summer of 1989 decreased 8% in south-central Alaska and 35% in southwestern Alaska (including the Aleutian Islands) as compared to 1986 levels, amounting to an estimated loss of $19 million in visitor spending (Oxford Economics, 2010).

Negative effects included decreased visitor traffic due to lack of available visitor services (accommodations, charter boats, air taxis), labour shortage in the tourism industry due to workers seeking high-paying spill clean-up jobs, thus increasing the costs for industry businesses (McDowell Group, 1990)

Although market research showed that the oil spill had affected potential visitors' perception of the area negatively, visitor patterns went back to normal during 1990, with the tourism industry having no permanent damage (Advanced Resources International, 1993). Full market recovery of the sector in Alaska happened within 2 years after cleanup. The overall cost of the spill for residents was estimated at $870 million (Cheong, 2012).

4.2. BRAER, 1993

On the 4th of January 1993, the Braer's engine failed due to water entering the bunkers. The next day a high sea tug meant the ship could not be towed, and it ran aground on the Shetlands, releasing nearly 85 thousand tonnes of crude oil. Although the winds and currents washed the oil away and in two weeks the oil had disappeared, the incident was widely featured in the media, damaging the image of Shetland. This lead to cancellations and slightly reduced booking and visitor numbers (Butler and Fennell, 1994), a reduction which was minimal and short lived (Carlsen and Butler, 2011). The presented claims for tourism related damages amounted to £550 thousand, with approved claims for tourism losses amounting to a total of £150 thousand according to a report by the International Oil Spill Compensation Fund (IOPCF, 1995).

Fishing areas suffered closures for several months, generating a series of losses for which the seafood industry presented claims of around £29 million (Goodlad, 1996). Cleanup costs were relatively low, of around £330 thousand, since not much of the oil hit the coast. There is no mention of any of the costs covered by the IOPC Fund being related to cleanup operations.

The total claims amounted to more than £80 million, with only £57 million covered by the IOPCF limit per oil spill, which has since been raised. The damage to the environment was not compensated.

4.3. SEA EMPRESS, 1996

The Sea Empress sustained serious damage on the 15th February 1996, releasing around 72,000 tonnes of crude oil when entering Milford Haven and coating more than 200km of coastline. The area had an important tourism industry due to its natural beauty, wildlife and vulnerable bird species. The oil spill affected the area of a Coastal National Park, two National Nature Reserves and a Marine Nature Reserve.

The impacts weren't as severe as expected since the oil spill happened in February, which is a time of low environmental use and vulnerability, with many birds not having returned to the area to nest and many fish species being inactive or having migrated for the winter. Furthermore the wind carried the oil away from the coast and about 40% of the light crude oil evaporated and was blown away from the shore, with only 7% of the oil reaching the shore (Edwards and White, 1999). Around 50% of the oil spilt was dispersed (natural and chemical dispersion) and 3% was recovered at sea (Harris, 1997). The cleanup operations costed £23.5 million (Purnell, 1999) and the total damage of the spill was estimated at $60 million according to Grey (1997).

The major impact was on the tourism industry, although the fishing industry also suffered. Both industries were hit as a result of consumer perceptions in addition to actual damage caused to the environment. Both commercial and casual collection of fish, shellfish and seaweeds were prohibited, with most banns ending by the end of May and the remaining ones being removed 9 months after the spill (Law and Campbell, 1998).

In regards to tourism, the government of the UK estimated the cost to be around £10 to £15 million for tourism (Harris, 1997), although well executed cleanup operations and the loyalty of the area's visitors reduced the impact on the industry (Edwards and White, 1999).

4.4. ERIKA, 1999

On the 12th December 1999, the Erika broke in two in a severe storm, releasing about 20 thousand tonnes of heavy fuel oil, resulting in intermittent oiling over 400 km of shoreline between Finistère and Charente-Maritime in France, with the most heavily affected areas being in Loire-Atlantique, the northern Vendée and offshore islands like Belle Ille. The cleanup cost was €124 million (Bonnieux and Rainelli, 2004), with the amount covered by the IOPC Fund for cleanup operations being €32 thousand.

Total damages were estimated to have amounted to €914 million, with losses to the tourism sector of around €500 million (Bonnieux and Rainelli, 2004) and the IOPC Fund covering nearly €130 million, out of which €76 million were related to tourism. The area suffered a 30% drop in summer holiday bookings (Jacobsson, 2007).

4.5. PRESTIGE, 2002

On November the 19th 2002 the Prestige broke in two after having its hull damaged on the 13th, releasing approximately 64,000 tonnes of heavy fuel oil into the sea, that, due to its persistent nature, travelled great distances helped by the winds and currents and coming ashore first in Galicia and later affecting the north coast of Spain and the Atlantic coast of France. Nearly 1,000 km of coastline were affected in Galicia alone, including more than 700 beaches. According to Garza-Gil et al. (2005), the cleanup cost was €559 million.

The most affected sectors were the fishing and tourism sectors, and the total damages for the tourism sector in the first four years after the oil spill were estimated to be of around 719€ million.

Total public administration expenditures for Spain amounted to 737€ million, an amount that includes expenses related to cleaning tasks, building infrastructures, fiscal measures taken to assist the affected by the sinking of the Prestige, restoring the food safety standards of fish and shellfish, research about the impact of the spill and campaigns to restore the image of Galicia as a desirable tourist destination, which on its own amounted to 31€ million (Loureiro et al., 2009).

Galicia experienced a tourism related income loss of around €210 million (Garza et al., 2009), with overnight stays decreasing by 5 million and income by €134 million, which meant an 8% decrease in both cases (Garza-Gil et al., 2005). The environmental damages of the spill were estimated at €604 million, the income losses of damaged sectors range from €633 million in the short term to €6,734 million in the long term.

The total costs for the Prestige oil spill amount to €2,250 million in the short term and €8,500 million in the long term, with only 2% of the cost covered by the 1992 Fund Convention and Civil Liability Convention, leaving 98% of costs to be paid by society (Liu and Wirtz, 2006).

4.6. HEBEI SPIRIT, 2007

On the 7th of December 2007, the Hebei Spirit, which was anchored in Port Incheon (South Korea), was run into by the Samsung 1, whose towline had broken, thus causing the accident. The Hebei Spirit's hull was damaged, spilling 10 thousand tonnes of crude oil into the Yellow Sea. More than 350 km of shoreline were coated in oil, including 15 beaches and a marine national

park, with the cost of cleanup estimated at ₩300 billion and the total damages arising from the spill at ₩738 billion (IOPCF Committee Meetings Report, 2015).

In regards to the tourism industry, tourist levels dropped by 70% to 80% in the first summer after the spill when compared to the previous year (Cheong, 2012), with the total losses for the sector being estimated at ₩100 billion (IOPCF Committee Meetings Report, 2010).

4.7. DEEPWATER HORIZON, 2010

In April 2010 the Deepwater Horizon oil rig exploded, pouring approximately 672 tonnes of crude oil into the Gulf of Mexico over the next three months. According to Ramseur (2015), BP spent more than $14 billion in cleanup operations. The total cost of the spill was estimated at approximately $252 billion (Lee and Garza-Gomez, 2012).

The oil spill affected tourism in nearby states, even those not directly in contact with the oil. Just in Louisiana alone, leisure visitor spending dropped by $247 million in 2010, with the increase in spending related to cleanup operations partially making up for it (Tourism Economics, 2011). Hotels throughout the Gulf Coast had cancellations and booking future events proved difficult (Knowland Group, 2010). General tourism interest in the area declined following the oil spill, with consumers searching 65% less for information on the Gulf Shores in the 20 days following the oil spill compared to the same period in the previous year according to Oxford Economics (2010). The same report also states that the costs in the tourism industry were of $7.6 billion.

