Environmental management of offshore oil development and maritime oil transport

A background document for stakeholders of the West African Marine Eco Region

by

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However, responsibility for the contents and for the opinions expressed in this paper are those of the authors.

The authors would be pleased to receive any comment about the content and opinions expressed in this paper and on suggestions for how future editions could be strengthened. Please send comments to srkloff@hotmail.com and clive.wicks@wicksfamily.plus.com.

II Executive Summary

In 2001 Oil was discovered in the West African marine and coastal eco system. This ecosystem includes the marine systems of six countries: Mauritania, Senegal, Gambia, Guinea Bissau, Guinea and Cape Verde and spans 3,500 kms of coast. Among its most striking features are the unique coastal wetlands and the up-welling of deep nutrient-rich ocean water to the surface that support one of the most diverse and economically important fishing zones in the world. The fact that many marine species pass different phases of their life cycles in the waters of the six countries underscores the need to understand and manage the eco-region as a whole.

Fisheries in this ecosystem generate some 500 million Euros annually, which makes it currently the single most important source of foreign exchange in the region and a key source of revenue for economic and social development. More than 10 million people live along the coast and over 600,000 men and women depend directly on fishing and fisheries related industries. Coastal Tourism is also becoming an increasingly important economic activity.

Oil can produce vital income for the countries in the region but the history of oil in Africa has been fraught with problems as identified by the World Banks Extractive Industries Review (EIR), which has highlighted the social and environment problems. Other marine and coastal ecosystems have been damaged by oil activities in the region, including the Niger Delta in Nigeria.

This report provides an overview of oil and gas development worldwide, the West African regional situation and National Energy and Sustainable Development plans. Insight is given into the environmental impacts of offshore oil development and maritime oil transport. This is followed by an overview of regulatory frameworks. It is argued that virtually all aspects related to maritime oil transport are covered by International law, but that there are considerable loopholes in the international legal framework for offshore oil development. Many countries already engaging in offshore oil extraction have developed their own national or regional laws and standards.

The authors recommend the governments of the West African marine and coastal eco-region adopt the concept of a comprehensive regional convention for offshore oil development. This convention should reflect the specific needs of the region and the vulnerability of the local ecosystem. Involving a large range of stakeholders will be critical to establish regional standards. A citizen council in which representatives of key stakeholders are united may provide governments with a workable framework for effective stakeholder consultation.

No final policy recommendations will be presented in this report. Instead the authors provide a selection of important building blocks that are essential to create an environmentally sound legal framework for offshore oil development. The ultimate purpose of this report is to inspire policymakers, those who wish to influence policy as well as other stakeholders in the region to initiate a dynamic on going policymaking process aimed at preserving the marine environment while engaging in oil exploitation.

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PART 1. Background to oil and gas development

This part gives an overview of oil and gas development worldwide, the West African regional situation and national energy and sustainable development plans.

Oil production facility

Oil spill fire in the Niger Delta, Nigeria
(Photo: Urhobo Historical Society)

1.1 Oil and Gas Exploitation Worldwide

Oil and gas extraction create most of the energy and resources needed to run our society. They also result in a range of present and future environmental and social costs, both direct and indirect, which need to be balanced against the benefits they bring.

The world is highly dependent on oil – it powers transport, heats and cools buildings, creates industrial and domestic chemicals and provides the feedstock for many materials and clothing. Transport uses 60 per cent of oil production, mostly to fuel cars and trucks. Oil is a non-renewable resource that is used at a rate of 100 million barrels a day at present and some estimates are that this will double by 2025. Other estimates, by some of the Industry's own geologists are that by 2025 there will be severe shortages of oil and gas as reservoirs are depleted. Already oil wells in Texas and the North Sea are drying up (BBC documentary "The Last Oil shock").

The oil and gas industry impacts on people and the environment in three ways; through climate change, operations on land and at sea and through positive or negative impacts on National economies. Unregulated actions by the oil industry destroy habitats and damage biodiversity. Oil spills at sea have damaged mangrove forests, coral reefs and fisheries, both through major accidents and regular leakage from tankers, loading buoys and drilling rigs and platforms. Transport of oil is also implicated in ecological damage: for example, there were an estimated 16,000 spills during the construction of the Trans-Alaskan pipeline (in: Dudley and Stolton, 2002). Oil tanker accidents are other well-known examples of ecological disasters that can have long-term effects.

The extractive industries have often failed to make a contribution to sustainable development and to protect the environment adequately. The industry is considered by many civil society organisations to have contributed to corruption, pollution and civil disturbance - including wars - in a number of countries, notably in Africa.

In response to this, in 2000 the World Bank Group launched the Extractive Industries Review (EIR) to discuss its future role in these industries with concerned stakeholders. Dr Emil Salim, a distinguished scientist and former Environmental Minister in the Indonesian Government, was asked to chair the review. He presented his report in 2004 (World Bank, 2004).

Dr. Salim summarises the EIR in an editorial, "World Bank must reform on extractive industries" that appeared on 16 June 2004 in the UK Financial Times:

"*Not only have the oil, gas and mining industries not helped the poorest people in developing countries, they have often made them worse off. Scores of recent academic studies and many of the bank's own studies confirmed our findings that countries which rely primarily on extractive industries tend to have higher levels of poverty, child morbidity and mortality, civil war, corruption and totalitarianism than those with more diversified economies. Does this mean extractive industries can never play a positive role in a nation's economy? No, it simply means that the only evidence of such a positive role we could find took place after a country's democratic governance had developed to such a degree that the poorest could see some of the benefits. Before the fundamental building blocks of good governance – a free press, a functioning judiciary, respect for human rights, free and fair elections and so on - are put in place, the development of these industries only aggravates the situation for the poorest*" (Extracts from editorial)

International and National efforts have been made to help resolve the problems with the Industry. These include the UN Convention on Corruption, the Extractive Industries Transparency Initiative (EITI), the OECD Guidelines for Multi National Companies and the World Bank Groups Guidelines for financing projects. Governments have been asked to sign the International Conventions and to insist that companies sign and respect the EITI or similar initiatives

1.1.1 Oil extraction in Africa

- In the 1960's Africa produced 10 million tonnes of oil per year;
- Today, Africa produces 376.4 million tonnes of oil per year, 10.6 % of world oil production;
- The quality of the West African Crude Oil is excellent;
- Between 2003-2012 production is predicted to exceed 20 billion barrels, worth at least $500 billion (and possibly $1,000 billion if current $50/barrel prices continue). 80% will come from Nigeria and Angola.
- The USA wants to get 25% of its energy from Africa by 2015 in order to reduce dependence on more politically volatile states;
- China may become a big competitor for African oil and start dealing directly with African governments. China is already involved in oil extraction in Sudan;
- The rush for oil is causing/contributing to conflicts in many parts of West Africa;
- Oil is being stolen from Nigeria at a massive rate and mafia and terrorist groups are believed to be involved;
- Disaffected rebels challenge governments and use money from stolen oil to purchase arms;
- Corruption is a major issue: easily earned money invites "rent seekers" behaviour;
- Fraud and corruption spread from Oil and Gas to other sectors;
- Companies are moving from Asia to Africa because they can get a better deal from African governments. The cost of licences and share of profits with governments is better for the companies than in Asia.

The UN Secretary General was concerned about the situation in West Africa and has appointed a Special Representative for the Region. The Special Representative presented some of the critical issues associated with oil and gas development at a meeting in London in 2004. (Details are shown in his draft Power Point Presentation, available from the authors).

Tensions are caused by

- Scramble for highly priced oil in the region;
- Delimitation and demarcation of inherited boundaries particularly marine boundaries;
- Corrupt practices and lack of transparency;
- States are weakened by over-dependence on oil (Dutch Disease/Paradox of Plenty).

Disputes are occurring at many levels

- Between States on delimitations of land borders and maritime boundaries;
- Between governments and oil companies on contracts and revenues;
- Between governments and their populations on revenues and redistribution;
- Within countries between local authorities and tribal groups over rights (before oil was found, these communities lived relatively peacefully together);
- Disputes between oil companies.

Territorial Claims on land but mainly on Marine boundaries

- Gabon and Equatorial Guinea;
- Nigeria and Equatorial Guinea;
- Nigeria and Sao Tome and Principe;
- Sudan oil found in conflict areas.

The UN is trying to resolve/solve disputes

- Through government channels;
- Arbitration;
- Negotiation (Cameroon Nigeria Mixed Commission etc);
- Sharing oil revenue: e.g. Nigeria splits oil revenues from a disputed Marine oil field with Equatorial Guinea.

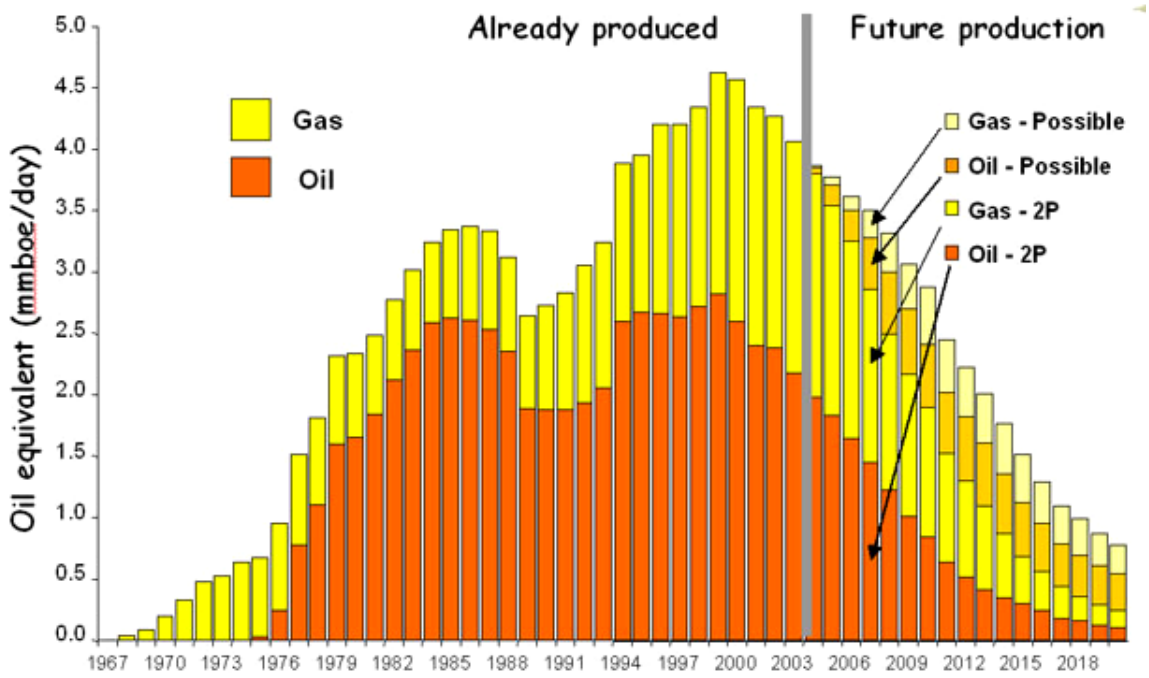
Transparency in dealings with the Oil Industry will help to reduce tensions but will only succeed with external support

- Companies to publish what they pay;
- Local Government to inform public on how the oil revenue is used;
- Transparency to favour development projects which benefit all;
- The use of transparency should help ensure oil revenues benefit countries;
- It should support democratic reforms in producer countries thereby minimising risks of wars and increase stability in oil producing regions.

The oil industries are moving into remote, fragile ecosystems and areas of unique biodiversity where governments often have limited capacity to protect the environment, other economic activities or the people who live there. Most of the increased oil and gas production in West Africa will be from offshore wells situated in sensitive marine environments, which are critical for human and economic survival.

1.1.2 Oil and Gas - a Short Period of History for the United Kingdom (UK)

Oil and Gas are finite resources and even large offshore fields such as the UK's North Sea Oil fields can be depleted very quickly. The Department of Trade and Industry (DTI) recently published a graph showing that by the year 2020 it will be more or less all over.



The West African offshore oil and gas fields are considered to be much smaller than UK's North Sea fields and they can therefore be depleted even more rapidly - perhaps in 8 to 15 years. It is therefore vital that the National economies stay diversified and do not become overly dependant on oil revenues (Dutch disease). The development of renewable sources of energy should keep pace with extraction rates. It is advisable that governments make similar estimations of their offshore potential like the UK has done in the graph above. Such graphs could be used to assist decision-making prior to licensing exploitation rights. It could help governments to measure the economic benefits of offshore oil extraction against the potential risks and the environmental/socio-economic costs involved.

1.2 Management frameworks for minimising environmental damage

The international recommendation is that plans for oil and gas exploitation and plans to protect the marine environment should be developed within the context of National sustainability strategies as recommended at both the Rio (1992) and Johannesburg (2002) World Summits on Sustainable Development (WSSD) (See Annex 1).

Oil and gas are finite resources but they can contribute to national sustainability within national energy/renewable energy strategies.

1.2.1 Strategic Environmental Assessment (SEA)

One way of helping to develop National Strategies for the oil and Gas and marine sectors is to carry out a Strategic Environmental Assessment (SEA). SEAs are recommended by the World Bank group, the European Union and many other organisations including the Extractive Industries Review.

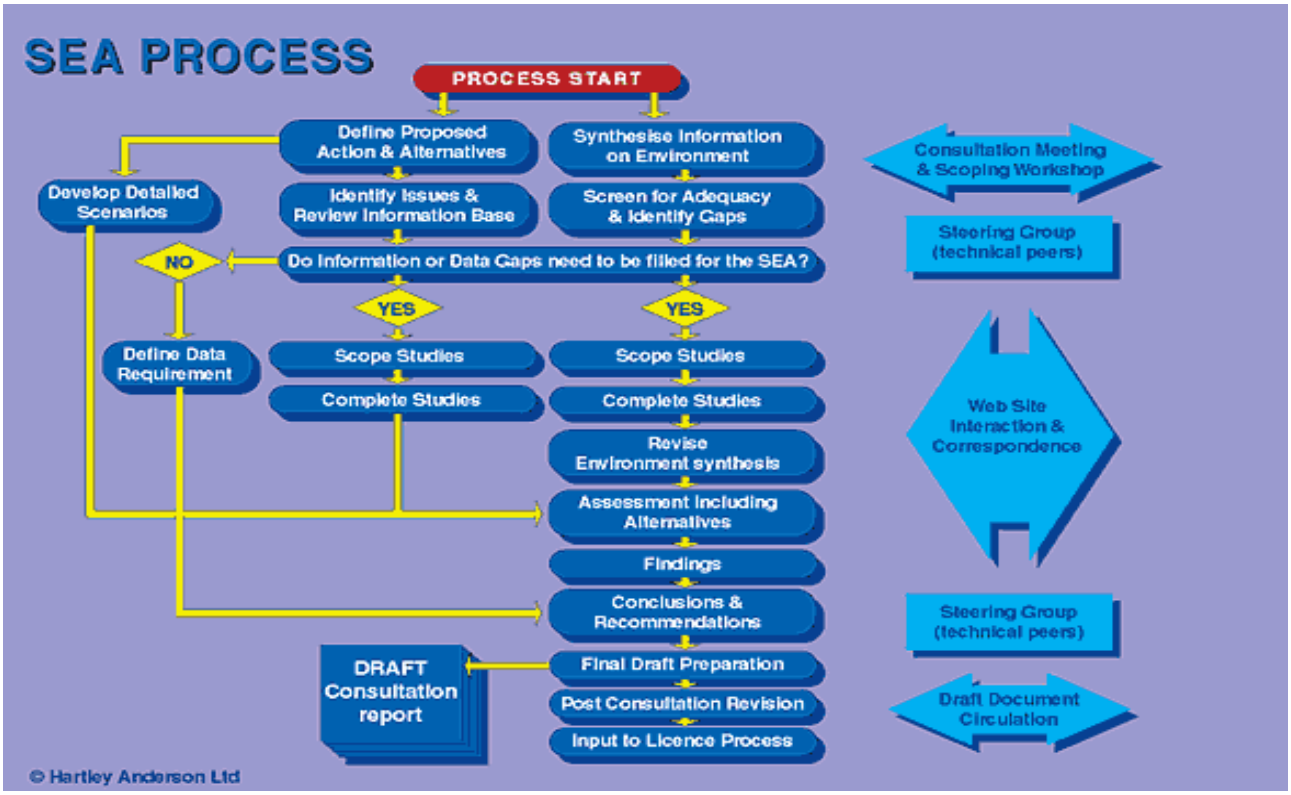
The Extractive Industry Review (EIR) commissioned by the World Bank Group (WBG) recommends that impact assessments preceding development should take into account multiple aspects (environmental, socio-economic) and should be broad-based. The impact assessments should identify cumulative impacts of projects and socio-economic linkages to environmental issues. Social impacts should be fully identified, including health impacts and project's effects on vulnerable groups. The report recommends furthermore that WBG should not finance any oil, gas, or mining projects or activities that might affect current official protected areas or critical natural habitat or areas that officials plan to designate in the future as protected. Any extractive industry projects financed within a known "biological hot spot" must undergo additional alternative development studies. Clear "no-go" zones for oil, gas, and mining projects should be adopted, according to the EIR, on the basis of this policy. Implementation of these zones can only be done by governments.

Countries like Canada, New Zealand and Argentina use cartographic systems to illustrate the ecological vulnerability and economic value of different areas on the continental shelf to assist decision-making. Areas with high ecological, recreational, cultural values or areas that are critical for fisheries such as reproduction zones are declared as no-go zones for the offshore oil industry (Patin, 1999).

The UK carries out a SEA of its continental shelf. This is designed for predicting and evaluating the environmental implications of a policy, plan or programme. A SEA is conducted at a strategic level - this is in contrast to Environmental Impact Assessment (EIA) which is carried out for a specific development or activity. The SEA will look at the individual impacts and also at the cumulative impacts on both the environment and socio-economic structures. Before oil development proceeds in the UK, the Department of Trade and Industry (DTI), responsible for offshore oil development, consults the full range of stakeholders in order to identify areas of concern and establish best environmental practice. The stakeholders involved with the Oil & Gas SEAs include the general public, Non Governmental Organisations (NGOs) (such as the Royal Society for the Protection of Birds and the Worldwide Fund for Nature (WWF)), local authorities, government agencies (e.g. the Joint Nature Conservation Committee), experts in the field (universities, commercial consultants etc,) the industries wishing to undertake the development and other marine industries such as the fishery sector (UK-Department of Trade and Industry: DTI: website).

DTI is proposing to follow the process illustrated in the flow chart below for subsequent pre-licensing of offshore development blocks. A key early step is a Strategic Environmental Assessment (SEA) scoping exercise to obtain external input to help define:

- The issues and concerns that the SEA should address;
- Key information sources and perceived gaps in understanding of the natural environment;
- Key information sources and perceived gaps in understanding of the effects of the activities that would result from oil and gas licensing.



1.2.2 Environmental Management System

It is recommended that the SEA is followed by the development of an Environmental Management System (EMS) for the project, into which the Environmental and Social Impact Assessment (ESIA) is incorporated. The EMS sets the standards for all the other studies and monitoring programmes. The EIA and Social studies should then be carried out together in compliance with International Norms and World Summit for Sustainable Development recommendations.

1.2.3 Espoo Convention

Many international financial institutions (IFIs), including the European Bank for Reconstruction and Development (EBRD Environmental Policy, Annex 2, Para. 3.10) require that, when there is a risk of transboundary impacts, notification and consultations must be done in accordance with the guidelines in the working papers to the United Nations Economic Commission for Europe (UNECE) *Espoo Convention on EIA in a Transboundary Context.* This would require consultation with all the countries likely to be affected by an oil spill or other activities.

1.2.4 Aarhus Convention

The European Bank for Reconstruction and Development and other IFIs also take guidance from the principles of the UNECE *Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters* (Aarhus Convention). Full and informed consultations would need to be carried out with all the stakeholders before projects are approved.

1.3 The West African Marine Eco Region – *For Millions Fishing is Life*

The West African Marine Eco Region (Mauritania, Senegal, Gambia, Guinea Bissau, Guinea and Cape Verde) cover an area of more than 1.5 million sq. km and have a population of over 22 million. An estimated 60% of this population lives within the coastal zone. The 3500 kms long coastline is made up of a wide variety of habitats, from rocky cliffs, broad sand beaches, and extensive sea grass prairies in the North to dense mangrove forests in the South (PRCM, 2000). Every year, these beautiful landscapes attract an important number of tourists to the region. The majority go to Gambia, Senegal and Cape Verde to spend their holidays in luxurious beach resorts. Numerous tourists also visit the nearby coastal nature reserves, like the mangrove forests of the Sine Saloum in Senegal, the Tanji River Bird Reserve in Gambia and the corals around the Cape Verdian island of Sal. The Bijagos archipelagos of Guinea Bissau, the islands of Los in Guinea and the Banc d'Arguin and Diawling National Parks in Mauritania also have great potential to become important tourist attractions.

Small motorised boats used by many local fishermen in West Africa (Photo: Paul Siegel)

Today, fisheries represent the largest economic sector in the region. The coastal waters are one of the richest fishing grounds in the world, thanks to the trade winds that push nutrient poor surface water away from the coast and draw cold, nutrient-rich waters from deep in the ocean up to the surface. The combination of bright sunlight and up-welling water results in an explosion of algal growth, which forms the foundation of an extremely productive food chain (Wolff, et al., 1993; PRCM, 2000; Samb and Demarcq, 1989). Over 600,000 jobs are directly related to the fishery industry. Local fishermen operate small-motorised boats and fish in the coastal zone area, while large foreign industrial trawlers exploit the marine resources further offshore. Fishing licences sold to the foreign fleet contribute significantly to the State revenues of notably Senegal and Mauritania. Fisheries in the whole region generate some 500

million Euros annually, which makes it currently the single most important source of foreign exchange and a key source of revenue for economic and social development (PRCM, 2000). However, the carrying capacity of this rich marine ecosystem is put under a lot of pressure by the fishing industry. Of twenty-two commercial fish species analysed in the region, five are classified as over-exploited and at least one is at risk of extinction (FAO, 2004; Bours, 2004).

It is against this precarious background that offshore oil exploitation is introduced in the marine environment. The Australian energy company Woodside discovered the *Chinguetti* field in 2001, the first commercially exploitable oil field situated off the Mauritanian coast. The British oil company Premier has also opened up an office in Guinea Bissau after having success with its offshore *Sinape* oil well. These discoveries attracted a lot of attention to the potential environmental impacts of offshore oil extraction in the region. Public debate revolved around marine pollution and focussed especially on the compatibility of this new economic activity with the existing economy based mainly on fishery resources and partly on tourism. Risks arising from present and future maritime traffic surfaced during these discussions as well. Every year some 400-500 million tonnes of crude oil and refined products, from notably Nigeria, Gabon and Angola, transit the East Atlantic sea route along the West African coast (UNEP, 2002). An accident with one of these vessels could cause a major oil spill. With offshore oil development many more vessels will navigate the continental shelf to load oil from future production platforms.

The West African Marine Eco Region faces an important public policy challenge. Policymakers need to make sure that the great expectations arising from offshore oil are fulfilled and not followed by great disappointment. Worst case scenarios, such as large oil spills, or unregulated long-term chronic pollution which will slowly deteriorate the marine ecosystem and end in the collapse of tourism and fisheries, need to be prevented. Tourism and especially the fishing industry can also have negative impacts on the regional environment, but both these economic activities have the potential to be long-term and sustainable. The oil industry will however only contribute to the regional economy during a limited amount of time - the first commercially exploitable oil field discovered off the Mauritanian coast has an expected lifetime between 8 to 15 years (Woodside, 2002).

Mauritania will start exploiting oil in 2005/2006 and identified the need to install an environmentally sound legal framework for offshore oil development. The International Maritime Organisation (IMO) responded and provided technical advice during the formulation of a proposed law, which covers offshore oil exploitation as well as maritime oil transport. The proposal was presented at a workshop in June 2004 and was attended by people with a stake in the marine environment. In addition to IMO´s efforts, this report will provide policymakers, stakeholders and those who wish to influence policy in the region, with further background information.

PART 2. Marine pollution

This section contains information on current and future sources of marine pollution in the region and outlines direct and potentially negative ecological consequences of maritime oil transport and offshore oil extraction.

Blowout of exploratory well Ixtox 1 in 1979 in Mexico (Photo: NOAA)

Accident with Prestige off the Spanish coast 2002

Oil pollution in Saudi Arabia, Gulf War 1991 (Photo: Research Planning, Inc)

2.1 Sources of marine pollution in the region

2.1.1 Land-based pollution

Although the focus of this report is on oil exploitation and maritime traffic, it is also important to mention marine pollution arising from land-based sources. On a global scale it is generally recognised that marine pollution is mainly caused by human activities based on land and much less by human activity taking place at sea (GESAMP, 1999).

Land-based pollution of the coastal and marine areas is also a growing problem in the West African Marine Eco Region. The economies have diversified and large industries have been set up. Main sources of pollution are breweries, textile industries, tanneries, refineries, and edible oil manufacturing. Their wastewaters carry numerous and different pollutants that frequently end up in the marine environment. Also untreated sewage water and household garbage produced by fast expanding urban areas are increasingly polluting the coastline and the sea. Land-based pollution is likely to get worse with growing populations and rising economic pressures to expand industrial operations (UNEP, 2002).

Agricultural pollution is another widespread problem in the region. Chemical residues, fertilizers and soil are washed by rivers into the Atlantic Ocean. This causes eutrophication (over-enrichment with nutrients) in coastal wetlands and estuaries, resulting in biodiversity loss and presumably in the proliferation of toxic marine micro algae (GESAMP, 1999).

2.1.2 Maritime traffic in the region

However, a significant amount of marine pollution, certainly oil pollution, is caused by human activities taking place at sea. The best-known example is maritime traffic. Maritime traffic in the region mainly consists of dry bulk vessels, but numerous oil tankers also navigate off the coast (Woodside, 2002). Every year some 400-500 million tonnes of crude oil and refined products are transported, from notably Nigeria, Gabon and Angola, to countries in Europe and the United States (UNEP, 2004). The main global trade routes of hydrocarbons are illustrated below.

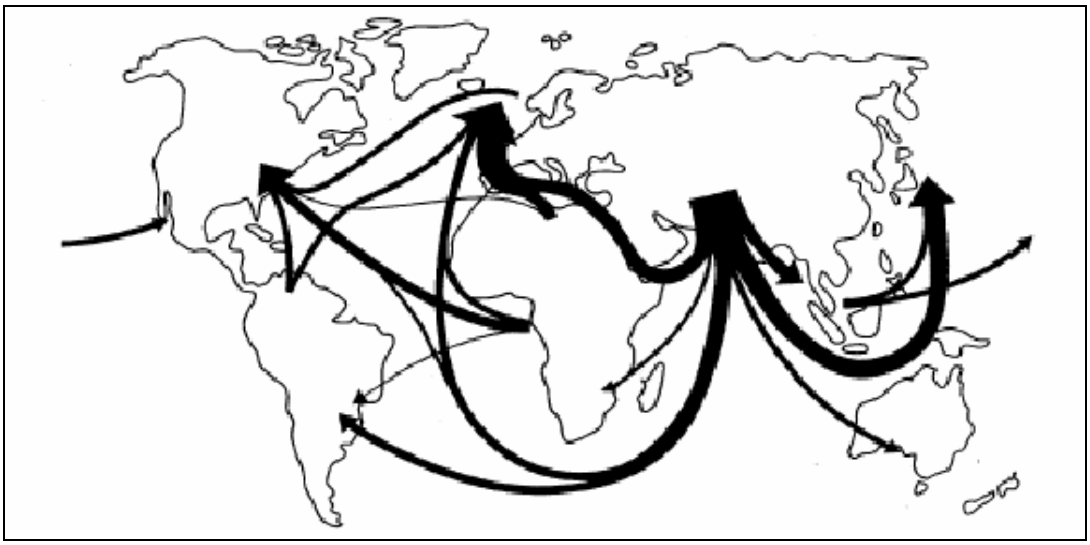


Fig.1. Main global trade routes of hydrocarbons (Oceana, 2004).

In 2002 the Australian Energy Company Woodside carried out an analysis of existing oil pollution off the Mauritanian coast. Several satellite images of oil slicks, taken from 1992 to 2001, are shown in Figure 2. Woodside attributes this pollution to natural seeps but also

argues that many of these slicks may be traced back to vessels that routinely discharge oily wastes.

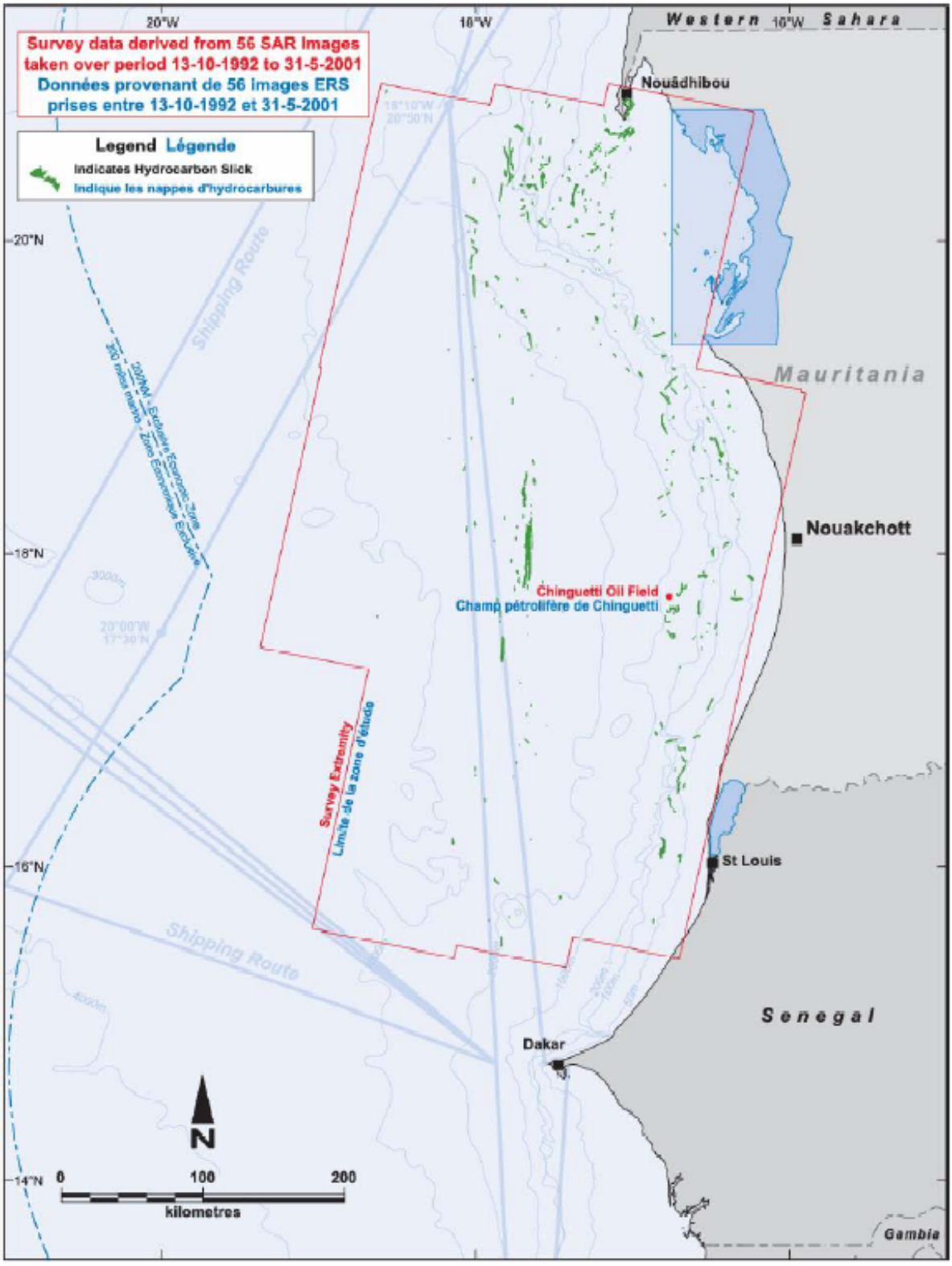


Fig. 2 Oil slicks off the Mauritanian coast: compilation of 56 satellite images taken from 1992 to 2001.