By 2011 Florida, Louisiana, Alabama and Mississippi had recovered. By the end of the year the number of visitors and their expenditure were 9% higher than the pre-spill levels, according to calculations made using the official statistics of each state. This might be related with their big investment in tourism promotion, which was of around $200 million and funded by BP (Stimeling, 2014).

Table 1. Case studies summary table

	Year	Oil spilled		Location	Economic impact $2015 million		Impact on tourism $2015 million		Cleanup cost $2015 million	
		Type	Kilotonnes (kt)		Total	$/kt	Total	$/kt	Total	$/kt
Exxon Valdez	1989	Crude oil	39	Prince William Sound, Alaska, USA	1,663.00	42.64	91.50	2.35	5,925.00	151.92
Braer	1993	Crude oil	85	Shetland Islands, Scotland	199.85	2.35	1.37	0.02	0.82	0.01
Sea Empress	1996	Crude oil	73	Milford Haven, UK	90.64	1.24	34.85	0.48	54.59	0.75
Erika	1999	Fuel oil	20	Bay of Biscay, France	1,331.01	66.55	728.12	36.41	180.58	9.03
Prestige	2002	Fuel oil	64	Galicia, Spain	2,984.52	46.63	278.56	4.35	741.49	11.59
Hebei Spirit	2007	Crude oil	10	Incheon Port, Korea	917.58	91.76	124.34	12.43	373.00	37.30
Deepwater Horizon	2010	Crude oil	672	Gulf of Mexico, USA	273,910.00	407.60	8260.86	12.29	15,217.37	22.64
				AVERAGE	40,156.66	94.11	1,359.94	9.76	3,213.26	52,614.79

Source: Author, based on all aforementioned research

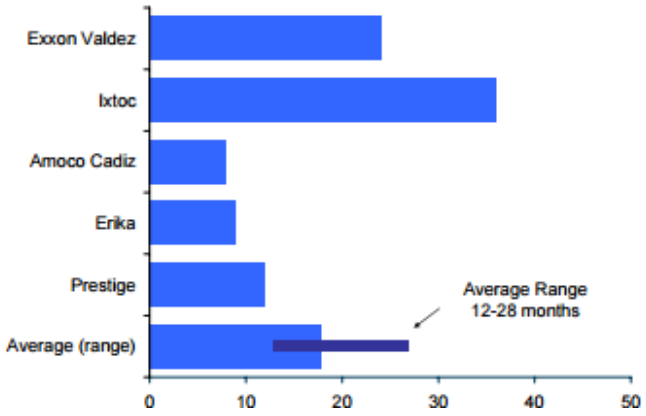
After all the data had been gathered, the rough estimates found on all the different sources were converted to constant US dollars for 2015 to allow comparisons between different oil spills. The result of this is shown in Table 1.

This comparison table should be taken with a grain of salt, given that in many cases the literature analyzed didn't provide a clear explanation of the methodology used, what was considered an impact or if indirect and induced impacts also made it into the cost calculations. Furthermore, although the average cleanup cost and economic impact per tonne has been included in the table, it is important to understand that most of the literature seems to agree that it is not the quantity of the oil spilt that sets the magnitude of the impacts, but rather other factors such as the type of oil spilt, the location and characteristics of the area affected, the time frame in which the spill takes place in relation to key seasons for different sectors, among others (Kirby and Law, 2010).

In regards to the time it takes affected areas to recover after an oil spill, it could be measured in several ways, depending on what our objective is. If we want to measure the recovery of the tourism industry after a crisis, it seems logical to use markers such as number of visitors or visitor expenditure.

According to a report by Oxford Economics (2010), the average range of months after the initial disruption for visitor spending to return to the baseline in oil spills is from 12 to 28 months (including cases like the Exxon Valdez oil spill, the Erika and the Prestige, also studied in this paper). Although the initial intention was to add all the studied cases to Figure 3, in most cases the visitor expenditure data of the affected areas was not available in the literature and most of them didn't have monthly statistics open for public access.

Figure 3. Average time for visitor spending to return to baseline



Source: Oxford Economics, 2010

5. ECONOMIC IMPACTS OF OIL SPILLS IN COASTAL TOURISM DESTINATIONS

According to Bonnieux and Rainelli (2004), the damages incurred by an oil spill can be a result of the effects of pollution, like cleanup and restoration costs, or the indirect effects of the pollution, like damages to marine resources, tourism trade, leisure, amenities and biodiversity.

Based on the gathered information, the reviewed study cases and several other published papers on the issue of oil spills, the scope of impacts to be expected in case of such an event taking place is very wide. In this section, we have tried to highlight the main affected parts of the industry and how these impacts could affect the destination in both the short and the long term.

5.1. TOURISM RESOURCES: SEA, BEACHES & THE COASTAL LANDSCAPE

Oil floating on the sea surface and coating the coast and beaches of a tourist destination is the main sign of an oil spill and the one evident impact that tourists can and will not ignore. On top of beaches needing to be closed to the public until they can be fully cleaned and safety has been restored, oil spills affect the scenery, making tourists reticent to using the beaches, swimming in the water and engaging in water activities, even after the cleanup operations have finished and the water has been deemed safe for use. In the case of the Rayong oil spill in 2013, 30% of tourists left after the beaches were coated in oil according to the Rayong Region Tourist Association. In the Cosco Busan oil spill in 2007, beach closures continued throughout the whole recovery process, with cleanup efforts lasting more than a year (Bjarnason et al. 2010).

In a survey conducted by the Knowland Group after the Deepwater Horizon spill in 2010, hotel managers reported that 48% of cancellations mentioned the spill's potential effect on the beach as the main reason.

Even not so severe cases of oil spills like the MV River Princess in Goa in 2000, which released only 40 tonnes of oil into the sea, can have an impact on tourism. A study conducted in 2014 concluded that the vessel, which was still on site 12 years after the incident and had around 15 tonnes of fuel still on board, was affecting tourist satisfaction in the Candolim-Sinquerim beach. Scenic quality of the beach was graded average or below, with the vessel being the least liked aspect of the view by 80% of visitors, who also got deterred from swimming by the ship's presence (60%), with less than 50% of visitors saying they would recommend the beach to their friends (Williams et al. 2014).

As for the long term, visible effects are generally gone once cleanup operations are finished, although sometimes left over oil can wash up ashore later on, oiling the beach again in a much lighter way. Sometimes more persistent oils stay in the subsurface sediments of exposed shores for far longer than we could expect, like the oil from the Exxon Valdez oil spill. A study published by the National Oceanic and Atmospheric Administration (NOAA) in 2001 indicated that nearly 60% of the 91 sites assessed were still contaminated and another study published in 2007 reported that oil still persists in the Gulf of Alaska beach sediments 17 years after the crisis (Short et al., 2007).

5.2. TOURISM RESOURCES: MARINE ECOSYSTEM AND BIODIVERSITY

After an oil spill, the hardest hit is normally taken by the marine ecosystem, affecting the area's biodiversity and generally lasting for longer periods than any other impacts. Take the Exxon Valdez oil spill as an example. According to several published studies, the incident had severe long-term impacts on the ecosystem, with effects still being apparent 20 years later (Peterson et al., 2003; Guterman, 2009). But the impacts of the oil spills on the ecosystem are not just seen long-term, in the short-term the effects can also be devastating.