2.1.3 Offshore oil development in the region

Offshore oil extraction will soon become another sea-based source of pollution in the West African Marine Eco Region. Only the continental shelf of the Cape Verde is still free from offshore oil exploration. Figure 3 gives an overview of where oil companies are currently exploring the sea in the region.

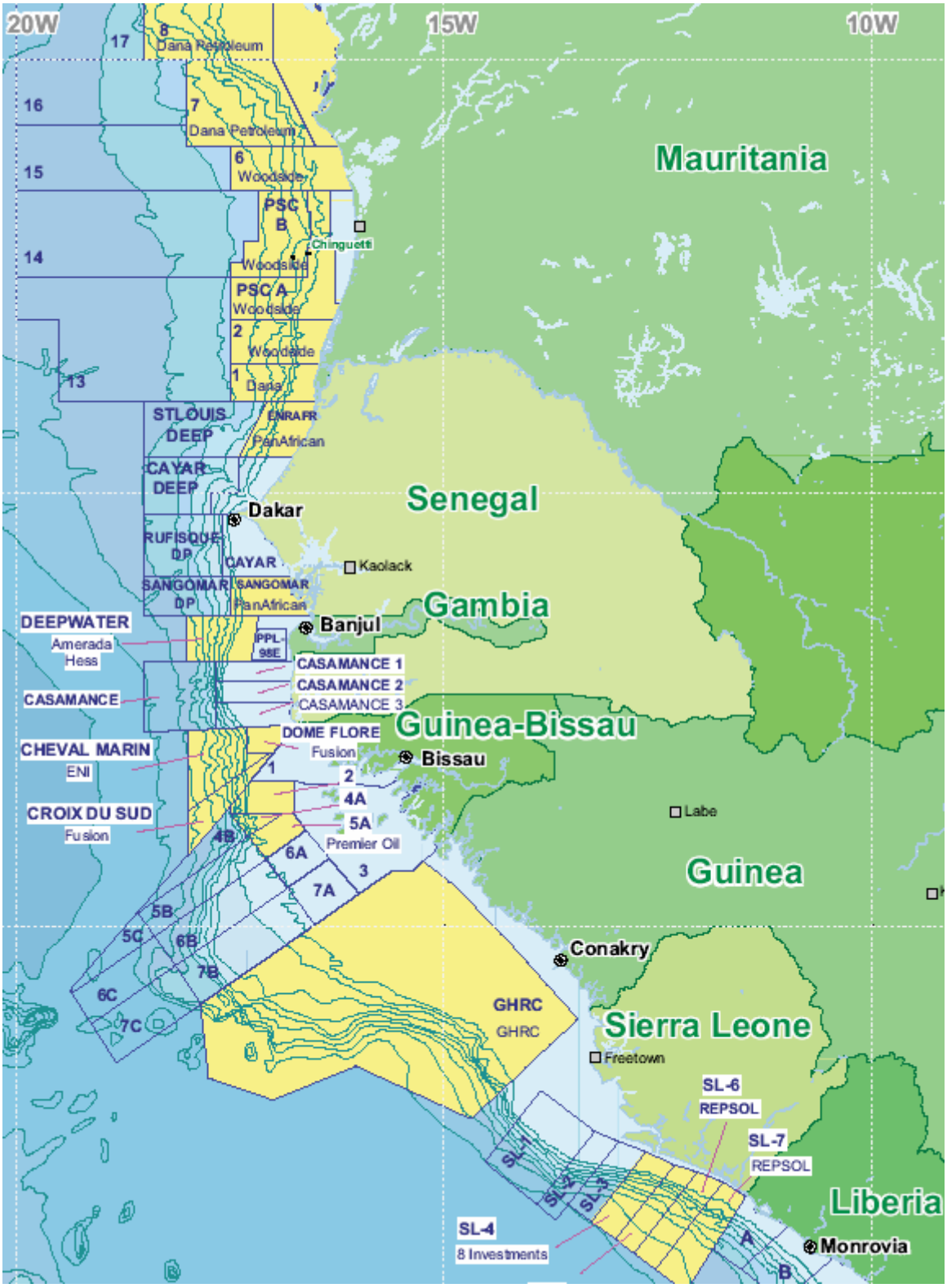


Fig. 3 West Africa 2004 offshore oil and gas concessions map. From Deloitte Petroleum Services

The first commercially exploitable oil well, *the Chinguetti field*, has been found in 2001. The field is situated at 80 km off the Mauritanian coast at 800 meters deep. A consortium of companies led by Woodside Energy will start exploiting this field in 2005/2006.

2.2 Sources of marine oil pollution

Quantitative data about oil polluting activities will give insight into how much each source contributes to the total oil pollution balance at sea and will give policymakers an indication on where to place their priority. However, it should be noted that the magnitude of oil discharged into the sea cannot be translated directly into real environmental impacts. This also depends on the toxicity of the oil and different input rates. A relatively small but sudden input of oil (for example an oil spill caused by a tanker accident) has acute and lethal effects on most marine life, whereas large quantities of oil discharged over longer periods of time (for example oil in production water arising from offshore oil exploitation) may have chronic and sub-lethal impacts.

2.2.1 Worldwide scale

Oil pollution at sea is generally attributed to ships and offshore installations, but it also ends up in the marine environment via coastal discharges of sewage and industrial waste waters, oil extraction based on land, dumping of dredged materials and riverine inputs. - An example from Nigeria on how oil extraction on land contributes to marine pollution is given in Annex 3. - Atmospheric deposition and natural seepage also pollute the marine environment with oil (OSPAR, 2000). Data compiled in 2001 by the United States National Research Council (NRC) show, according to best estimates, that maritime traffic is the largest contributor to the global oil pollution balance (413,100 tonnes) at sea. The next largest input at sea is derived from land-based activities (140,000 tonnes) and offshore production is representing the smallest source of oil pollution (53,760 tonnes). The relative importance of each of these sources is illustrated in figure 4[1,2].

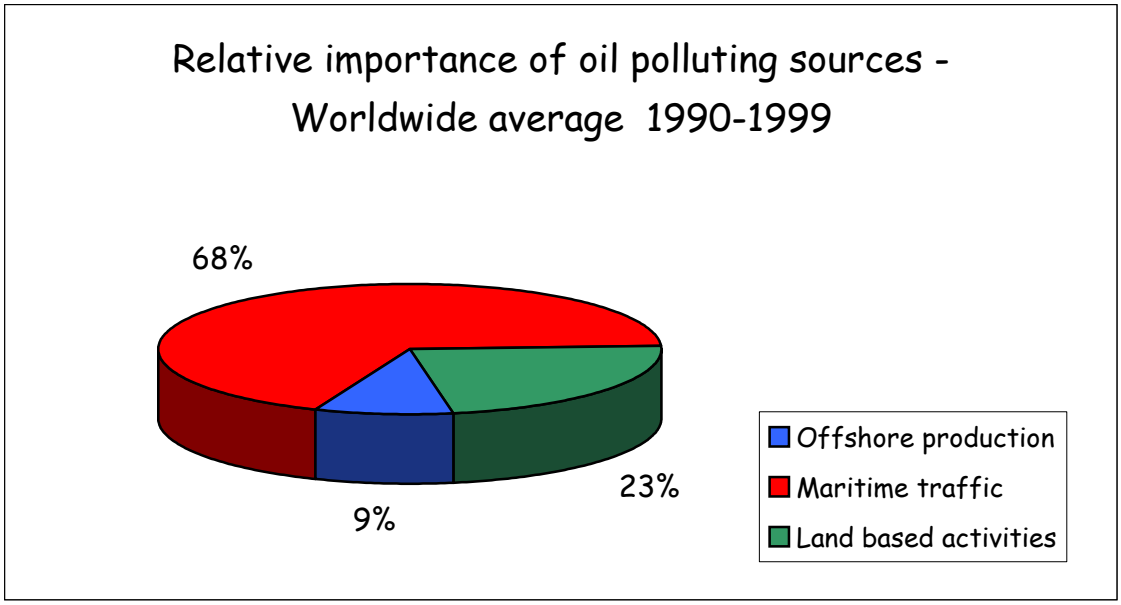


Fig. 4 Worldwide relative oil pollution input. Average data from 1990-1999 (from Lentz and Felleman, 2003)

[1] The contribution from so-called natural seeps and atmospheric deposition is not included. The contribution from the latter source is relatively small and including the input from natural seepage in this presentation would distract from the goal of defining policies for sources we are able to control *(from: Lentz and Felleman, 2003)*.

[2] Different estimates exist on how much each source contributes to the global oil pollution balance at sea. However, most estimates reveal the same order of importance; (1) maritime traffic, (2) land-based activities, and (3) offshore oil production.

2.2.2 Regional scale

If one zooms in on a coastal region with intensive offshore oil production like the North Sea, the oil pollution balance looks completely different (see figure 5). This perspective is in fact more appropriate than a global view with regard to the focus of this report; helping to define environmental policies for a coastal region with offshore oil potential. Data from OSPAR of 1995 reveal that the oil pollution balance in the North Sea is mainly fed by land-based sources (figure 5). Offshore production is the second largest source and maritime traffic the smallest contributor to the regional oil pollution balance. [3]

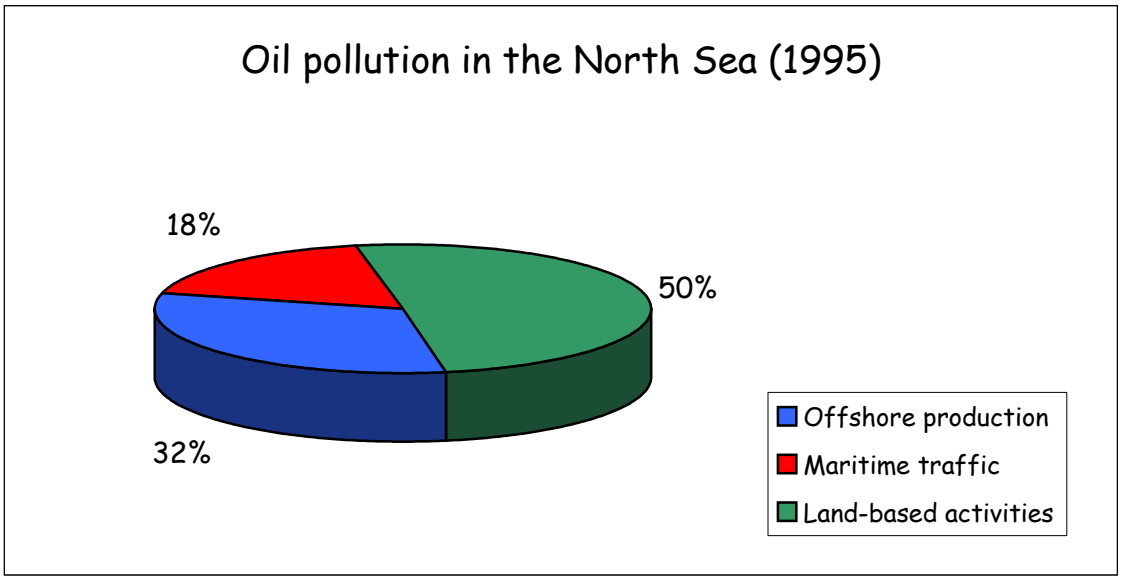


Fig. 5 Total oil input in the North Sea (data derived from OSPAR, 2000)

In a coastal sea area such as the North Sea the largest reduction in oil pollution arising from sea-based activities will be achieved by reducing oil discharges from offshore oil development. Thanks to increasingly strict regulations in the North Sea area and improving technology, this particular oil pollution has already been reduced by 50 % during the last 15 years (OSPAR, 2000). Reducing oil pollution in a coastal sea area will also depend on resolving environmental problems on land. Maritime traffic seems less important in this regional context. However, the well-known potential of oil tankers to cause large oil spills keep policymakers everywhere in the world relatively vigilant.

[3] Land-based (18,670 tonnes); Offshore oil (11,800 tonnes); and maritime traffic (6,750 tonnes). Estimates from land-based sources may be underestimated in this analysis. Input from certain types of land based pollution was not subjected to regular reporting within the regional OSPAR agreement (North West Atlantic and North Sea areas).

2.3 Chronic pollution arising from maritime oil transport

2.3.1 Routine oil pollution

Routine pollution arising from maritime traffic is usually associated with tank cleaning of large oil carriers. When oil tankers have discharged their cargo in consuming countries they return empty to producing countries. In the early days of maritime oil transport, the oily residues in empty cargo tanks were cleaned with water. The oil/water mixture was subsequently discharged into the sea. On top of this problem, ballast water was directly loaded into the empty and dirty cargo tanks. Heavily oil polluted ballast water was discharged on a large scale during this era. Today most tankers have segregated ballast water tanks and the oil/water mixture arising from tank cleaning is separated onboard. Another contemporary method for cargo tank washing is Clean Oil Washing (COW) - empty tanks are washed with pressurised oil instead of water (NCR, 2002). The new cargo is loaded on top of the remaining oil after the Clean Oil Washing method and after the water separation method.

Thanks to these improvements routine oil pollution arsing from maritime traffic decreased over the past decades. Today, the largest proportion of routine oil pollution has shifted from cargo tank cleaning to discharges of oil arising from machinery rooms (NCR, 2002). Oils and other hydrocarbon substances are essential for the operation of most sea-going vessels. These substances serve as fuel (heavy oil bunkers or marine diesel fuel) and lubrication for the ship's engines and machinery (Lentz and Felleman, 2003). World use of heavy fuel for maritime traffic is estimated to be 130 million tonnes per year. These fuel oils contain between 1 and 5 percent sludge or waste oil, which is not burnt (NCR, 2002). Part of this waste oil is illegally discharged at sea.

2.3.2 Ballast water

A less obvious source of pollution associated with maritime traffic in general are animals or plants that accidentally hitchhike along with the vessel's ballast water from one part of the world to the other. When these "non-indigenous" or exotic organisms are discharged, they may reproduce rapidly under the new environmental conditions and become ecological pests (ICES, 1994).

Examples of non-indigenous organism introduction through ballast water:

- The Eurasian zebra mussel (*Dreissena polymorpha*) in the North American Great Lakes, resulting in expenses of billions of dollars for control operations and the treating of fouled underwater structures and water pipes;
- The American comb jelly (*Mnemiopsis leidyi*) in the Black Sea and Azov Sea, contributing to the near collapse of the commercially important anchovy and sprat fisheries;
- The Japanese brown kelp (*Undaria pinnatifida*) in Tasmanian waters, having detrimental impacts on the abalone and sea urchin fisheries;
- Southeast Asian dinoflagellates of the genera *Gymnodinium* and *Alexandrium* to Australian waters, which can cause Paralytic Shellfish Poisoning when contaminated molluscs are consumed;
- *Vibrio cholerae* (causative agent of cholera) into Latin American waters, while not demonstrably linked to ballast water discharge, is indicative of the need to take measures to ensure that the spread of pathogenic organisms through the ballast water route is minimized (UN Atlas of the Oceans website).

2.3.3 Anti-fouling paints

Antifouling paint on ships is another less visible source of chronic pollution that arises from maritime traffic. These paints often contain potent biocides such as tributyltin (TBT). Biocides reduce the encroachment of marine organisms on the ship's hull or offshore production installations. But these substances also leach into the marine environment and may adversely affect several non-target species. One infamous effect of TBT contamination is the masculinisation of female marine snails, resulting in reproductive failure and decline of populations. Female snails with abnormal development of male reproductive organs (also called *Imposex*) have been found in the North Sea along important shipping lanes. Tributyltin is also found in relatively high concentrations in harbour sediments (Mensink, *et al.,* 1997).