Since marine mammals and seabirds need to have routine contact with the sea surface, they experience high risk from oil floating in the surface (Loughlin, 1994; Ocean Studies Board & Marine Board, 2002). Should this oil coat their fur or feathers, the loss of insulating capacity could be fatal. Hypothermia, drowning or ingestion of toxic hydrocarbons could easily end the animal's life (Peterson et al., 2003). Only days after the Exxon Valdez incident, the deaths of more than 2000 otters and more than 250,000 seabirds had been documented (Loughlin, 2013). If getting coated in oil does not do it, inhalation of toxic fumes will. This causes brain lesions, stress and disorientation, and is said to have been the cause of the deaths of around 300 harbour seals after the Exxon Valdez.

Sometimes, the disturbances produced by the clean up process can cause more harm than the oil itself (Whitfield, 2003), as seen after the Exxon Valdez oil spill, where beaches that had been cleaned had longer recovery times than those that had not (Peterson, 2001).

5.3. LEISURE AND SPORTS: WATER SPORTS & RECREATIONAL FISHING

Coastal destinations rely heavily on the coastline and the water for their offer of leisure activities. An oil spill generally means that seawater is not immediately safe for use, and water sports and other sea-dependent activities have to stop until the cleanup operations are finished and safety has been restored. According to reports published by the Exxon Valdez Oil Spill Trustee Council, tourism business related to marine recreational activities such as kayaking, recreational fishing and bird watching were heavily impacted, with a 50% business decline in 1992 when compared to averages before the spill. More than 40% of surveyed businesses felt the oil spill had significantly affected their results.

According to a report published by Oxford Economics in 2010, the Exxon Valdez oil spill affected recreational fishers due to closures, with the number of non-resident fishing days falling by 25%, a decline that is attributed to area closures and fear of contamination among others. Approximately 128 thousand sport fishing trips were lost in 1989 and 40 thousand in 1990, translating into a loss of between 4 and 50 million dollars according to the Exxon Valdez Oil Spill Trustee Council. Human use of recreational areas also changed as a consequence of the spill, with areas not affected becoming more heavily used due to displacement of activities from oiled areas in which users such as kayakers were prevented from enjoying beaches that harbored visible oil (Oxford Economics, 2010).

In the Cosco Busan oil spill in 2007, the impact on recreational usage of the coast meant a loss of over a million user-days, translating to $18.8 million lost. More than 60% of survey participants reported that their outdoor leisure activities had been affected by the incident (Bjarnason et al., 2015).

5.4. ACCOMMODATION AND RESTAURANTS

The impact that oil spills can have on accommodation are difficult to assess. On the one hand, tourists can leave the affected area, make early check-outs and cancel upcoming stays, but on the other hand, the demand for accommodation from cleaning crews and media personnel might make up for that loss. A survey conducted by the Knowland Group after the Deepwater Horizon incident in 2010 found out that 60% of hotels had experienced cancellations and 42% of hotels had difficulties booking future events. However, according to the same survey, 36% of hotels saw an increase in transient bookings from guests associated with the petroleum industry, 40% from environmental groups and 12% from the media. Nonetheless, it is important to note that while the sudden increase in customers associated with the spill cleanup made up for the cancelled or otherwise non-booked rooms, these rooms were often booked at a discounted price. This, coupled with business facilities in hotels not being occupied and restaurant demand being lower, meant much lower revenue for hotels in general throughout Louisiana, Mississippi, Alabama and Florida.

In regards to the effects on restaurants, after an oil spill they may struggle to find sufficient supplies to meet customer demand or even see the demand severely reduced amid fears of tainted products (Garza-Gil et al., 2006; Cheong, 2012). Oil spills are generally regarded as damaging to the environment and the fauna, especially in terms of seafood edibility. According to a study conducted by the Market Dynamics Research Group for the Louisiana Office of Tourism, nearly 60% of the people surveyed thought Louisiana after the Deepwater Horizon spill thought oyster beds were contaminated and unsafe to eat, with 48% adding that they were unsure whether restaurants that use Louisiana seafood were putting their customers at risk. Nearly 30% of those surveyed were not sure about regulations being in place to ensure that Louisiana does not sell contaminated seafood. Furthermore, according to another survey conducted by the Greater New Orleans Group, restaurant owners reported that, while in 2006 33.4% of their customers asked about the origin of their seafood often, after the spill this percentage rose to nearly 70%.

5.5. TRANSPORT AND INTERMEDIATION

As we all know, tourism transport and intermediation are highly dependent on back-to-back operations. Dwyer (2007) defines back to back operations as those where a tour operator runs a series of flights in a continuous chain manner. When a group of tourists flies to a destination, the ones who just finished their holiday use the same plane to come back, thus using the plane capacity more efficiently. The same can be applied to any other means of transport, like ships. When an oil spill happens, it is expected that the area remains closed to ship traffic, thus generating heavy losses for any companies relying on vessel traffic for their business model. This would be the case for cruise ships, which in addition normally have hired tours for their clients in other cities where they were making stopovers.

According to Bjarnason et al. (2015), after the Houston Ship Channel spill in 2014 the Channel was closed to all vessel traffic for three days, delaying more than a hundred vessels, cruise ships included, generating an economic loss of more than 300 million dollars per day. The same happened after the Mississippi River spill in 2014, when the area was closed for two days and delayed more than 30 vessels.

5.6. IMAGE & PERCEPTION

The image that potential travellers have of a certain place can heavily affect the selection process, thus having an impact on the very viability of the destination (Hunt, 1975). Since most tourism products are intangible and can only compete in terms of image, the main objective of a destination's positioning strategy should be to reinforce positive images the target audience may already have, correct the negative ones or create a new image altogether (Pike and Ryan, 2004).

A destination's success rests heavily in "its ability to offer tourists a perceived safe and pleasant place to visit" (Breda and Costa, 2006), which would be fairly difficult if a destination is portrayed in the media as having oiled beaches, dead animals washing ashore, a tainted marine environment, sea not safe for swimming and seafood not safe for consumption.

The way a certain event is depicted in media can make or break a destination. When an area is portrayed as disaster-stricken through sensational footage and shocking images, the coverage can bring volunteers for cleanup operations, donations and other positive consequences. However, if the broadcasted image of the destination changes tourists perception of the destination and depicts affected areas as unclean and unsafe to swim in or to eat from, the consequences can be disastrous for the destination's image, severely affecting both tourism and the fishing industry in both the short and the long term (Faulkner and Vikulov, 2001; Garza et al., 2009).

Oftentimes, the media fails to put the disaster in perspective, forgetting to mention the vast unaffected areas and focusing on the destruction, causing many potential tourists to misunderstand and perceive the whole region as contaminated.

We can affirm that it is not reality that matters, but the tourists' perception of that reality. For example, after the Deepwater Horizon oil spill a quarter of people surveyed thought that leisure activities were closed due to the incident when in fact this was not the case. At the same time, people thought that seafood was not safe to eat even though the opposite had been proved. It is due to this perceived reality that 26% of people who intended to visit Louisiana postponed or cancelled their trips after the oil spill (MDRG, 2010). The same happened after the Hebei Spirit oil spill in 2007, when tourists and consumers in general shunned fish from the affected area because they feared it had been contaminated, including fish from unaffected nearby sites (Cheong, 2012).

As stated, in the short-term the media coverage might be beneficial, however, if the media doesn't report the recovery process, people's perception of the place will stay at the negative images fed to them initially, discouraging visitors in the long-term.

5.7. SPILL INDUCED VISITORS

As we already mentioned, initially after the oil spills there is a sudden inflow of visitors related to the cleanup operations and the media. That is what happened after the Hebei Spirit oil spill in 2007, when the area saw a brief surge of visitors including the aforementioned groups of people plus government officials, police and military personnel (Cheong, 2012).

To these visitors we must add what is known as *dark tourism*. From the Coliseum in Rome to the concentration camps in Auschwitz, dark tourism has been defined by several authors in slightly

different ways. Tarlow (2005:48) defines it as "'visitations to places where tragedies or historically noteworthy death has occurred and that continue to impact our lives" and Stone (2006:146) as "the act of travel to sites associated with death, suffering and the seemingly macabre".

Although we haven't found research that successfully links oil spills and dark tourism, it is obvious that the environmental disasters that these incidents cause could indeed be severe enough to incite this kind of tourism.

5.8. OVERALL IMPACT ON DESTINATION ECONOMY

The effects of an oil spill are not restricted to the tourism industry, such a crisis affects every sector of the economy in direct, indirect and induced ways. For example, the oil spill alters the ecosystem and damages fish and other seafood. Closures and bans are subsequently placed on affected fishing areas, changing consumers' perception of the seafood edibility and severely affecting the demand. The losses derived from the decreased demand of seafood due to fears of the produce not being safe for consumption then have a ripple effect on the fisheries supply chain, with docks and fish processing and supply businesses suffering negative impacts (García Negro et al., 2009; U.S. Department of Commerce, 1983).

As for other sectors, power stations, refineries and desalination plants depend on the availability of large quantities of water to use as a coolant, and in the case of the desalination plants, these also require seawater as an input for potable water production (IPIECA, 2015). Seawater that has been contaminated by an oil spill is not suitable for these purposes, thus extending the impacts of the oil spill to other parts of the economy.

Furthermore, it is clear that any reductions in disposable income derived from lost jobs in the tourism and fishing industry affect demand in other industries and produce a generalized economic loss for the global economy of the destination (Jacobsson, 2007).

A destination's economy is an intricate web of interdependent sectors and industries and when one or more of those industries suffer a negative impact, all the other sectors take a hit, amplifying the effects of many crises and disasters. Trying to cover all possible economic impacts on every sector of the economy in a detailed manner goes far beyond the scope of this paper.

6. ISLAND TOURISM, VULNERABILITIES AND DISASTERS

6.1. ISLANDS AND THEIR VULNERABILITY

As we already stated in the introduction, Islands have been extensively regarded as economically vulnerable in research and literature throughout the years (Britton, 1980; Wilkinson, 1989; Pelling and Uitto, 2001; Turvey, 2007). The main reasons why they are deemed vulnerable is that their small economies lead to diseconomies of scales and the limited space and resources they possess severely limit their export capabilities (Scheyvens and Momsen, 2008a). To this we must add the geographical isolation that normally characterizes islands, which coupled with their usual lower population not only means they are far away from major markets, but they also have a very small domestic market (Briguglio et al., 1996; Milne, 1997), not to mention that the added

transportation costs render many exports of small islands non-competitive in the world market (Scheyvens and Momsen, 2008b).

In addition, oftentimes the local population lacks the skills needed for proper economic development and the local capital is not enough to drive said development. On top of that, transportation links to islands, which are generally weak and the accessibility to certain areas being sometimes limited gravely affect the aforementioned development (Harrison, 2003). These vulnerabilities make it so that more often than not islands have to rely on aid and international trade (Scheyvens and Momsen, 2008a). All of these combined factors translate into small island states being severely affected by events such as natural disasters, terrorism and disturbances in the political order (Harrison, 2003; Hoti et al., 2005).

On the other hand, it is the very characteristics that make them vulnerable that also make them attractive as a tourism destination; islands are the second most important holiday destination after historic cities (Gartazar and Marin, 1999; cited in d'Hauteserre, 2003: 49). It is that very geographic isolation which is generally portrayed as a problem for their economy that is regarded as an attractive and exotic quality in a tourism product, particularly so in the case of small islands (Scheyvens & Momsen, 2008b), and it is particularly their small size that makes coordinating tourism development, innovating and adapting to changes in market demand easier (Croes, 2006; Streeten, 1993), also making branding, marketing and catering to a niche target market easier (Scheyvens and Momsen, 2008b).

Nonetheless, we should also keep in mind that the small size and populations of islands generally mean that the impacts of tourism are more prevalent and ubiquitous than they would be in a larger mainland destination, with many small islands receiving several times their population in tourist arrivals (McNulty, 2002).

6.2. CASE STUDIES

In this section, three incidents are presented and their impacts on islands analysed. We have a man-made crisis, a case highlighting the importance of tourists' perceptions for the industry and a natural disaster.

6.2.1. Bali Bombings, 2002: Terrorist attacks, a man-made crisis

In October 2002, a terrorist bomb attack took place at two nightclubs in Kuta, a popular resort. Over 200 were killed (mostly tourists), over 300 injured and nearly 500 buildings destroyed. Trips were cancelled all across Indonesia and travel agents and tour operators stopped selling Bali and repatriated customers in the area. In less than three days, nearly 20 thousand tourists had left Bali, with arrivals dropping by 80% within the next two weeks. The number of flights was cut due to a lack of demand. Accommodation fell from 75% to 10% rates and all businesses relying on tourists for revenue saw tremendous losses. Bali's image was severely damaged, and although efforts were made to distribute accurate information about the circumstances in Bali, in January 2003 there were just 60 thousand tourists on the island, as opposed to the 110 thousand in the same month of the previous year. They tried to boost domestic tourism, set up discounts and urge suppliers to lower prices. Bali called for cooperation and solidarity and asked the international community to understand their situation and offer support, for example by lifting or lightening the travel warnings that some countries had issued. Balinese tourism started

recovering in 2003, but SARS epidemic and the war in Iraq stopped this favourable development. A hotel was then bombed in Jakarta in August 2003, heavily impacting tourism once more and dropping arrivals by 22.7% in 2003 (to under one million), with this number increasing again by 46.9% the following year (Pender and Sharpley, 2005; Henderson, 2007).

6.2.2. Hong Kong, 2003: SARS epidemic and tourists' perception of risk

July 2003, Severe Acute Respiratory Syndrome (SARS) outbreak was officially declared by the World Health Organisation (WHO). More than 8 thousand people in 30 countries were infected and over 800 victims died. Sensational and unobjective media coverage had a major impact on tourism flows, especially in Southeast Asia, were international arrivals fell by as much as 80%. Hong Kong was particularly affected, with 80% reductions in inbound and outbound travel and hotel occupancy sharply descending to an average of 20%, resulting in a loss of 41% of the area's tourism industry's GDP in 2003 and a loss of over 40 thousand jobs. The impact was due to the hysteria surrounding the disease and the tourists' reaction was out of proportion to the actual threat, after two months just 0.02% of the local population were infected (Pender and Sharpley, 2005).

6.2.3. Icelandic volcanic plume, 2010: Natural disasters

The first eruption began on the 21st of March 2010, although it was quite the spectacle, it wasn't very important in a geological scale. The eruption produced a small quantity of ash and lava coming from the volcano formed *lavafalls*. When the situation was stable and the area was deemed safe, tourists arrived to see what was going on. The eruption was used as a prestige consumer object, with celebrity chefs using the still scorching hot lava to prepare barbecues, guided tours offering to see the eruption from close up, etc., giving Iceland's tourism a boost.