2.4 Chronic pollution arising from offshore oil installations

Offshore oil development usually starts with seismic surveys and is followed by exploratory drilling. The development of offshore oil is furthermore associated with increased support vessel and oil tanker traffic. The general impacts of exploration and exploitation include noise and vibration, solid and liquid production wastes, increased water column turbidity from dredging, disturbance of the sea bed areas, avoidance of the area by marine wildlife such as fish and marine mammals due to construction noise, vibration and the presence of erected facilities, and possible invasions of non-indigenous species carried in ballast water of support vessels and oil tankers (Steiner, 2003; Wills, 2002; Patin, 1999). The environmental stress caused by offshore oil development may cause different biological responses including complex transformations at all levels of the biological hierarchy. The following flowchart illustrates the possible negative impacts on higher marine organisms, including commercial fish species.

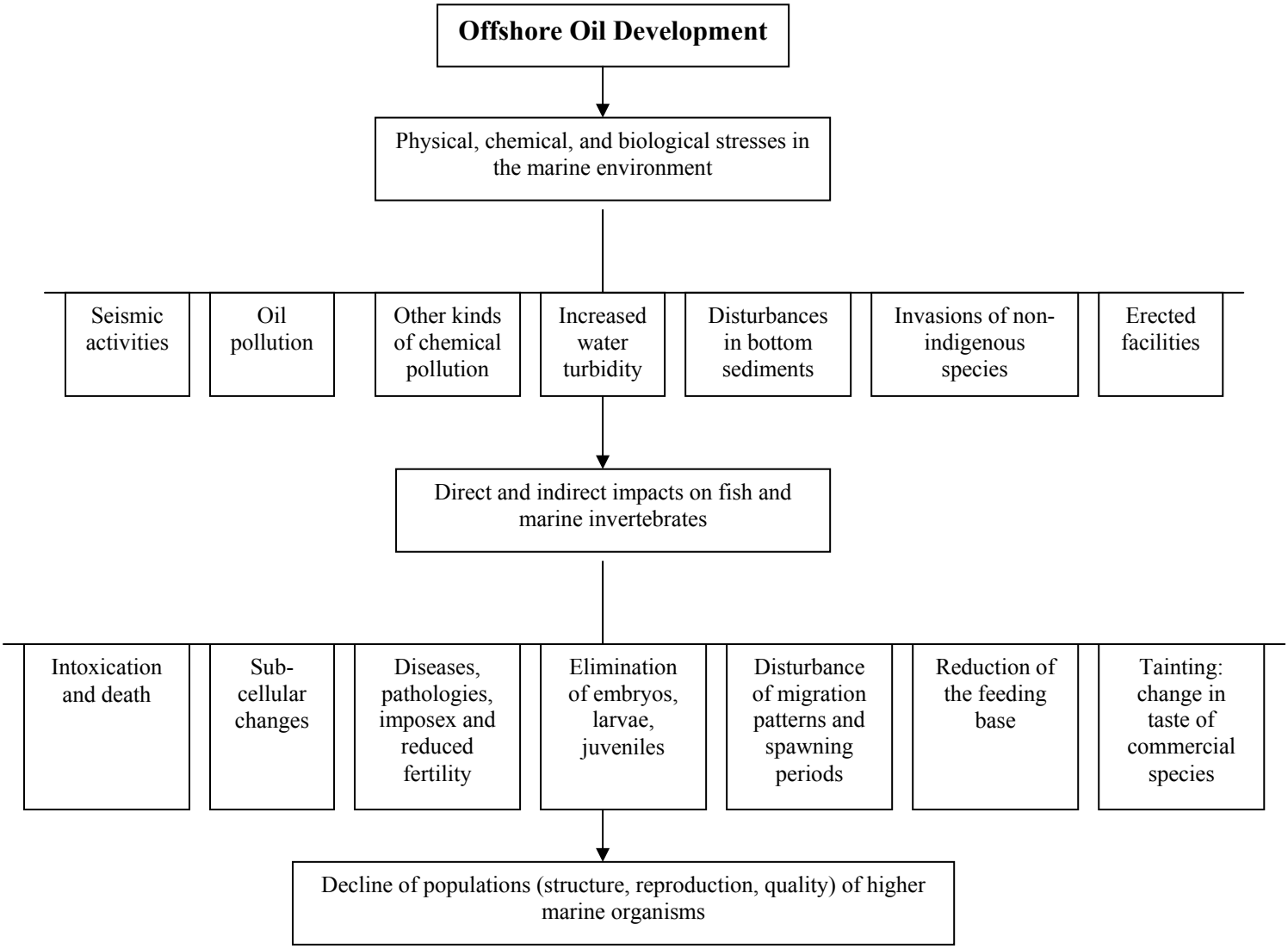


Figure 6. Flow-chart showing complex impacts on higher marine organisms including commercial fish species during offshore oil development (derived from Patin, 1999)

2.4.1 Different ways to extract offshore oil

Fixed platforms were initially used for offshore oil extraction, but as oil has been increasingly searched for into deeper water (≥ 200m), floating production facilities have become the main solution for offshore development. There are four types of floating production facilities: FPSO/FSO (Floating Production, Storage and Offloading system), TLP (Tension Leg Platform), Spar and Semi-submersible facilities (see figure 7).

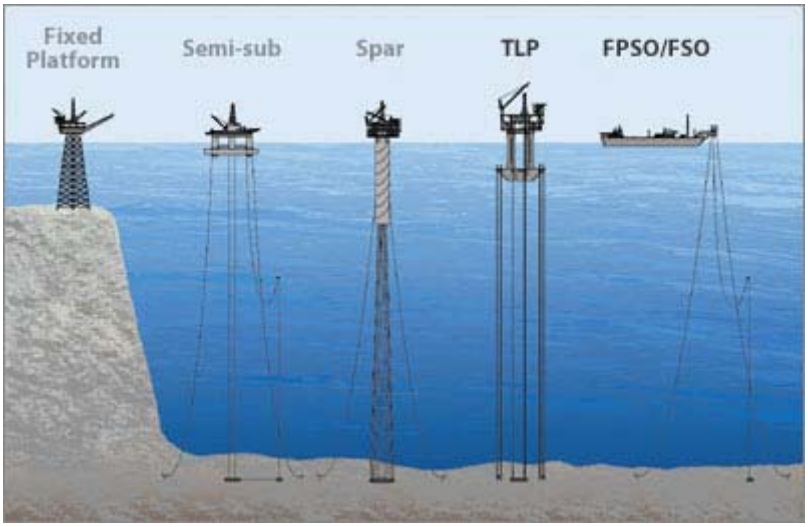


Fig. 7. Different offshore production facilities (from: Modec Inc. website)

The FPSO development option has evolved from being a technology for marginal fields to one for larger discoveries. Over the past ten years, FPSOs have become the primary choice for field development in many areas of the world. Petro-Maritime Consulting has predicted that over the next 10 years another 100 FPSOs would be required (Lloyd's list, 2000, 2001, and 2003). Especially the West African Region constitutes an important growth market for FPSOs (Lloyd's list, 2003 and 2004). The newly discovered oil in Mauritania, *the Chinguetti field*, will also be exploited with the help of an FPSO. Because FPSOs will be the most likely development option for most offshore fields in the West African Marine Eco Region, the rest of this report will focus on this particular type of production facility.

2.4.2 Seismic surveys

The first development stage of offshore oil development, seismic surveys, involves generating loud and mostly low frequency sound waves. Their reflection off the seafloor and sub seafloor strata provides data on the oil and gas potential of the area (Woodside, 2003). Industry and some scientists argue that seismic surveys have only limited and temporary effects; sound produced is comparable in magnitude to many naturally occurring and other man-made sounds (OGP/IACG, 2004).

However, the ecological impacts of seismic surveys are generally not fully understood. While there is little information available, many marine mammals do seem to be particularly sensitive to seismic testing. Studies have shown that whales and dolphins stop feeding and socializing and change their diving patterns in the vicinity of seismic survey areas. Scientific research shows that cetaceans especially, with low frequency hearing abilities, avoid seismic survey activity (McCauley, 2003). Sperm whales in the Gulf of Mexico appeared to move more than 50 km away when surveys began. Similarly, sperm whales in the Indian Ocean stopped vocalising in response to seismic pulses from airguns that were more than 300 km away (WDCS website).

It has been observed that seismic surveys may also have a negative impact on fish. Fish catches in an area where seismic surveying took place can be temporarily reduced by 40 % (Engas, 1996). Marine scientists argue that impacts can be more profound and long term if these studies are carried out while fish migrate or spawn. For example, fish migrating in schools and exposed to loud sounds may become dispersed, lose track of their migratory path and become an easy prey for predators. Seismic surveys also seem to have a profound negative impact on fish eggs and larvae and juvenile marine species in (shallow) areas that are known as reproduction sites. Rules that help oil companies choose how, where and when to carry out these surveys could significantly minimise negative impacts (Dalen, 1996; Engas, 1996; Patin, 1999; Woodside, 2004; Shell, 2001; IAGC website).

2.4.3 Drilling fluids and cuttings

As soon as seismic surveys reveal a promising area where oil could be found, exploratory drilling starts. Drilling operations can introduce oil and a wide range of other complex chemical compounds into the environment via drilling fluids and muds. There are several classes of drilling fluids: oil-based, synthetic-based and water-based. These fluids circulate into the borehole to control temperatures and pressures, to cool and lubricate the drill bit, and to remove drill cuttings from the borehole. The cuttings are small fragments of subsurface rock that break and are incorporated into the drilling fluid, the drilling mud (Steiner, 2003; Wills, 2002). One production platform may discharge about 60,000 m^3 of drilling fluids and 15,000 m^3 of drilling cuttings after an average drilling of about 50 wells. Drilling muds consist of gelling and deflocculating agents (bentonite clays) filtration control agents, pH and ion-control substances, barites, biocides, corrosion inhibitors, lubricants, defoaming agents and trace elements of heavy metals (arsenic, barium, chromium, cadmium, lead, mercury, etc.) (Steiner, 2003; Wills, 2002; Patin, 1999).[4]

2.4.4 Production water

The largest and continuous discharges can be expected from production water. Volumes vary considerably throughout the lifetime of a field. Typical volumes of a North Sea field range from 2400 m3/day to 40,000m3/day (E&P forum/UNEP, 1997). Production water consists primarily of relatively warm water from the oil reservoir, containing dissolved and dispersed oils, high salt concentrations, heavy metals, Polycyclic Aromatic Hydrocarbons (PAHs), no oxygen and on occasions naturally occurring radioactive material (Steiner, 2003; Wills, 2002; Patin, 1999).

[4] Thousands of different mixtures are used and most oil companies have favourite drilling fluids whose detailed composition usually remains a commercial secret (Wills, 2000).

– Production water discharged in waters of the United Kingdom (UK) –

Data on the amount of production water discharged in the waters of the UK together with associated oil products are illustrated below. The increase in production water does not perfectly correspond with oil input because regulations on oil content in production water have become stricter and the techniques to reduce the oil content in production water have improved.

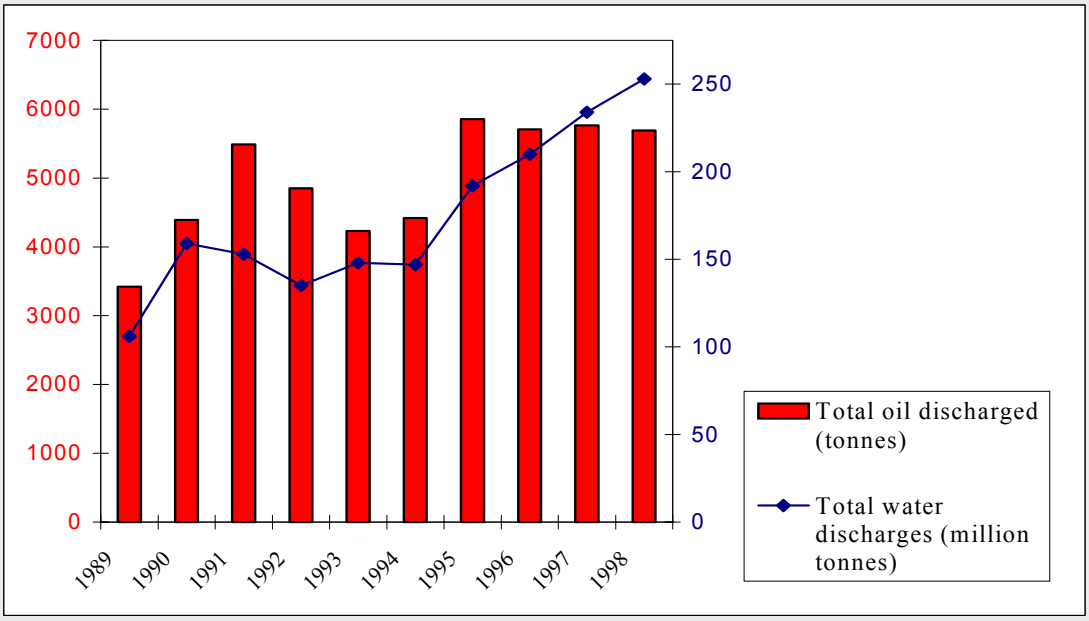


Fig 6.Data on operational discharges of production water on the UK continental shelf ranging from 36 production platforms in 1989 to 64platforms in 1998(data derived from UK Department of Trade and Industry and Trade, 1999)

2.4.5 Ecological impacts of waste products discharge

The four possible disposal methods for all waste products arising from offshore oil extraction are overboard discharge, ship-to-shore, re-injection or disposal in a platform core or especially drilled underground structures. Overboard discharge is the easiest and cheapest but unfortunately also the most environmentally damaging method. However, a number of scientists have stated that overboard disposal will generally result in local, limited and short-term environmental impacts. Oily wastes are quickly degraded and will rapidly loose their toxic properties. These observations are mostly quite valid in the context of which these studies were carried out. The effects of overboard discharge on just a few marine species were observed during a short period of time. However, their findings cannot provide enough scientific foundation for excluding the possibility of long-term and cumulative ecological impacts (Patin, 1999).

Contemporary research takes on a more ecosystem-based approach to measuring the effects of chronic contamination. This research increasingly reveals the existence of subtle, long-term and cumulative consequences of routine offshore oil operations. New evidence indicates that species composition of micro organisms can radically change; especially hydrocarbon degrading bacteria grow abundant at the expense of other micro organisms (Al-Hadhrami *et al.,* 1995; Bruns *et al.*, 1993). Other studies reveal high mortality and morphological anomalies of fish eggs and larvae (NERC, 1994; MacGarvin, 1995; Klump & Westernhagen von, 1995). A Norwegian study recently showed that exposing fish to very low levels of

Polycyclic Aromatic Hydrocarbons (PAHs) in production water results in a feminisation of male fish, which significantly reduces fertility and delays the spawning period with several weeks (Meier et al., 2002). Also cancer in fish and especially in benthic organisms has been related to pollution arising from offshore production installations (Anderson, 1990; Klekowski *et al.*, 1994).

– Impact of chronic offshore oil pollution on wetlands –

The so-called "low energy habitats" or coastal wetlands of the West African Marine Eco Region, mangroves, estuaries or salt marches, are particularly vulnerable to relatively small amounts of oil pollution and other waste products that are routinely discharged by offshore oil installations. Light weighted hydrocarbons molecules and heavy metals in for example production water, can absorb easily to the large amount of particles in suspension in these wetland ecosystems. Contaminated particles are deposited on the bottom, resulting in an accumulation of pollution in these critical habitats. In deep, turbulent and relatively clear water, the waste products may dilute more quickly over vast areas (NRC, 2002).

2.5 Acute pollution - oil spills

Oil spills can arise from both oil tankers and offshore oil installations. If a large spill occurs, levels of oil pollution reach almost immediately lethal limits for plants, fish, birds and mammals. Consequences are especially disastrous when the oil washes ashore and accumulates in sediments of shallow coastal zones.

– Impacts of an oil spill on a mangrove forest –

An oily coating on aerial roots of mangrove trees hinders oxygen supply to root tissues below ground that are imbedded in anoxic soils. (Teas *et al*., 1993). Oil can be taken up by the root system, translocated to the leaves, and interrupt transpiration (Getter *et al.*, 1985). Oil may disrupt the special root membranes of mangrove trees, which will result in the build-up of lethal concentrations of salt in plant tissue (Page *et al.,* 1985).

A sudden and massive mortality of mangrove trees will cause sediment erosion (Garrity *et al.*, 1994). After an oil spill in Panama in 1986, many mangrove trees rotted and fell. Mats of sea grasses became detached. Sediments from these habitats eroded at rates up to several centimetres a day (Jackson, *et al.* 1989). The eroded sediments and oil in various stages of degradation were deposited in neighbouring habitats such as coral reefs, which had not been contaminated in the original spill. In many cases the residence times of oil in these deep mud habitats have stretched to decades, which prolong ecosystem recovery considerably in these tropical habitats (NCR, 2002). Loss of coastal wetlands will inevitably also result in a loss of fish catches. These habitats are known to play a vital role as nurseries for many (commercial) fish species.

2.5.1 Terminal operations

Small accidental oil spills usually arise during routine operations when oil is loaded and discharged. This normally occurs in ports or at oil terminals such as offshore production platforms. The magnitude of the problem is quite serious. The amount of oil spilled during terminal operations is 3 times of an order greater than the total amount of oil spilled after accidents with oil tankers (ITOPF website). However, there are several examples of global best practice in port management and tanker traffic control systems, where the problem has been reduced to very small proportions using existing technology and careful management. Examples are the port of Sullom Voe, in the Shetland Islands, where all the oil majors agreed to this system in 1979, and the Valdez Marine Terminal in Alaska, which has imposed a similar zero-tolerance pollution regime after the Exxon Valdez disaster in 1989.

2.5.2 Oil tanker accidents

Large spills may arise from maritime traffic after the grounding of an oil tanker, collisions with other vessels, and due to cargo fires and explosions. Technical failure and human errors are the most usual causes. Under a combination of certain extreme conditions like bad weather, bad maintenance, old age and metal fatigue, some oil tankers may simply break in two. The accident with the *Prestige* is probably the most recent sad example of such a complex of circumstances. Eighty per cent of the cargo, 77,000 tonnes of heavy fuel oil, polluted the Spanish and French coastline in 2003. This type of oil causes the very worst kind of oil pollution. Just before the spill, the *Prestige* had suffered hull damage, developed a severe list and drifted towards the Spanish coast. The decision by the Spanish government to tow the vessel further away from the shore, in the hope of safeguarding the Spanish coastline,

aggravated the problem and helped spread the oil more widely when the ship finally broke in two in the heavy weather of the high seas (New Scientist, 2003).

Volunteers trying to clean the beaches of Galicia after the Prestige oil spill in 2003. (Photo: Ecologistas en Acción)

2.5.3 Offshore oil production accidents

Accidents that result in large oil spills involving offshore oil installations can be caused by many different factors. 'Blowouts' of wells or pipeline ruptures are the best known-examples. A blowout or "loss of well control" can take place if a drilling rig encounters a pocket of sub sea oil under excessive geological pressure or when errors are made or from technical failures. One of the best-known blowouts occurred in 1969 off the Californian coast near Santa Barbara, when over 13,600 tonnes of oil poured into the ocean (Charter, 2002). The resultant negative and fierce publicity led to a ban on further offshore developments in this area. Technologies to reduce blowouts have been improved over the past years, but these kind of accidents can and still do occur. A major blowout accident took place in August 2004 off the Egyptian coast. This field contained mostly gas and fortunately only a relatively small amount of oil. The black smoke on the photo below indicates that some oil is being burnt. It can take up to six weeks to control a well blowout. Between 1970 and 1995, 162 offshore rigs were total losses, due to various kinds of accidents (Canadian maritime law association, 1996)

August 2004, Offshore platform accident due to a blow-out off the Egyptian coast

Many of the well-known causes for tanker accidents also apply to offshore production platforms such as FPSOs. The hull of an FPSO may be perforated after a collision with another vessel in the same way as an ordinary oil tanker. The industry argues that FPSOs are nevertheless a safe development option. Part of their reasoning is based on the fact that no major accidents have occurred during the last 30 years that FPSOs have been in use. Drawing conclusions from historical data is however difficult because the bulk of FPSOs have only recently been put into service. The first FPSO was installed in 1974 in Indonesia and 2 more FPSOs were commissioned in 1976 in Spain and Brazil. But it was not until the second half of the 1990s that the number of FPSOs began to grow significantly. Today approximately 90 FPSOs are operating worldwide (Shimamura, 2002). Because of meagre historical data, insurance companies find it difficult to make proper risk analysis and also to establish adequate insurance fees for FPSOs (Lloyd's website). There is no doubt that things can and do go wrong with FPSOs. A near accident with an FPSO occurred off the Brazilian coast in 2002 (see box).

– Petrobras battles to save listing FPSO –

Photo BBC News World Edition

Petrobras technicians were fighting to save the $200 million P-34 floating production storage offloading vessel after an electrical failure caused the production ship to tilt more than 30° on 13 October 2002 (BBC News World Edition, 2002).

The 52,000 dwt FPSO could have sunk and cause a terrible oil spill if the listing had not been rectified. Petrobras said a fault in the electricity system provoked a disruption in the ship's water balance system, causing the tilt. The Brazilian oil workers union officially complained to Petrobras about the FPSO's electricity problems 5 month before, but it appears this was not followed up (Lloyds list, 2002).

Some of the International Oil companies such as Elf-Total-Fina, Shell and Texaco are building new and double-hulled FPSOs for the African East Atlantic, for respectively the Girassol field off Angola, and the Bonga and Agbami fields off Nigeria. Some contractors, like Dutch Bluewater, are proposing to convert double-hulled oil tankers into FPSOs instead of single-hulled ones (Lloyds list, 2003). But several oil companies are planning to use old (25-28 years), converted single-hulled oil tankers as FPSOs for West Africa. These are mostly large oil tankers that will not be allowed to operate anymore as conventional tankers by the year of 2007 thanks to International law. These tankers were initially intended to be sold for scrap. Currently there are no legally binding international rules for the design or hull configuration of FPSOs.

The industry and some scientists are of the opinion that the climate and sea conditions of the West African region are benign. They conclude therefore that there is no need for new, purpose-built and double-hulled FPSOs in this particular region, whereas they do perceive a need for this in severe weather areas such as the North Sea, the North East Atlantic, the Gulf of Mexico and some parts of Australia. Other scientists are in disagreement with this point of view and believe that double-hulled FPSOs should be used as standard everywhere in the world. They furthermore argue that double-hulled FPSOs must be used as a precautionary measure especially in areas of important marine biodiversity and in regions where a high collision risk prevails because of dense maritime traffic. The West African Marine Eco System combines both these characteristics.

2.5.4 Large oil spills in the region

Some accidents that took place with crude oil transporters in the East Atlantic waters off the African continent are listed amongst world's worst oil spills. An explosion aboard the super tanker, *ABT Summer*, off the Angolan coast in 1991 caused an oil spill of 260,000 tonnes and in 1989 80,000 tonnes of oil were spilled in Moroccan waters by the oil tanker *Khark -V* (ITOPF website country files).

A platform accident in 1980 in Nigeria polluted the sea with 54,000 tonnes of oil. A pipeline rupture at sea in 1998, also in Nigeria, resulted in an oil spill of 14,300 tonnes (UNEP, 2002). NGOs and some government officials in Nigeria have made reports of oil spills that have not been officially reported by the spiller. Pilots have reported flying over large unreported oil spills at sea (Personal communication to Clive Wicks).

No major oil spill has occurred in the West African Marine Eco Region itself. The closest the region has come to a real oil spill, according to the International Tanker Owners Pollution Federation (ITOPF), was in 1992 when the super tanker The *World Hitachi Zosen* collided with a dry bulk vessel off the northern part of the Mauritanian coast. A ship-to-ship transfer was carried out and no oil eventually impacted the coastline (ITOPF website country files). The West African Marine Region is currently classified by ITOPF as an area that deserves special attention with regard to oil spills mainly due to oil tanker traffic. On a scale from 1 (low risk) to 3 (high risk) they place the region in category 2 (medium risk) (Moller, 2002). With the arrival of offshore oil development, it is most probable that the area will soon fit into category 3.

PART 3 Regulating maritime transport of oil and offshore oil development

The final part is devoted to policies and legislation and highlights deficiencies in international legislation for offshore oil development. Extra tools provided by international law for the protection of particularly sensitive sea areas against threats arising from international maritime traffic will be closely examined. Several examples of regional and national regulatory frameworks for offshore oil development will be outlined. The report concludes with an example of how people with a stake in the marine environment can make valuable and ongoing contributions to the policy making process in an organised way.

Head quarters of the International maritime Organisation (IMO) in London

FPSO on the UK continental shelf (Photo: UKOOA)

Clean coastline of Mauritania

3.1 Environmental regulation of maritime oil transport

Virtually all aspects of maritime traffic are covered by international conventions. This sector is highly internationalised; the ships register (flag state), ship-owner, and crew may be and often are comprised of different nationalities. Vessels navigate around the globe and an accident could impact on the environment anywhere. Environmental regulation of this sector on an international level is therefore highly appropriate. International conventions are binding on national governments, which are obliged to implement the internationally established rules and regulations through their own national legislation.

In addition to international legislation some countries have written extra stringent regulations for ships that trade in their Exclusive Economic Zone or EEZ (the 200 nautical mile zone as defined by the United Nations Convention on Law of the Sea (UNCLOS)). For example the USA and countries of the European Union will no longer accept any single-hulled oil tankers in their ports and do not allow such oil tankers to load oil from their offshore facilities. Under International legislation Ultra and Very Large single-hulled oil tankers are still allowed to navigate until 2007. Smaller oil tankers are allowed to navigate up to 2015.

However, coastal states have no jurisdiction over international vessels that are on "innocent passage" through their EEZ – vessels that do not trade in that zone and constitute no acute environmental hazard. Nevertheless one way for coastal states to exercise some influence on transiting maritime traffic is to establish "Areas-to-be-Avoided", Particularly Sensitive Sea Areas (PSSA) and Special Areas (SA) under the provision of the International Maritime Organisation, (IMO). These policy options will be further discussed in chapter 3.2. First, the following paragraph will explain how international regulation evolved and who the different actors are.

3.1.1 Maritime traffic – a historical perspective

In the early days of maritime traffic, the high seas were an area where total anarchy traditionally prevailed. With the rapidly developing maritime sector and its increasing economic importance it soon became apparent that internationally agreed rules had to be formulated. France and the United Kingdom adopted the first international agreement on traffic rules and signalling in 1863 and this was later ratified by most other maritime nations of the day (Boisson, 1999). The most important international treaty concerning maritime safety was the International Convention for the Safety of Life at Sea (SOLAS) first signed in 1914, in response to the Titanic disaster. In 1948 an international agency entirely devoted to maritime traffic was set up under the auspices of the United Nations. Maritime safety was attributed as one of the main tasks to the International Maritime Organisation (IMO), which started with the adoption of the SOLAS convention (IMO website).

During the 1950s ships became bigger and the last commercial sailing ships gave way to motorised cargo vessels. It was also in this period when maritime transport of gas and oil gained increasing importance. In the early 20th century, crude oil and natural gas started to play the leading role in the world's fuel-energy balance. Since then the use of oil and gas resources has approximately doubled every decade. At present, they supply about 63% of the worldwide energy needs. Today more than 1.7 billion tonnes of oil are transported annually by ships from producing and refining countries to consuming countries (Drewry Shipping Consultants, 1994).

Marine oil pollution became a noticeable problem in the 1950s. Oil tankers routinely discharged enormous quantities of oily wastewaters. Oil pollution became another important issue for the IMO to tackle. In 1954 a treaty was adopted to deal with the problem – the International Convention for the Prevention of Pollution of the Sea by Oil (OILPOL). IMO took over responsibility for this treaty in 1959, but it was not until 1967, when the tanker *Torrey Canyon* ran aground off the coast of the United Kingdom and spilled more than 120,000 tonnes of oil into the sea, that the world realized just how serious the threat was. Until then it was assumed that the oceans were big enough to cope with any pollution caused by human activity. Since then IMO has developed numerous measures to combat marine pollution - including that caused by the dumping into the seas of wastes generated by land-based activities (IMO website).

3.1.3 Key actors regulating maritime safety

Key actors	Regulating:
IMO	This UN agency is composed of 164 countries who agree on the common body of law that serves to guide first of all international maritime traffic. Through its conventions, IMO sets the regulatory framework for reducing pollution from ships. Currently the bulk of international regulations for marine pollution arising from maritime traffic are contained in the 1973 International Convention for the prevention of Pollution from ships amended in 1978 and thereafter called MARPOL 73/78 (IMO website). MARPOL 73/78 incorporates the OILPOL convention of 1954 and it's various amendments. IMO's main technical work is carried out by various committees: Maritime Safety, Marine Environment Protection, Legal, the Technical Co-operation, and Facilitation Committee. IMO conventions tackle the problem of marine pollution in a number of ways, via measures to prevent and reduce operational pollution, by reducing the chances of accidents, by reducing the consequences of large oil spills, by providing compensation to oil spill victims and by providing technical assistance to member states (IMO website).
Classification societies	These are independent private companies who verify the condition of a ship and issue a 'class certificate' to reflect compliance with IMO's standards for ship design and seaworthiness.[5] The classification surveys also enable insurance companies to determine the insurance fee for a specific vessel (IACS, 2004).
Flag States	The principal responsibility for complying with the IMO' regulatory framework is with flag states. These states exercise direct control over national fleets and their crews (Stopford 1997). Most flag states carry out their regulatory responsibility through classification societies.
Port State Control	Because of non-compliance of several ships, largely due to poor controls of certain flag states, coastal states increasingly exercise their right to inspect incoming vessels.[6] Port state inspections have become the principal tool against substandard

[5] Most classification societies are member of the International Association of Classification Societies. IACS provides support to its members and controls the quality of performance of its members. Many Classification Societies are non-profit organisations.

[6] The United Nations Convention on the Law of the Sea, 1958. UNCLOS art 25 provides states with an international legal basis for port state control. States are allowed to take necessary steps to prevent any breach of conditions to which the call of any vessels at its ports may be subject. Arts 216 and 218 enable a port state to enforce international anti-dumping and anti-pollution measures, with art 219 giving states power to take measures to prevent errant vessels from leaving port.

	shipping. If a vessel does not meet the minimum international (and additional national requirements), a coastal state is allowed to detain the vessel until it complies with the minimum requirements (Häseli, 2003; OECD, 2003).

3.1.4 IMO and protecting the marine environment

The most important convention regulating and preventing marine pollution by ships is MARPOL 73/78. It covers accidental and operational oil pollution as well as pollution by chemicals, goods in packaged form, sewage, garbage and air pollution.

IMO's Intervention Convention affirms the right of a coastal State to take measures on the high seas to prevent mitigate or eliminate danger to its coastline from a maritime casualty.

The International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC), 1990 provides a global framework for international co-operation in combating major incidents or threats of marine pollution.

IMO also has Secretariat responsibilities for the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (LDC), 1972, generally known as the London Convention. It contains rules for the dumping of waste products generated on land.

The Marine Environment Protection Committee (MEPC) is IMO's senior technical body on marine pollution related matters. It is aided in its work by a number of Sub-Committees (IMO website).

3.1.5 Regulations concerning operational discharge of oily wastes by ships

The main objective of MARPOL is to reduce routine discharge of oil products by maritime traffic. During normal operations certain tankers are allowed to discharge a limited amount of oil contained in ballast water and tank washings into the sea. Regulation 9 of MARPOL 73/78 limits the amount of discharges of oil to 1/30,000 of the total cargo oil volume. The extra requirement that the oil content of discharged effluent cannot exceed 15 ppm (1 mg/L is approximately 1 ppm) has the practical effect of limiting operational discharge to amounts much less than these maximum values (NCR, 2002; IMO website). Discharge of oily wastewaters within 50 nautical miles from the shore is prohibited (NCR, 2002; IMO website).