Everything changed when a new eruption began on the 14th of April, sending a column of ash high into the air. The consequent ash cloud covered the air, bringing with it the closure of most of the European airspace. Tourists all over the world cancelled their holidays in Iceland and booking numbers fell sharply. Iceland's image was deeply affected and the tourism destination was deemed unsafe and its future uncertain. Towards the end of May, after the eruption had ended, the Inspired by Iceland campaign worth 700 million ISK was announced to try and change the tourists' perception of the country and establish that it was now a safe destination (Benediktsson et al., 2010).

As depicted by the previous study cases, the tourism industry, although highly resilient, is "a fragile activity [...] highly vulnerable to external forces or shocks that, either temporarily or permanently, disrupt, decrease or divert tourist flows" (Pender and Sharpley, 2005: 278), if we add to this the vulnerabilities that characterize islands, the consequences can be devastating.

7. IMPLICATIONS FOR THE CANARY ISLANDS

In this section we will apply everything that we have learnt throughout this paper to the Canary Islands, stating what we do and do not know, and trying to understand the specific impacts that an oil spill could have on these islands.

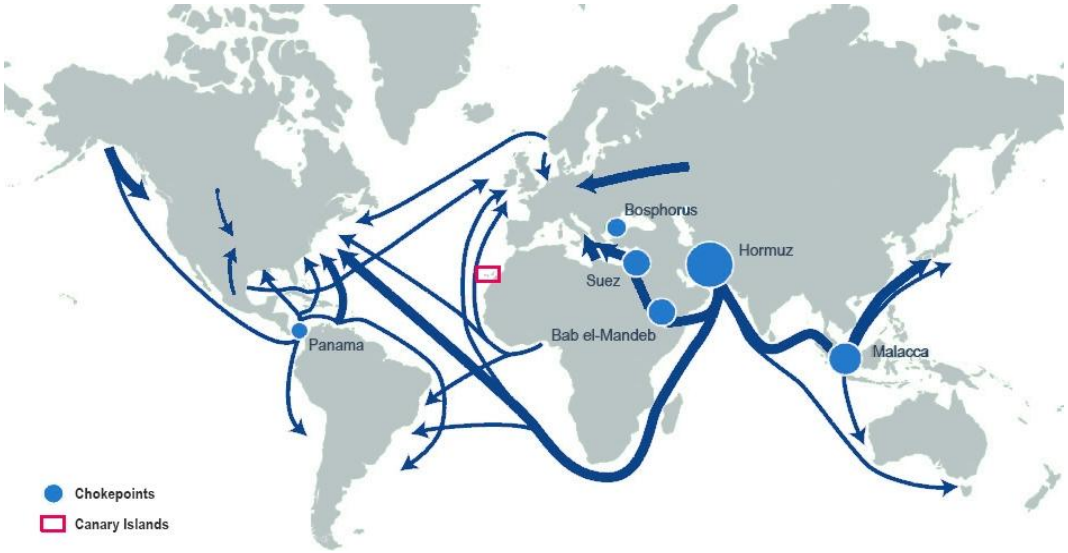
The economy of the Canary Islands, a Spanish archipelago located off of Africa's northwestern coast, is heavily dependent on tourism, with around 31.4% of its GDP being derived from tourism activity. The archipelago saw around fifteen million tourists in 2015 (ISTAC), which amounts to more than seven times its resident population. Even though the Canary Islands have long been a known tourist destination, part of this tourism influx can be attributed to recent events taking place in direct competing destinations, which in turn have incurred in market share losses due to being perceived as unsafe.

So why risk an oil spill that could have devastating effects on our main economic driver? Is oil really that necessary for the Canary Islands? The fact that we are heavily dependent on oil is clear if we keep in mind that in 2015 nearly 500 thousand tonnes of gasoline, 800 thousand tonnes of gasoil and a thousand tonnes of fuel oil were consumed in the Canary Islands (ISTAC). More than 90% of the energy consumed in the archipelago is derived from oil products. Furthermore, the islands are located in a country that imports 80% of the energy it requires (Red Eléctrica de España). Had the prospections been successful in finding quality and quantity oil deposits, Spain's government would have been indeed very happy.

So why study the potential effects of an oil spill in the Canary Islands if there is no oil to extract?

The archipelago is located at the confluence of two of the world's most important marine transport routes and is subject to intensive traffic of large oil tankers coming from and to the Persian Gulf when transporting oil between Asia and Europe. The number of vessels following this route has been estimated at 1,500 per year. Furthermore, not only are the Canary Islands are in a strategic point for vessels travelling between South America and Europe, but the island of Tenerife has a refinery which receives around 4 million tonnes of oil per year (MEPC, 2005).

Figure 4. Map of oil transportation routes



Source: Modified from the International Energy Agency

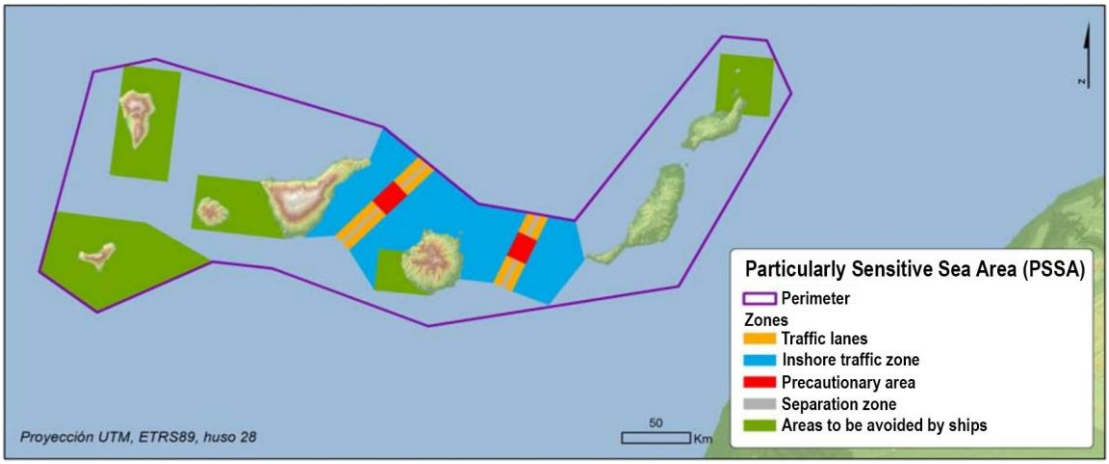
As the International Maritime Organization states, the Canary Islands, with an area of 7.5 thousand km^2, "contain more than 300 protected spaces, including four national parks, 7 rural parks, 11 integrated marine reserves, 15 special natural reserves, 2 marine reserves, 27 special bird protection areas, 3 islands declared biosphere reserves, 174 sites of Community interest, 11 natural parks, 19 sites of scientific interest, 51 natural monuments and 27 protected landscapes" (MEPC, 2005:3-4).

With surface area of 7,554 km² and a coastline of 1,540 km, the Canary Islands are home to a wide variety of threatened bird species, with some of them not being present in any other part of the world. The waters surrounding the archipelago, home to dolphins, whales and over 500 species of fish, offer unparalleled living conditions for no less than 20 cetaceous species, both those permanently living in these waters and those visiting for feeding or reproductive purposes. The unmatched conditions that the archipelago offers are the very reason why lute turtles have chosen the islands as the only place in the European Union where they lay their eggs (MEPC, 2005).

It is this very biodiversity, added to the wonderful climate and the beautiful landscapes, that attracts millions of tourists to the archipelago year after year.