Under regulation 13 of MARPOL 73/78, oil tankers of 20,000 tonnes deadweight and above are required to have segregated ballast tanks (SBT), dedicated clean ballast tanks (CBT), and/or Clean Oil Washing systems (COW), depending on the vessels type, when they were built, and their size (NCR, 2002; IMO website).

For crude oil carriers of 20,000 and product tankers of more than 30,000 tonnes deadweight delivered since 1983, it is mandatory to have segregated ballast tanks. These ballast tanks are completely separated from the cargo oil and fuel oil system and are exclusively allocated to carry ballast water. This system greatly reduces the likelihood of oily ballast water discharge (NCR, 2002; IMO website).

Tankers with a clean ballast tank system (CBT) have a piping system that may be connected with the cargo oil pump and piping system. There are however few CBT tankers operating today (NCR, 2002; IMO website).

Discharge of fuel oil sludge from machinery room is strictly forbidden anywhere in the world by MARPOL (IMO website). This sludge oil should be discharged at reception facilities in ports.

3.1.6 Regulations concerning the prevention of accidental pollution

As explained in part 1, large quantities of oil may end up in the sea after tanker accidents and have devastating effect on the marine environment. Safer vessels will obviously reduce the risks of accidents. International legislation for making shipping safer is contained in several IMO conventions. The Convention for the Safety of Life at Sea (SOLAS) is an important instrument to reduce tanker accidents. Fire is an important cause for maritime accidents and the convention contains strict fire safety provisions. It also contains rules to replace inflammable oil fumes with inert gas (a non-explosive gas). An inert gas system is required on all new oil tankers and most existing tankers of 20,000 dwt and above (IMO website).

Human failure is another important factor causing maritime accidents, about 80% (Häseli, 2003). Collisions, technical failure and shipboard fires and explosions are all factors that could be caused by human error. It is therefore important that a ship's crew have a thorough technical knowledge and possess the necessary qualifications. IMO's International Convention on Standards of Training, Certification and Watch keeping for Seafarers (STCW), 1978 was the first internationally agreed Convention to address the issue of minimum standards of competence for seafarers. The STCW Convention was completely revised and updated in 1995 to clarify the standards of competence required and provide effective mechanisms for enforcement of its provisions (IMO website).[7]

Although the measure is still at the centre of hot debate, in 1992 MARPOL adopted regulation 13F which states that all new tankers need to have a double-hull. This measure was introduced with the aim to reduce the likelihood of an oil spill after collision (see box). Regulation 13G requires mandatory retirement for single-hull tankers at 25 years of age. A revision to regulation 13G requires phase out of all single-hull tankers above 20,000 tonnes deadweight by 1 January 2007 (NCR, 2002; IMO website). However, flag states will be allowed to operate smaller single-hull tankers up to 2015 or to their 25th anniversary of construction (whichever comes first). These tankers are subject to a newly strengthened condition assessment scheme (CAS). From April 5th 2005 any tanker of 15 years or older must undergo CAS at their next survey (WWF, 2003). All these new regulations do not apply to vessels that are used as floating offshore production platforms, such as FPSOs.

[7] In spite of IMO, Seafarers Unions and many civil society groups argue that the quality of seafarers has eroded over the past decades. Crews have moreover difficulty communicating in a common language because a ships´ crew is often composed of different nationalities.

– Double-hull oil tankers –

Vessels with a double-hull configuration provide a significant degree of reduction in risk of oil spills in the event of relatively low impact collision or grounding. For instance, Conoco Oil Company, which built all double-hulled tankers far in advance of the IMO requirement, had two potentially serious incidents in the 1990s, neither of which resulted in an oil spill thanks to the double-hulls. In 1996 the "Randgrid", a double-hulled Conoco tanker with 1 million barrels of oil onboard, grounded on a rock reef in France and spilled no oil. In 1997, a barge slammed into the "Guardian", another double-hulled Conoco tanker with 550,000 barrels of oil onboard in Louisiana, and although a 120 m gash was torn in its hull, again not one drop of oil was spilled. A statement by Conoco said, "in both incidents, the ship's outer hull absorbed the brunt of the impact and, although penetrated and heavily damaged, protected the inner hull and prevented any loss of cargo" (Steiner, 2003).

The Oil Companies International Marine Forum argues that double-hull tankers are not the answer to safer shipping. Their main worries with regard to double-hulled vessels are increased corrosion and more work to inspect larger surface areas during regular maintenance check ups. They argue that poorly designed, constructed, maintained and operated double-hull tankers have as much if not more potential for disaster than their single-hulled predecessors. Well maintained, diligently operated, high quality tankers, whatever hull configuration, are according to them the answer. Another of their arguments is that high impact collisions will also perforate double-hulled tankers (OCIMF website).

3.1.7 Compensation regime after oil spills caused by oil tankers

IMO contains rules for the compensation of oil spill victims and for the availability of funds to finance clean up costs if an oil spill is caused by an oil tanker. The Civil Liability Convention (CLC) of 1969 puts the onus of paying compensation on the ship owner. The 1971 Fund Convention extends additional liability to cargo owners (the oil companies, importers), who pay to a central fund. Increased levels of compensation will in the future be available for victims of oil pollution from oil tanker accidents, following the adoption of a Protocol establishing an International Oil Pollution Compensation Supplementary Fund by a diplomatic conference held in 2003.

- Under the Civil Liability Convention (1992 protocol, amended in 2003), those affected by pollution are able to claim damages from the ship owner up until $132 million dollars for ships of 140 000 grt and above.
- When the damage exceeds the limit of the ship owner, the Fund Convention of 1971 (1992 protocol, amended in 2003) provides an additional compensation to a maximum of $299 million dollars.
- The aim of the Oil pollution Supplementary fund (2003) is to increase the compensation available under the 1992 Civil Liability and Fund Conventions with an additional, third tier of compensation. The Protocol is optional and participation is open to all States Parties to the 1992 Fund Convention. The total amount of compensation payable for any one incident would be limited to a combined total of just over $1,1 billion dollars, including the amount of compensation paid under the existing CLC/Fund Convention.

The Liability conventions do not apply to conventional offshore oil installations or to oil tankers that were converted into production platforms (IOPC fund website).

– US Oil Pollution Act –

On March 24, 1989, the Exxon Valdez grounded on Bligh Reef, and spilled 38,800 tonnes of oil across 1,300 Kms of coastline in the biologically rich waters of Prince William Sound. The costs involved with the clean up and compensation of the Exxon Valdez oil spill in Alaska exceeded $2.1 billion dollars. Impacts are noticeable even until today, more than 15 years later. Exxon Valdez oil persists in certain environments, especially in areas sheltered from weathering processes, such as in the subsurface under selected gravel shorelines, and in some soft substrates containing peat.

Because of the enormous costs that could be involved in oil spills, the US has put in place an unlimited liability for gross (or wilful) negligence. All tankers trading in US waters are required to demonstrate to local authorities (with Certificates of Financial Responsibility) that they carry adequate insurance to cover maximum financial risk. - In contrast to IMO, the same liability rules for vessels do also apply for offshore oil installations. - Unlimited financial liability of the ship owner or the company managing an offshore platform is considered in the US as an important incentive for responsible conduct of the private sector. With adequate liability at risk, oil companies and ship owners will be motivated to design, construct and operate their projects as safely as possible (Steiner, 2003). Insurance companies will be less likely to take the risk to insure "sub-standard" vessels or offshore platform with unlimited liability at stake.

An Oil spill liability trust fund was furthermore established in the US to allow the affected parties to seek immediate relief from this fund if full compensation is not directly available – investigations and law suits may take time.

Unlimited liability is according to the oil and gas industry and many legal experts unpractical. A limited liability which is realistic and which would provide for sufficient compensation after an accident is according to them the answer.

3.1.8 Regulations concerning ballast water

In part two we have seen that ships, including oil tankers, may introduce non-indigenous species via ballast water. International regulations for mitigating risks of the introduction of exotic species are now contained in the International Convention for the Control and Management of Ships Ballast Water and Sediments, which was adopted by consensus at a Diplomatic Conference in February 2004 (Globallast website). Regulations include:

- Whenever possible, conduct ballast water exchange at least 200 nautical miles from the nearest land and in water at least 200 metres in depth.
- In cases where the ship is unable to conduct ballast water exchange as above, this should be as far from the nearest land as possible, and in all cases at least 50 nautical miles from the nearest land and in water at least 200 metres in depth.
- Minimising the uptake of organisms during ballasting, by avoiding areas in ports where populations of harmful organisms are known to occur, in shallow water and in darkness, when bottom-dwelling organisms may rise in the water column.
- Cleaning ballast tanks and removing muds and sediments that accumulate in these tanks on a regular basis, which may harbour harmful organisms.
- Avoiding unnecessary discharge of ballast.
- To implement a Ballast Water and Sediments Management Plan. All ships will have to carry a Ballast Water Record Book and will be required to carry out ballast water management procedures to a given standard.

The convention will enter into force 12 months after ratification by 30 States, representing 35 per cent of world merchant shipping tonnage.

Coastal states could, in addition to the requirements outlined in the convention, require from oil companies to only work with oil tankers that continuously refresh ballast water during their voyage on open sea. Shell for example has a policy to only work with this specific type of oil tanker (personal communication to Sandra Kloff).

3.1.9 Regulations concerning anti-fouling paint

In October 2001, IMO adopted a new international Convention on the Control of Harmful Anti-fouling Systems on Ships, which will prohibit the use of harmful organotins in antifouling paints used on ships and will establish a mechanism to prevent the potential future use of other harmful substances in anti-fouling systems. The resolution does not include anti-fouling paint for fixed and floating offshore platforms, floating storage units (FSUs), or Floating Production, Storage and Offloading units (FPSOs). The convention has not yet entered into force (IMO website).

3.2 International legal tools to protect sensitive sea areas from maritime traffic

– Special note to MARPOL –

MARPOL 73/78 definition of ship includes vessels of any type operating in the marine environment, including floating craft and fixed or floating platforms (art.(4)).

However, the definition of "discharge" excludes the release of harmful substances directly arising from the exploration, exploitation and associated offshore processing of seabed mineral resources (art. 3(b)(ii). Thus MARPOL would apply to FPSOs, but not to drill cuttings or production water. However, MARPOL would apply to all these vessels with respect to garbage and chemical residues, and oily residues from engines or ballast rooms.

As noted above, the 1973 International Convention for the Prevention of Pollution from Ships, as modified by its 1978 Protocol (MARPOL), regulates operational discharges from ships, and to some extend from floating craft and fixed or floating platforms. It details where, and under what conditions, a vessel may discharge waste oil (Annex I), noxious liquid substances (Annex II), sewage (Annex IV (not yet in force)) and garbage (Annex V). Annex III regulates the carriage of harmful substances carried in packaged form, thus no discharge regulations are needed. Annex VI regulates air pollution from ships.

3.2.1 Special Areas

Special Areas are specifically provided for under MARPOL in cases where certain areas of the sea require greater protection from discharges than is provided by the generally applicable rules in Annexes I, II and V. The relevant coastal States may apply for "Special Area" status for sea areas at special risk from ship–source pollution, in order to benefit from stricter requirements, including a complete prohibition on discharges. Under MARPOL, "Special Areas" are defined as certain sea areas, in which, for technical reasons relating to their oceanographic and ecological condition and to their sea traffic, the adoption of special mandatory methods for the prevention of sea pollution is required.

Guidelines for the Designation of Special Areas under MARPOL 73/78 (IMO Assembly Resolution A.927(22) (Annex I)) detail the procedures for applying for Special Area status. A separate proposal is required to achieve Special Area status under each of the MARPOL annexes.

The criteria for Special Areas include:

1) oceanographic conditions which may cause the concentration or retention of harmful substances in the waters or sediments of the area;
2) ecological conditions which indicate that the area needs protection from harmful substances; and
3) vessel traffic characteristics indicating that the sea area is used by ships to an extent that the discharge of harmful substances by ships when operating in accordance with the requirements of MARPOL 73/78 for areas other than special areas would be unacceptable in the light of existing oceanographic and ecological conditions in the area.

Most existing MARPOL Special Areas are very large, encompassing the EEZs of one or more states, or even an entire enclosed or semi-enclosed sea. However, IMO's Maritime Safety, Marine Environment Protection Committee recently approved a Special Area encompassing part of the EEZ of Oman (the Oman Arabian Sea coast out to the outer limits of the EEZ). The special discharge requirements of a Special Area come into effect only after the governments in the region notify IMO that there are adequate reception facilities for ships. This requirement for adequate reception facilities has delayed the coming into force of many Special Areas.

Special Areas under MARPOL 73/78 are (IMO website):

Annex I: Oily Wastes
Mediterranean Sea area
Baltic Sea area
Black Sea Area
Red Sea area
"Gulfs" area
Gulf of Aden area
Antarctic area
North West European Waters
Arabian Sea Coast of Oman

Annex II: Noxious Liquid Substances:
Baltic Sea area
Black Sea Area
Antarctic area

New IMO provisions concluded in 2003 for Noxious Liquid Substances mean that effectively all the world seas have become a Special Area for this specific Annex.

Annex V: Garbage
Mediterranean Sea area
Baltic Sea area
Black Sea Area
Red Sea area
"Gulfs" area
North Sea
Antarctic area (south of latitude 60 degrees south)
Wider Caribbean region including the Gulf of Mexico and the Caribbean Sea

Annex VI: Air Pollution "SOx Emission Control Areas" (not yet in force)
Baltic Sea
North Sea

3.2.2 Particularly Sensitive Sea Areas

To help coastal nations protect significant marine areas that are vulnerable to the impacts of international shipping activities, the IMO has developed the concept of the Particularly Sensitive Sea Area (PSSA), which is defined as:

"*an area that needs special protection through action by IMO because of its significance for recognized ecological, socio-economic or scientific reasons and which may be vulnerable to damage by international shipping activities*."

Guidelines for the Identification and Designation of Particularly Sensitive Sea Areas (the PSSA Guidelines) (IMO Assembly Resolution A.927(22) (Annex II)) establish criteria and procedures for applying to IMO for PSSA status. The PSSA Guidelines are under frequent review, and the most recent version should always be referred to. At present, PSSAs do not have any specific protective mechanisms that automatically come into effect upon their designation. In each case, it is up to the proposing Member Government to select and propose a measure available through the IMO, such as routeing measures, strict application of MARPOL discharge and equipment requirements for ships or installation of Vessel Traffic Services (VTS).

While PSSA designation is not specifically to regulate international shipping activities for environmental purposes, it does provide some additional benefits. It brings international recognition to the special importance of a designated area and informs seafarers of the importance of taking extra care when navigating through the region. The process of preparing a PSSA proposal is also helpful as it provides a framework for States to identify sensitive areas and address risks from international shipping.[8] In areas where two or more IMO Member Governments have a common interest, they are encouraged to submit joint proposals (MEPC Circ. 298).

In general, to be identified as a PSSA, three elements must be present

(1) the area must have certain characteristics (ecological, socio-economic or scientific);

(2) it must be vulnerable to damage by international shipping activities; and

(3) there must be measures that can be adopted by IMO to provide protection to the areas from these specifically identified shipping activities (MEPC Circ.398 Guidance Document for Submission of PSSA Proposals to IMO).

A proposal should normally identify at least one protective measure that addresses the risk posed by international shipping activities to the area. Associated protective measures can include, for example, areas to be avoided (see section 3.5.3 below), traffic separation schemes, vessel reporting systems, discharge restrictions, restrictions on anchorage, vessel traffic services, pilotage schemes, etc., but they are limited to measures within the remit of IMO relating to international shipping activities. Under the provisions of the United Nations Convention on the Law of the Sea (UNCLOS) Article 211.6, special mandatory measures may be adopted that go beyond existing IMO measures (see MEPC 49/8/2 Draft Guidance Document on Associated Protective Measures for Particularly Sensitive Sea Areas, submitted by WWF).

[8] The results of this process may also be useful in helping States to identify no-go zones for offshore oil development and associated oil transport or to install special discharge restriction in those sensitive areas.

– Criteria for PSSAs –

To be identified as a PSSA, a proposed area must meet at least one of the ecological, socio-economic or scientific criteria provided in the PSSA Guidelines:

Ecological criteria: uniqueness or rarity; critical habitat; dependency; representativeness; diversity; productivity; spawning or breeding grounds; naturalness; integrity; vulnerability; bio-geographic importance.

Social, cultural and economic criteria: economic benefit; recreation; human dependency.

Scientific and educational criteria: Research; baseline and monitoring studies; education.

– Risks from International Shipping Activities –

PSSA proposals must address factors increasing the risk of damage such as:

- Vessel traffic characteristics in the area (operational factors, vessel types, traffic characteristics and harmful substances carried) ;
- Natural factors affecting navigation in the area (hydrographical, meteorological and oceanographic);
- Evidence of damage from international shipping activities;
- History of groundings, collisions or spills in the area and their consequences;
- Foreseeable circumstances under which significant damage might occur;
- Stresses from other environmental sources;
- Measures already in effect and their actual or anticipated beneficial impact.

Though the evidentiary requirements appear high, broad-based consultation can help to develop the required information. Moreover, the PSSA Guidelines do recognize that applicants from developing countries and those with economies in transition may have special needs and limited financial capacity.

There are currently seven designated PSSAs: the Great Barrier Reef, Australia (designated a PSSA in 1990); the Sabana-Camagüey Archipelago in Cuba (1997); Malpelo Island, Colombia (2002); waters around the Florida Keys, United States (2002); the Wadden Sea, Denmark, Germany, Netherlands (2002); Paracas National Reserve, Peru (2003); and PSSA status for the Western European Waters was approved in October 2004. The Torres Straits (Australia and Papua New Guinea) the Baltic Sea (except Russian waters), waters of the Canary Isles (Spain), Galapagos Archipelago (Ecuador) have been approved in principle as PSSAs but are still awaiting (October 2004) adoption of associated protective measures.

3.2.3 Areas to be Avoided

An Area to be Avoided (ATBA) can close an area to all ships or just certain sizes or classes of ships, such as large tankers or ships carrying other hazardous cargoes. An ATBA is defined as: "An area within defined limits in which either navigation is particularly hazardous or it is exceptionally important to avoid casualties." ATBAs have become an increasingly significant

approach to protecting specific areas; they can reduce pollution threats by removing altogether potentially polluting ships from sensitive areas.

Other IMO routeing measures may also be relevant to increasing the protection of the marine environment, improving the safety of navigation, decreasing the risk of collision or grounding, or organizing a safe traffic flow in or around environmentally sensitive areas (International Convention for the Safety of Life at Sea (SOLAS), 1974, Chapter V, regulation 10, as amended). These include:

- Inshore traffic zones (complements traffic separation schemes by creating a near shore traffic zone to steer local traffic away from transiting traffic);
- Deep water routes (a designated route surveyed for safety to keep transiting traffic away from shallow waters and submerged obstacles);
- Precautionary areas (an area within which ships must navigate with particular caution);
- Recommended routes (IMO-approved routes surveyed for safety along which ships are advised to navigate).

No Anchoring Areas may also be established in a clearly defined area where anchoring is hazardous or could result in unacceptable damage to the marine environment.

The required information and procedures for proposals are provided in the IMO General Provisions on Ships' Routeing (Assembly Resolution 572 (14), as amended), and the International Convention for the Safety of Life at Sea, 1974 (SOLAS) Chapter V, regulation 10. Assistance for preparing proposals may be found in the Guidance Note on the Preparation of Proposals on Ships Routeing Systems and Ship Reporting Systems for Submission to the Sub-Committee on Safety of Navigation (MSC/CIRC.1060). The General Provisions on Ship Routeing are updated frequently so the most recent version should always be referred to.

– Information requirements for new routeing system proposals –

- the objectives of the proposed routeing system and a demonstrated need for its establishment, including the reasons why the proposed routeing system is preferred;
- traffic patterns and hazards to navigation, and whether aids to navigation and the state of hydrographical surveys are adequate to enable accurate and safe navigation;
- marine environmental considerations;
- whether the proposed routeing system is to apply to all ships, or just certain categories of ships or ships carrying certain cargoes or types and quantities of bunker fuel;
- any alternative routeing measures, if necessary, for ships which may be excluded from using a routeing system or any part thereof;
- the reference chart used for delineation of the routeing system showing the new system or the amendments to existing systems;
- whether the system being proposed will be mandatory.

Routeing systems beyond the territorial sea are generally adopted as recommendations to seafarers, in other words, expert advice to follow at their discretion. Where there is "proper and sufficient justification" (e.g. problems with compliance), routeing systems may be made mandatory. The extent of a mandatory routeing system is to be limited to "what is essential in the interest of safety of navigation and the protection of the marine environment" and must not adversely affect ports and harbours of other nations.

IMO will only adopt a proposed routeing system if it is satisfied that the proposed system will not impose unnecessary constraints on shipping and is otherwise in accordance with the requirements of SOLAS. In particular, an area to be avoided will not be adopted if it would impede the passage of ships through an international strait.

The application of ship's routeing measures for the specific purpose of protecting sensitive marine areas is becoming more widespread and widely accepted by the international community. Since 1994, at least 14 areas have been protected through application of routeing measures at least partially on the basis on their environmental sensitivity and vulnerability to the impacts of international shipping. This is in addition to associated protective measures adopted for PSSAs. In 2004, the first mandatory ATBA was approved to protect an environmentally sensitive sea area along the coast of New Zealand's North Island, including the Poor Knights Islands marine reserve (MSC 78/26).

3.3 Environmental regulations of offshore oil development

At present, over 70 international conventions and agreements are directly concerned with protecting the marine environment (Patin, 1999). However, not one of these legally binding agreements is exclusively devoted to regulating offshore oil development. Some aspects are incorporated in different conventions, especially in conventions that were in principle designed for the transportation of oil by ships. But the majority of aspects related to offshore oil are not contained in international conventions. There are for example no international laws for the design of floating production platforms or clear legally binding rules for seismic surveys. The international agreements for oil spill liability, Safety of Life on Sea (SOLAS) or the Standards of Training, Certification and Watch keeping for Seafarers (STCW) were exclusively designed for maritime traffic and do not apply to offshore oil platforms. There are no legally binding international limits for the discharge of waste products such as drilling fluids and cuttings and production water. The Canadian Maritime Law Association (CMLA) has addressed the need for an international legal framework many times. In one of their documents they state (CMLA, 1996):

"The CMLA has always taken the position that government and industry should actively pursue the idea of a comprehensive international convention on offshore units and related matters in a calm and reasonable atmosphere before a major disaster takes the issue in an emotional and political direction where neither reason or common sense will prevail."

and

"The need for a comprehensive international convention on offshore units would present to the international community a consensual regime on all relevant matters which would avoid piecemeal and fractured responses by individual nations and the international community."

In 1995, Greenpeace sent a proposal, to IMO, to amend the International Convention for the Prevention of Marine pollution by Dumping of Wastes and other Matter (London Convention) with all waste products generated by offshore production. The proposal was rejected in 1996. Because of the lack of an international legal framework, IMO advises countries to write national and preferably regional legislation for offshore development. Several International organisations have written guidelines for the regulation of offshore oil development (see annex 3). These guidelines may be useful to countries and regions willing to formulate their own legal framework.

3.3.1 Important conventions for the regulation of offshore oil

Although important conventions such as the Biodiversity Convention, Convention on migratory species or RAMSAR did not formulate specific restrictions for the offshore oil industry, developments should be carried out in accordance with their general principles. Examples of some relevant general principles that are mentioned in declarations of the United Nations Conferences on the Human Environment in 1972 (Stockholm declaration) and in 1992 (Rio declaration) are:

- Principle 22 of the Stockholm Declaration and Principles 12 and 13 of the Rio Declaration emphasize the international responsibility of States to develop effective international regimes to address transboundary pollution and liability and compensation for environmental damage both within and outside State jurisdiction.
- Chapter 17 of the Rio declaration refers to the needs of addressing environmental impact assessment, contingency plans and human resource development.

- The Rio Declaration includes the precautionary principle: in order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. This implies that where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

Some important International conventions that specifically mention one or several aspects directly related to offshore oil development are outlined below (Caicedo Restrepo, 2000; Canadian Maritime Law Association, 1996):

International Conventions	**Aspects related to offshore oil exploitation**
The Declaration of the United Nations Conference on the Human Environment (1992) Rio Declaration").	States, acting individually, bilaterally, regionally or multilaterally and within the framework of IMO and other relevant international organisations, whether sub-regional, regional or global, as appropriate, should assess the need for additional measures to address degradation of the marine environment from offshore oil and gas platforms, by assessing existing regulatory measures to address discharge, emissions and safety and the need for additional measures.
The United Nations Convention on the Law of the Sea, UNCLOS	Declaration of general principles for any activity exploiting resources of the ocean; gas, oil, minerals and fish. It contains obligations that States shall take all means necessary to control pollution of the marine environment, including minimizing discharges from offshore oil installations to the fullest possible extent; and taking measures for accident prevention and emergency response, and the regulation of the design, construction, equipment, operation and crewing of them; and to carry out environmental impact assessments before starting any potentially harmful activity. States shall establish global and regional rules for the control of marine pollution arising from offshore units and seabed activities. States need to ensure that sufficient recourse is available under their legal systems for prompt and adequate compensation or other relief in respect of damage caused by pollution to the marine environment. Coastal States are required to give warning of the presence of offshore oil platforms, and arrange the removal of abandoned structures for safety of navigation and protection of the marine environment.
The International Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (the Basel convention). The United Nations Environment Programme	Its objective is to reduce transboundary movements of wastes subject to the Convention to a minimum consistent with the environmentally sound and efficient management of such wastes; to minimize the amount and toxicity of wastes generated and ensure their

(UNEP) provides the secretariat for this convention.	environmentally sound management as closely as possible to the source of generation; and to assist member states in environmentally sound management of the hazardous and other wastes they generate
IMO: MARPOL 73/78	It contains regulations for discharge from vessels of any type operating in the marine environment, including floating craft and fixed or floating platforms. However, the definition of "discharge" excludes the release of harmful substances directly arising from the exploration, exploitation and associated offshore processing of seabed mineral resources. This implies that garbage and chemical residues, and oily residues from the vessels engines, generated on offshore platforms, are regulated. Discharge of drilling cuttings, fluids and production water are not included in this convention.
IMO: Convention for the Prevention of Marine pollution by Dumping of wastes and other Matter (London Convention)	Contains rules for incineration at sea and dumping at sea of waste products generated on land. It contains guidelines (non-legally binding) for the disposal of platforms and other man made structures at sea.
IMO: International Convention on Oil Pollution Preparedness, Response, and Co-operation (OPRC)	Its objectives are to advance the adoption of adequate response measures in the event that an oil-pollution incident does occur; to provide for mutual assistance and co-operation between States.
IMO MEPC guidelines on application of MARPOL Annex I requirements to FPSOs and FSUs	It contains non-legally binding guidelines for FPSOs equivalent to those that are required by MARPOL for conventional oil tankers. The guidelines provide a list with MARPOL annexe I regulations and indicate which regulations are applicable, not applicable and recommended for oily waste management and design of FPSOs.
IMO: Code for the Construction and Equipment for Mobile Offshore Drilling Units	It contains non-legally binding guidelines equivalent to those that are required by the International Convention for conventional ships such as SOLAS and STCW.
Examples of Regional Conventions	**Aspects related to offshore oil exploitation**
OSPAR or Convention for the Protection of the Marine Environment of the North-East Atlantic	Its objectives are to safeguard human health and to conserve marine ecosystems and, when practicable, to restore marine areas which have been adversely affected; to take all possible steps to prevent and eliminate pollution and enact the measures necessary to protect the sea area against the adverse effects of human activities. It contains discharge limits for waste products and contains rules to prevent and eliminate pollution generated by offshore production platforms. The Appendices to the convention provide details about best available technology and best environmental practice.
The Baltic Marine Environment Protection Commission (Helsinki Commission or Helcom)	Similar to OSPAR.
Convention for Co-operation in the Protection and Development of the	It contains a protocol on Co-operation in Combating Pollution in Cases of Emergency such as an oil spill.

Marine and Coastal Environment of the West and Central African Region (Abidjan Convention).	

The following paragraphs will give an overview of legal frameworks that regulate separate activities related to offshore oil development.

3.3.2 Regulations concerning seismic surveys

At the international level no specific regulations for the use of seismic air guns exist. However the sounds generated during a seismic survey could, as a form of energy, fall under the definition of pollution of the marine environment contained in the UN Law of the Sea convention (UNCLOS). UNCLOS formulates several general duties for the protection and preservation of the marine environment. These obligations include: to protect the marine environment from pollution; to prevent it from occurring; to act with precaution, and to carry out environmental impact assessments (Dotinga and Oude Elferink, 2000). Several states have translated these general duties into the following measures that impose restrictions on seismic surveys.

In Canada, for example, such restrictions include maintenance of the distance between the survey and marine mammals and limitations on seismic surveys during the season that some of these species are present in Canadian waters.

The United States has similar restrictions as in Canada. Seismic surveys are prohibited in certain areas at certain times of the year when endangered species are likely to be present.

Norway has incorporated the recommendations of a study summarizing the effects of seismic surveys on fish into its national regulations. This report concludes that use of air guns should be advised against in areas where fishing is taking place. Buffer zones of 50 kilometres around the outer edges of fishing areas are established. Surveys within these zones are only allowed when no fishing takes place. Fish migration routes are protected from seismic surveying in a similar way as fishing periods and areas. Surveys are forbidden all year round in shallow areas that are known to be reproduction areas for fish (Dalen, 1996; (Dotinga and Oude Elferink, 2000).

United Kingdom indicates limitations for seismic surveys in the exploration license. The spawning periods of fish and migration routes are amongst other limitations taken into account (Shell, 1999; Dotinga and Oude Elferink, 2000). Other measures ensure that seismic surveys will not start if cetaceans are seen within 500m. Surveys may therefore only be carried out during the daytime and only when there is reasonable visibility. Survey vessels have to wait for 20 minutes after the last sighting before proceeding (UKOOA website).

Several oil companies like Shell, Conoco-Phillips or Woodside begin airgun firing with a slow build up of power, also called *soft start*, to give unspotted cetaceans or fish some time to leave the area. They also use observers for visual sighting of cetaceans and in some cases Shell also uses sonic identification.

3.3.3 Regulations concerning drilling fluids and cuttings, and production water

The general principles contained in UNCLOS also apply to the waste products generated by offshore development. Because new scientific evidence indicates that the ecological impacts of these waste products may be more profound than initially presumed, many governments

increasingly seek to require zero-discharge (Patin, 1999). A European Union proposal outlines a general goal to achieve zero oil discharge in European waters by the year of 2020. However, the proposal has not been accepted yet and the European offshore operators are actively lobbying against it.

Discharge of oil-based drilling muds into the sea is prohibited in many regions. Oil-based drilling muds and cuttings arising from the use of oil-based drilling fluids should be taken ashore for treatment in for example Canada, the US, the Baltic Sea (Helcom), North Sea and North East Atlantic (OSPAR). Water based and synthetic based muds are tested under OSPAR and Helcom formats for bioaccumulation potential and bio-degradability. A discharge permit is only given if these muds are judged to be environmentally benign. - WWF argues that these tests are limited and do not fully assess cumulative and ecological impacts. - Discharge of drilling cuttings is strictly forbidden under Helcom and OSPAR if they contain more than 1% of oil. Under Helcom the concentration of mercury and cadmium should furthermore not exceed 1 mg/kg for the whole mud (Wills, 2000).

On a worldwide scale, production water is increasingly re-injected into the geological formations. U.S. regulations prohibit discharges of produced waters from platforms in ecological vulnerable areas and in near shore waters. Discharge of produced waters into vulnerable ecosystems such as estuaries and mangrove ecosystems still continues in Nigeria, Angola, China and Thailand (Rabalais, 1998).