The International Maritime Organization (IMO) stated that the ecological balance of the archipelago can be easily altered, since it generates high biodiversity but low biomass, being a fragile and delicate system. That is why, given the aforementioned high traffic of vessels and the other vulnerabilities that characterize the Canary Islands, the IMO declared the archipelago as a Particularly Sensitive Sea Area (PSSA) in 2005, introducing two traffic separation schemes of three miles of width, areas to be avoided, and the CANREP, a mandatory ship reporting system.

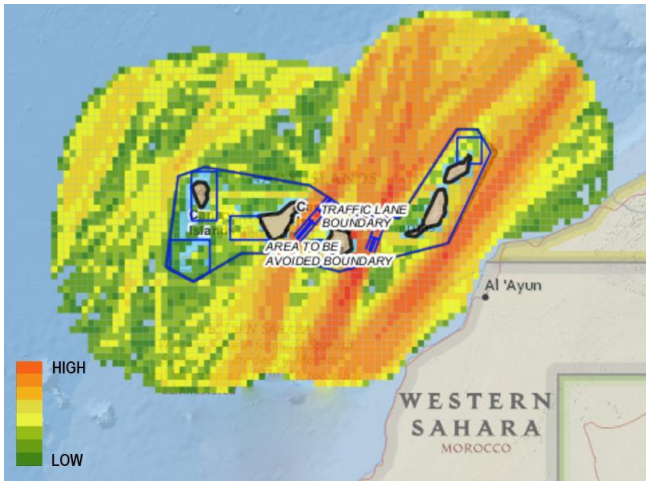
Figure 5. Canary Islands: Particularly Sensitive Sea Area



Source: Translated from the Spanish Ministry of Agriculture, Food and Environment (MAGRAMA, 2012)

From that moment on, vessels could only navigate legally through the Canary Islands using the designated traffic lanes, with the exception of vessels sailing to and from the islands. A heat map generated from the vessel traffic density can be seen in Figure 5. The rightmost lane is outside the maritime space regulated in the Canary Island PSSA designation.

Figure 6. Local shipping density heat map



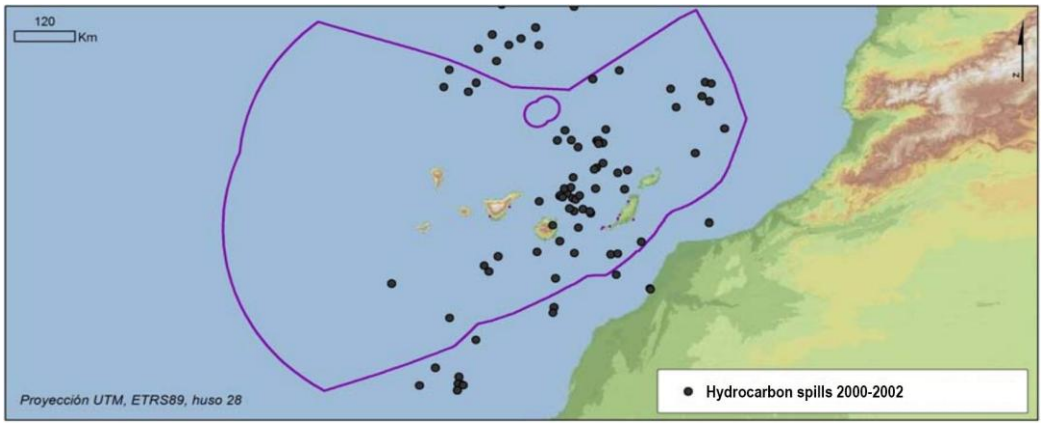
Source: International Maritime Organization

Even though we have ascertained that the risk of oil spills in the Canary Island is indeed very real, the specific impacts that a hypothetical spill would have in this specific case can still not be assessed. As we have stated several times throughout the paper, although the impacts to expect can somewhat be imagined based on previous experience, the specific impacts caused by an oil spill depend on a series of factors which are unknown until it becomes a reality. Oil type and concentration, frequency and duration of spill contact with the coast, time frame in relation to key seasons for the different sectors, location and characteristics of the area all play a major role in the aftermath of a spill (Stolzenbach et al., 1977; Findikakis and Papadimitrakis, 1998; Kirby and Law, 2010).

Location and characteristics of the area is the one fact that we do know, and, as we have stated, the Canary Islands have a very fragile ecosystem that would probably suffer a heavy hit, impacting fisheries, tourism, leisure activities and the economy in general. To what extent is a question that we cannot answer in this paper.

We should take this as a chance to reflect on the risks that the Canary Islands are facing and how our perception of the situation is majorly that of total safety. Does the threat really come only from the oil prospections?

Figure 7. Oil spills in the Canary Islands' marine demarcation. ERGOS 2000-2002.



Source: Translated from MAGRAMA, 2012

8. CONCLUSIONS

Tourism is a fragile but resilient industry, oil spills are a very real risk wherever oil is present, and they can have devastating consequences. As we have already stated, the magnitude of the consequences and the specific impacts on the environment and the economy cannot be asserted, since it depends on a plethora of factors, most of which we don't know until the spill happens.

Impacts to be expected of an oil spill in coastal tourism destinations include damages to tourism resources like beaches, coastal landscapes, marine ecosystems and biodiversity; impediments to water sports, recreational fishing and coastal area leisure activities in general; damages to accommodation businesses and restaurants; changes affecting intermediaries and transportation related businesses and an overall impact on the whole economy of the destination, both direct and derived from impacts on specific sectors.

Oil spills can have a particularly negative impact on the destination's image, affecting tourist perception through depiction in the media, needing great economic efforts to be corrected. However, spill induced visitors like cleaning crews and media personnel can have a positive impact on the short-term.

Furthermore, the economic impacts of oil spills are difficult to predict using past experiences as a guide, since the methodology used to estimate these impacts is not standardized, with each author measuring impacts in their own way, using different timeframes and including different impacts to measure the total cost.

In the specific case of the Canary Islands, we have ascertained that there is indeed a risk of oil spills in the archipelago coming mainly from their geographical location and the vessel traffic intensity, which in addition to the inherent vulnerability of islands in general could aggravate the impacts of a hypothetic oil spill.

9. REFERENCES

Advance Resources International. (1993). Economic Impacts of Oil Spills: Spill Unit Costs for Tankers, Pipelines, Refineries, and Offshore Facilities.

Benediktsson, K., Lund, K. A., & Huijbens, E. (2011). Inspired by eruptions? Eyjafjallajökull and Icelandic tourism. *Mobilities*, *6*(1), 77-84.

Bjarnason, H., Hotte, N., & Sumalia, R. (2015). Potential economic impact of a tanker spill on ocean-dependent activities in Vancouver, British Columbia. *Fisheries Economics Research Unit.*

Bonnieux, F., & Rainelli, P. (2004). Lost recreation and amenities: the Erika spill perspectives. Economic, Social and Environmental Effects of the Prestige Oil Spill. Santiago de Compostela, Spain: Consello da Cultura Galega, 139-186.

Briguglio, L., Archer, B., Jafari, J., & Wall, G. (1996). Sustainable tourism in small and island states: issues and policies. *London, Pinter*.

Britton, S. G. (1980). Tourism and economic vulnerability in small Pacific island states: the case of Fiji. In: The island states of the Pacific and Indian Oceans: anatomy of development. *Monograph, Development Studies Centre, Australian National University*, (23), 239-263.

Butler, R., & Fennell, D. (1994). The effects of North Sea oil development on the development of tourism: the case of the Shetland Isles. *Tourism Management*, *15*(5), 347-357.

Carlsen, J., & Butler, R. (2011). *Island Tourism: Towards a Sustainable Perspective* (J. Carlsen & R. Butler) (Vol. 8). CABI.

Centre of Documentation, Research and Experimentation on Accidental Water Pollution (Cedre). *Database of spill incidents and threats in waters around the world*. From http://wwz.cedre.fr/en/Our-resources/Spills

Chang, S. E., Stone, J., Demes, K., & Piscitelli, M. (2014). Consequences of oil spills: a review and framework for informing planning. *Ecology and Society*, *19*(2), 26.

Cheong, S. (2012). Fishing and tourism impacts in the aftermath of the Hebei-Spirit oil spill. *Journal of Coastal Research*, *28*(6), 1648-1653.

Croes, R. R. (2006). A paradigm shift to a new strategy for small island economies: Embracing demand side economics for value enhancement and long term economic stability. *Tourism Management*, *27*(3), 453-465.

D'Hauteserre, A. (2003). A response to 'Misguided policy initiatives in small-island destinations: why do upmarket tourism policies fail?' by Dimitri Ioannides and Briavel Holcomb. *Tourism Geographies*, *5*(1), 49-53.

De la Huz, R., Lastra, M., Junoy, J., Castellanos, C., & Vieitez, J. (2005). Biological impacts of oil pollution and cleaning in the intertidal zone of exposed sandy beaches: preliminary study of the "Prestige" oil spill. *Estuarine, Coastal and Shelf Science*, *65*(1), 19-29.

Dwyer, L. (2007). International handbook on the economics of tourism. Edward Elgar Publishing.

Edwards, R., & White, I. (1999). The Sea Empress oil spill: environmental impact and recovery. *International Oil Spill Conference*. American Petroleum Institute.

Faulkner, B. (2001). Towards a framework for tourism disaster management. *Tourism management*, *22*(2), 135-147.

Faulkner, B., & Vikulov, S. (2001). Katherine, washed out one day, back on track the next: A post-mortem of a tourism disaster. *Tourism Management*, *22*(4), 331-344.

Findikakis, A., Lav, A., & Papadimitrakis, Y. (1998). Assessment of the risk of shore contamination by offshore oil spills: model formulation. *WIT Transactions on Ecology and the Environment*, *27*.

Garza-Gil, M. D., Prada-Blanco, A., & Vázquez-Rodríguez, M. X. (2006). Estimating the short-term economic damages from the Prestige oil spill in the Galician fisheries and tourism. *Ecological Economics*, *58*(4), 842-849.

Garza, M. D., Prada, A., Varela, M., & Rodríguez, M. X. V. (2009). Indirect assessment of economic damages from the Prestige oil spill: consequences for liability and risk prevention. *Disasters*, *33*(1), 95-109.

Goldberg, V. P. (1994). Recovery for Economic Loss following the Exxon "Valdez" Oil Spill. *The Journal of Legal Studies*, *23*(1), 1-39.

Goodlad, J. (1996). Effects of the Braer oil spill on the Shetland seafood industry. *Science of the total environment*, *186*(1), 127-133.

Greater New Orleans, Inc. (2011). A study of the economic impact of the Deepwater Horizon oil spill. *GNO. Inc.*

Grey, C. J. (1999). The cost of oil spills from tankers: an analysis of IOPC fund incidents. *International Oil Spill Conference*. American Petroleum Institute.

Guterman, L. (2009). Exxon valdez turns 20. *Science*, *323*(5921), 1558-1559.

Harris, C. (1997). The Sea Empress incident: overview and response at sea. *International Oil Spill Conference*. American Petroleum Institute.

Harrison, D. (2003). Themes in Pacific island tourism. *Pacific island tourism*, 1-23.

Hayworth, J., Clement, T., & Valentine, J. (2011). Deepwater Horizon oil spill impacts on Alabama beaches. *Hydrology and Earth System Sciences*, *15*(12), 3639.

Henderson, J. C. (2007). Tourism crises: causes, consequences and management. Routledge.

Hill, S., & Bryan, J. (1997). The economic impact of the Sea Empress spillage. *International Oil Spill Conference*. American Petroleum Institute.

Hoti, S., McAleer, M., & Shareef, R. (2005). Modelling country risk and uncertainty in small island tourism economies. *Tourism Economics*, *11*(2), 159-183.

Huijer, K. (2005). Trends in oil spills from tanker ships 1995-2004. *International Tanker Owners Pollution Federation (ITOPF), London*, *30*.

Hunt ,J. D. (1975). Image as a factor in tourism development. *Journal of travel research*, *13*(3), 1-7.

International Association of Oil & Gas Producers (IPIECA). (2015). Economic assessment and compensation for marine oil releases. Good practice guidelines for incident management and emergency response personnel.

International Oil Pollution Compensation Funds. Publications. From http://www.iopcfunds.org/publications/

International Tanker Owner Pollution Federation (ITOPF). GIS Case Studies. From http://www.itopf.com/knowledge-resources/data-statistics/gis/gis-case-studies/

Jacobsson, M. (2007). The International oil pollution compensation funds and the international regime of compensation for oil pollution damage. *Pollution of the Sea—Prevention and Compensation*, 137-150.

Jefferson, J., & Bowling, N. (2011). The Economic and Biological Impacts of The BP Oil Spill.

Kirby, M. F., & Law, R. J. (2010). Accidental spills at sea–Risk, impact, mitigation and the need for co-ordinated post-incident monitoring. *Marine pollution bulletin*, *60*(6), 797-803.

Knowland Group. (2010). The Gulf Coast oil spill and the hospitality industry. *McLean, Virginia: The Knowland Group.*

Law, R., & Campbell, J. (1998). The effects of oil and chemical spillages at sea. *Water and Environment Journal*, *12*(4), 245-249.

Lee, Y., & Garza-Gomez, X. (2012). Total cost of the 2010 deepwater horizon oil spill reflected in US stock market. *Journal of Accounting and Finance*, *12*(1), 73-83.

Liu, X., & Wirtz, K. W. (2006). Total oil spill costs and compensations. *Maritime Policy & Management*, *33*(1), 49-60.

Loughlin, T. R. (1994). Tissue hydrocarbon levels and the number of cetaceans found dead after the spill. *Marine mammals and the Exxon Valdez*, 359-370.

Loughlin, T. R. (2013). *Marine mammals and the Exxon Valdez* (T. R. Loughlin). Academic Press.

Loureiro, M. L., Loomis, J. B., & Vázquez, M. X. (2009). Economic valuation of environmental damages due to the Prestige oil spill in Spain. *Environmental and Resource Economics*, *44*(4), 537-553.

MacNulty, M. (2002). The role of government in successful island tourism. The economic impact of tourism in the islands of Asia and the Pacific. A Report on the WTO International Conference on Tourism and Island Economies, Jeju City, Jeju Province, Republic of Korea, 13-15 June 2001. World Tourism Organization.

Marine Environmental Protection Committee (MEPC). (2005). Designation of the canary islands as a particularly sensitive sea area. Resolution MEPC.134(53).

Market Dynamics Research Group. (2010). Oil spill survey research report. Wave 1. *Louisiana Office of Tourism.*

McDowell Group. (1990). An Assessment of the Impact of the Exxon Valdez Oil Spill on the Alaska Tourism Industry.

Milne, S. (1997). Tourism, dependency and South Pacific microstates, beyond the vicious cycle?. *Island Tourism, trends and prospects*, 281-301.

Ministry of Agriculture, Food and Environment (Ministerio de Agricultura, Alimentación y Medio Ambiente, MAGRAMA). (2012). Estrategia marina demarcación marina canaria evaluación inicial. Parte II: Análisis de presiones e impactos.

Morales-Caselles, C., Kalman, J., Riba, I., & DelValls, T. (2007). Comparing sediment quality in Spanish littoral areas affected by acute (Prestige, 2002) and chronic (Bay of Algeciras) oil spills. *Environmental Pollution*, *146*(1), 233-240.

Ocean Studies Board & Marine Board. (2003). *Oil in the sea III: inputs, fates, and effects*. National Academies Press.

Oxford Economics. (2010). Potential impact of the Gulf oil spill on tourism. *Prepared for the US Travel Association*.

Pelling, M., & Uitto, J. I. (2001). Small island developing states: natural disaster vulnerability and global change. *Global Environmental Change Part B: Environmental Hazards*, *3*(2), 49-62.

Pender, L., & Sharpley, R. (2005). *The management of tourism*. Sage.

Pennington-Gray, L., London, B., Cahyanto, I. & Klages, W. (2011). Expanding the tourism crisis management planning framework to include social media: Lessons from the Deepwater Horizon Oil Spill 2010. *International Journal of Tourism Anthropology*, *1*(3-4), 239-253.

Peterson, C. H. (2001). The "Exxon Valdez" oil spill in Alaska: acute, indirect and chronic effects on the ecosystem. *Advances in Marine Biology*, *39*, 1-103.

Peterson, C. H., Rice, S. D., Short, J. W., Esler, D., Bodkin, J. L., Ballachey, B. E., Irons, D.B. (2003). Long-term ecosystem response to the Exxon Valdez oil spill. *Science*, *302*(5653), 2082-2086.

Pforr, C., & Hosie, P. (2009). *Crisis management in the tourism industry: beating the odds?* (C. Pforr & P. Hosie). Ashgate Publishing, Ltd.

Pike, S., & Ryan, C. (2004). Destination positioning analysis through a comparison of cognitive, affective, and conative perceptions. *Journal of travel research*, *42*(4), 333-342.

Purnell, K. J. (1999). Comparative Costs of Low-Technology Shoreline Cleaning Methods 1. *International Oil Spill Conference*. American Petroleum Institute.

Ramseur, J. L.(2015). Deepwater Horizon oil spill: Recent activities and ongoing developments. *Congressional Research Service. April*, *17*, 2015.

Ritchie, B. W. (2009, May 15). *Crisis and disaster management for tourism*. Bristol: Channel View Publications.

Ritchie, B. W., Crotts, J. C., Zehrer, A., & Volsky, G. T. (2013). Understanding the effects of a tourism crisis: the impact of the BP oil spill on regional lodging demand. *Journal of Travel Research*, 0047287513482775.

Ronza, A., Félez, S., Darbra, R., Carol, S., Vílchez, J., & Casal, J. (2003). Predicting the frequency of accidents in port areas by developing event trees from historical analysis. *Journal of loss prevention in the process industries*, *16*(6), 551-560.

Sánchez, F., Velasco, F., Cartes, J. E., Olaso, I., Preciado, I., Fanelli, E. et al. (2006). Monitoring the Prestige oil spill impacts on some key species of the Northern Iberian shelf. *Marine Pollution Bulletin*, *53*(5), 332-349.

Scheyvens, R., & Momsen, J. (2008). Tourism in small island states: From vulnerability to strengths. *Journal of sustainable tourism*, *16*(5), 491-510.

Scheyvens, R., & Momsen, J. H. (2008). Tourism and poverty reduction: issues for small island states. *Tourism Geographies*, *10*(1), 22-41.

Short, J. W., Irvine, G. V., Mann, D. H., Maselko, J. M., Pella, J. J., Lindeberg, M. R. et al. (2007). Slightly weathered Exxon Valdez oil persists in Gulf of Alaska beach sediments after 16 years. *Environmental Science & Technology*, *41*(4), 1245-1250.

Sigam, C., & Garcia, L. (2012). Extractive industries: Optimizing value retention in host countries. UNCTAD.

Smith, L. C., Smith, M., & Ashcroft, P. (2011). Analysis of environmental and economic damages from British Petroleum's Deepwater Horizon oil spill. *Albany Law Review*, *74*(1), 563-585.

Sönmez, S. F., Apostolopoulos, Y., & Tarlow, P. (1999). Tourism in crisis: Managing the effects of terrorism. *Journal of Travel Research*, *38*(1), 13-18.

Stimeling, T. D. (2014). Music, Place, and Gulf Coast Tourism since the BP Oil Spill. *Music and Politics*, *8*(2).

Stolzenbach, K. D., Madsen, O. S., Adams, E. E., Pollack, A. M., & Copper, C. (1977). Review and evaluation of basic techniques for predicting the behavior of surface oil slicks.

Sumaila, U. R., Cisneros-Montemayor, A. M., Dyck, A., Huang, L., Cheung, W., Jacquet, J. et al. (2012). Impact of the Deepwater Horizon well blowout on the economics of US Gulf fisheries. *Canadian Journal of Fisheries and Aquatic Sciences*, *69*(3), 499-510.

Tarlow, P. (2005). Dark Tourism. Novelli, M.(edited) Niche tourism: Contemporary issues, trends and cases. 47-58.

Tourism Economics. (2011). The Impact of the BP Oil Spill on Visitor Spending in Louisiana. *Prepared for the Louisiana Office of Tourism*.

Turvey, R. (2007). Vulnerability assessment of developing countries: the case of small-island developing states. *Development Policy Review*, *25*(2), 243-264.

Whitfield, J. (2003). How to clean a beach. *Nature*, *422*(6931), 464-466.

Wilkinson, P. F. (1989). Strategies for tourism in island microstates. *Annals of tourism research*, *16*(2), 153-177.

Williams, A., Layton-Brown, M., Conneely, M., & Morgan, R. (2014). A very unusual 'groin', the MV River Princess, Goa, India and its impacts upon tourism. *Journal of Coastal Conservation*, *18*(3), 221-226.

10. ANNEX

Table of main international accidental spills in the last 30 years (offshore & inshore)

	Year	Oil spilled		Location	Studies on economic impact
		Type	Kt		
Odyssey	1988	Crude oil	132	Nova Scotia, Canada	*
Exxon Valdez	1989	Crude oil	39	Prince William Sound, Alaska, USA	YES
Khark 5	1989	Crude oil	70	Canary Islands, Spain	*
Aragon	1989	Crude oil	25	Madeira, Portugal	*
Haven	1991	Crude oil	144	Genoa, Italy	*
ABT Summer	1991	Crude oil	50	Angola	*
Aegean Sea	1992	Crude oil	67	Galicia, Spain	*
Katina P	1992	Crude oil	67	Maputo Bay, Mozambique	*
Braer	1993	Crude oil	85	Shetland Islands, Scotland	YES
Sea Empress	1996	Crude oil	73	Milford Haven, UK	YES
Erika	1999	Fuel oil	20	Bay of Biscay, France	YES
Prestige	2002	Fuel oil	64	Galicia, Spain	YES
Hebei Spirit	2007	Crude oil	10	Incheon Port, Korea	YES
Deepwater Horizon	2010	Crude oil	672	Gulf of Mexico, USA	YES

Data on incidents extracted from the Centre of Documentation, Research and Experimentation on Accidental Water Pollution (Cedre) Database.

*No literature on the specific incident or no accessible data about economic impacts found.