If overboard discharge is allowed, many countries require from oil companies to first remove the free oil content in produced water. Most oil companies are able to achieve average levels below 20 mg/L. Long-term average for California was 18 mg/L and for Alaska 15mg/L. The maximum allowable legal limit in the U.S. Gulf of Mexico is 29 mg/L and for the North Sea and Canada this is 40mg/L (NCR, 2002). In 2006, the limit for the North Sea will be lowered to 30 mg/L.

3.3.4 Regulations concerning the prevention of accidental pollution arising from offshore oil exploitation and extraction

The IMO Code for the Construction and Equipment for Mobile Offshore Drilling Units contains guidelines that are quite similar to the rules contained in conventions for shipping aimed at preventing accidents (i.e. SOLAS and STCW). The code does not contain any specific guidelines for FPSO design. However, it makes a special mention on metal fatigue analysis. A careful and regular analysis of fatigue for FPSOs is important. These constructions have to continuously endure extreme loading and offloading conditions which makes risks on small cracks in the metal relatively important (Ayyub and de Souza, 200).

Although there are no legally binding international (non-regional) regulations for FPSOs, the private sector developed guidelines for FPSO design and maintenance. These were formulated by classification societies such as, Det Norske Veritas (DNV), the American Bureau of Shipping (ABS) and Bureau Veritas. [9]

[9] DNV certified the FPSO that will be used by Woodside for the Chinguetti field off the Mauritanian coast.

– Double-hulled FPSOs –

An Environmental Impact Study was carried out in the US to assist decision-making on whether to allow FPSOs in the Gulf of Mexico or not. With regard to the selection of hull configuration of FPSOs, it was argued that double-hulled FPSOs will significantly reduce grounding risks after collision. Various studies have shown that a typical single-hull vessel can be penetrated with an energy impact of approximately 15 MJ. On the other hand, a typical double-hull wing tank of 2m in width would require approximately 170 MJ to penetrate the longitudinal bulkhead storing the oil (approximately 205 MJ for a 2.5m wing tank width). Various vessels loading oil can produce such energies based on their mass and typical speeds while maneuvering next to the FPSO (Wang *et al.,* 2002). The US government decided in 2002 to only allow double-hulled FPSOs and this only in a limited number of areas in the Gulf of Mexico.

An article in the Surveyor maritime magazine of spring 2003 states and agrees that there are many reasons to choose a double-hull FPSO. The smooth sided cargo tanks are easily cleaned, inspected and maintained and as the vessel ages, it is convenient to inspect, repair the underside of the cargo area from inside. This is an important advantage as FPSOs cannot be dry docked and will stay in service during the entire lifetime of the oil field (Surveyor, 2003)

Some of the FPSOs destined for the West Africa Region are likely to be converted single-hulled oil tankers (25-28 years old) (Lloyds list, 2003, 2004). The FPSO that will be used by Woodside for the Chinguetti field off the Mauritanian coast is likewise a converted single-hulled oil tanker (built in 1976). It is proposed that it will be used for up to 15 years by which time it will be about 43 years old.

Single-hulled tankers constitute a financially interesting development option for the industry. There are today many surplus fleets cheaply available on the market because of the IMO's requirement to phase out large single-hull conventional tankers by the year of 2007 (Shimamura, 2002). There are no regional or national rules for hull configuration of FPSOs in West Africa. Although the waters of the West African Region were declared benign by the industry, single-hulled FPSOs pose nevertheless a certain risk in this specific area. Collision risk for example between FPSOs and other vessels, especially fishing vessels, may be quite elevated. The West African Marine Eco Region is one of the most densely fished areas in the world.

– Collisions with offshore installations –

The UK Offshore Operators Association states that in the UK collisions with other vessels do occur. Most collisions between offshore production facilities are with oil tankers manoeuvring next or behind production facilities to load oil. Fishing boats caused approximately 4% of the collisions reported. In order to avoid and reduce these collisions, a safety zone is established around the offshore installations. Under UK legislation, a zone of 500m radius (an area of approximately 78 hectares) is created around offshore production installations (UKOOA, 2003). Because of the potential collision hazard, also with international maritime traffic, these exclusion zones could probably obtain official international recognition by IMO as "Areas-to-be-avoided".

3.4 Regulations for dealing with oil spills

3.4.1 Oil spill preparedness

We have seen in part 2 that the West African Region is classified as a medium risk area with regard to oil spills. The level of preparedness is however considered to be low. The area is therefore ranked by UNEP's Regional Seas Programme as a priority region for the spending of effort to improve oil spill response capabilities (Moller, 2002).

An IMO convention has been designed for oil spill preparedness. The International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 (OPRC Convention) defines the basic elements for co-operation between government and industry in marine pollution response. Emphasis is given in the Convention to developing contingency plans, equipment stocks, research and development initiatives, training and exercise programmes, and appropriate spill notification procedures. State parties to the OPRC must require Offshore Unit operators to report (accidental) discharges. Offshore Units are required to have oil pollution emergency plans. It should be noted however that most responses recover in practice less than 10% of the spilled oil (Steiner, 2003).

The Abidjan Convention, to which the coastal West and Central African countries are party, contains similar requirements as the IMO OPRC convention.

In addition to implementing the IMO's oil spill response convention, governments could require industries to have the equipment and personnel in place to respond to a maximum probable discharge. The oil Spill Response Team in Alaska has to be able to recover 45,000 tonnes in 72 hours.

The International Maritime Organization (IMO) and the International Petroleum Industry Environmental Conservation Association (IPIECA)—the oil industry's focal point for communication—are working with national governments and other partners to establish oil spill contingency plans around the World. This effort is called the Global Initiative (GI), which aims to:

- assist countries in developing a national structure for dealing with major oil spills through the mobilisation of external assistance and industry support at national and regional levels; and
- encourage ratification and implementation of the International Convention on Oil Pollution Preparedness, Response and Cooperation, 1990 (OPRC Convention), and the conventions relating to liability and compensation (1992 Civil Liability Convention (CLC) and 1992 Fund Convention).
- Encourage the tiered response concept which states that oil spill preparedness should exist at different levels. Tier 1, immediate response by on-site (vessel, platform) personnel and equipment; Tier 2, support from local or regional support centres; Tier 3, national/international support.

3.4.2 Liability

International legislation for liability of environmental causality arising from offshore platforms, including floating production facilities (FPSOs) is non-existent. Also oil spills arising from platforms can be disastrous and may involve considerable costs - clean up costs and compensation to affected parties (for example tourism, fishermen).

- International Convention for oil spill liability offshore oil has never come into force -

The only non-regional international convention specifically addressing liability for offshore exploration and exploitation civil activities is the 1976 Convention on Civil Liability for Oil Pollution Damage Resulting from Exploration and Exploitation of Sea Bed Mineral Resources (CLEE Convention), which has never come into force. The negotiators for the convention were not able to place the convention within the jurisdiction of any competent international organisation. Furthermore, CLEE failed to attract industry support because it breached the uniformity principle by allowing signatory states to opt for limited or unlimited liability (Canadian Maritime Law Association, 1996).

In absence of international law, a number of Offshore Unit Operators in Europe agreed to the Offshore Pollution Liability Association (OPOL-1974) voluntary pollution liability compensation scheme. Participating companies accept strict liability to affected persons for pollution damage and to government authorities for cleanup costs, up to a maximum of $120 million dollars per incident (Canadian Maritime Law Association, 1996; OPOL website). The UK government obliges oil and gas companies, wishing to exploit their continental shelf, to become a member of OPOL – a clause is included in the licence agreement. An adequate liability scheme for offshore oil platforms (including FPSOs) provides a strong incentive within the private sector for self-regulation (personnel communication by R. Segal from OPOL to S. Kloff).

– Who spilled the oil ? –

After a relatively large oil spill caused for example by a blow-out, an FPSO that is perforated after collision with another vessel or an oil tanker accident it is easy to track down the guilty party. But the majority of oil spills arsing from offshore platforms are small to medium-sized. This usually involves accidental discharges of oil during terminal operations and not all accidents are reported by the spiller as required by OPRC (AMSA, 1999).

In July 2004 a medium-sized oil spill washed ashore on Kalimantan's shore line (Indonesian Borneo). The coastline and aerial roots of the Mangrove forest became covered by oil. However, none of the oil companies active off the coast stepped forward as the responsible party (personal communication by G. Fredriksson, nature conservationist working in Kalimantan, to S. Kloff). Local government departments tried to remove the slick with very limited financial resources. Some of the oil companies compensated voluntarily a part of these costs. An Oil Spill Liability Trust Fund similar as in the US could in this case release the necessary financial resources in order to provide for immediate relief (cleanup costs and compensation to affected parties) instead of having to wait for an investigation that proves who spilled the oil. The Indonesian authorities are currently looking into the possibilities to trace down the perpetrator by making fingerprints of the oil. An analysis of the oil (chemical fingerprinting) provides evidence that the oil slick has the same unique characteristics as that of the oil discharged by a certain vessel or produced by a certain offshore well.

3.5 Citizen Advisory council - participatory approach to offshore development

In part two it was concluded that offshore oil development impacts on the environment in many different ways. Exploration usually starts with seismic surveys, which is followed by exploratory drilling. Exploration and exploitation activities generate significant amounts of waste products and attract furthermore intense support vessel and oil tanker traffic. All the different development stages may moreover occur simultaneously. Next to offshore development, the marine ecosystem has to carry a number of other impacts arising from for example land-based activities and fisheries. In the previous part we have seen that regulation of maritime oil transport and offshore oil development is complex and that there are many different actors involved.

Important international guidelines advise Governments and the Oil industry to actively involve a wide range of stakeholders in decision-making procedures, in order to resolve the complex issues. Fishermen, scientists and conservationists for example, all possess valuable information about the functioning and vulnerability of the marine ecosystem. Their input is critical in order to define the boundaries in which offshore oil development may take place without causing unacceptable damage to the environment and socio-economic activities in the region. However, stakeholders do not always have the time or resources, and often lack the technical knowledge to effectively contribute to long and complicated decision-making procedures regarding offshore oil development.

In Alaska stakeholders have found ways to fully and effectively engage in a constructive dialogue with government and the industry. Stakeholders are united in the Prince William Sound Regional Citizen's Advisory Council. The council is made up of representatives of the private sector (fishery and tourism), representatives of environmental NGOs and scientists. The council is funded by $2.7 million annually from the oil industry, maintaining two offices that employ a staff of 16.

The members of the council play, next to participation in decision-making procedures, an important role in law enforcement. All members have guaranteed access to oil facilities. Thanks to the funding they are able to undertake independent evaluations, ecological monitoring and to hire independent expertise. The ultimate goal of the council is to give informed feedback to both government and industry. The government and the oil industry have both greatly benefited from the Alaska citizen council. It has been responsible for continuing improvement in the safety of the oil transportation system in the region. Citizen confidence in the safety of oil development and maritime oil transport markedly increased thanks to the council. After the Exxon Valdez oil spill of 1989, people lost all faith in the self-regulating capabilities of the oil industry and the ability of their government to control them. The Alaska pipeline owners created the council right after the catastrophe with support from the government.

Stakeholders in Alaska based their organisation on a model that already existed on the Shetland Islands in Scotland. This particular council managed to negotiate extremely good conditions with the Oil and Gas Industry, which they have used to improve for example infrastructures on the islands. They have strict rules on dealing with the all Industries. Their policies include:

- The implications for fishing interests.

- The need to ensure that safe navigation is maintained.
- Taking into account of existing marine fish farms in the locality.
- The implications for recreational interests (Tourism).
- Potential effects, including cumulative, on the environment and natural heritage interests.

The Council will with others furthermore establish a Coastal Zone Management Plan that meets the needs of the Shetland community.

It is the experience of the authors that these types of citizen participation reinforce and support governments in accordance with the World Summit on Sustainable Development (WSSD) Implementation Plan, para 19 (t). They also support the Aarhus Convention as required by the International Financial Institutions. The Aarhus Convention in its preamble recognizes that "every person has the right to live in an environment adequate to his or her health and well-being."

By actively involving a wide range of stakeholders that are well informed, governments and industry can avoid a lot of the mistakes that have been made in the past particularly those identified by the Extractive Industry Review (EIR).[10]

[10] People involved with the Alaska and Shetland Islands councils are willing to provide support to stakeholders of the West African Marine Eco Region.

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Annex 1- WSSD Johannesburg 2002, Key action points on Oil, Gas and Marine issues

The World Summit for Sustainable Development (WSSD), held in Johannesburg in August 2002 reinforced the Rio agenda and urged in its Plan of Implementation that: "States should: Take immediate steps to make progress in the formulation and elaboration of national strategies for sustainable development and begin their implementation by 2005".

Paragraph 19 of the Johannesburg report states in clauses S-W:

(s) Strengthen national and regional energy institutions or arrangements for enhancing regional and international cooperation on energy for sustainable development, in particular to assist developing countries in their domestic efforts to provide reliable, affordable, economically viable, socially acceptable and environmentally sound energy services to all sections of their populations;

(t) Countries are urged to develop and implement actions within the framework of the ninth session of the Commission on Sustainable Development, including through public-private partnerships, taking into account the different circumstances of countries, based on lessons learned by Governments, international institutions and stakeholders and including business and industry, in the field of access to energy, including renewable energy and energy-efficiency and advanced energy technologies, including advanced and cleaner fossil fuel technologies;

(u) Promote cooperation between international and regional institutions and bodies dealing with different aspects of energy for sustainable development within their existing mandate, bearing in mind paragraph 46 (h) of the Programme of Action for the Further Implementation of Agenda 21, strengthening, as appropriate, regional and national activities for the promotion of education and capacity-building regarding energy for sustainable development;

(v) Strengthen and facilitate, as appropriate, regional cooperation arrangements for promoting cross-border energy trade, including the interconnection of electricity grids and oil and natural gas pipelines;

(w) Strengthen and, where appropriate, facilitate dialogue forums among regional, national and international producers and consumers of energy.

Para 31 deals with the Marine environment

In accordance with chapter 17 of Agenda 21, promote the conservation and management of the oceans through actions at all levels, giving due regard to the relevant international instruments to:

(a) Maintain the productivity and biodiversity of important and vulnerable marine and coastal areas, including in areas within and beyond national jurisdiction;

(b) Implement the work programme arising from the Jakarta Mandate on the Conservation and Sustainable Use of Marine and Coastal Biological Diversity of the Convention on Biological Diversity, including through the urgent mobilization of financial resources and technological assistance and the development of human and institutional capacity, particularly in developing countries;

(c) Develop and facilitate the use of diverse approaches and tools, including the ecosystem approach, the elimination of destructive fishing practices, the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks by 2012 and time/area closures for the protection of nursery grounds and periods, proper coastal land use; and watershed planning and the integration of marine and coastal areas management into key sectors;

(d) Develop national, regional and international programmes for halting the loss of marine biodiversity, including in coral reefs and wetlands;

(e) Implement the RAMSAR Convention, including its joint work programme with the Convention on Biological Diversity, and the programme of action called for by the International Coral Reef Initiative to strengthen joint management plans and international networking for wetland ecosystems in coastal zones, including coral reefs, mangroves, seaweed beds and tidal mud flats.

Para 32 Deals with land based pollution of the Marine Environment

Advance implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities and the Montreal Declaration on the Protection of the Marine Environment from Land-based Activities, with particular emphasis in the period 2002-2006 on municipal wastewater, the physical alteration and destruction of habitats, and nutrients, by actions at all levels to:

(a) Facilitate partnerships, scientific research and diffusion of technical knowledge; mobilize domestic, regional and international resources; and promote human and institutional capacity-building, paying particular attention to the needs of developing countries;

(b) Strengthen the capacity of developing countries in the development of their national and regional programmes and mechanisms to mainstream the objectives of the Global Programme of Action and to manage the risks and impacts of ocean pollution;

(c) Elaborate regional programmes of action and improve the links with strategic plans for the sustainable development of coastal and marine resources, noting in particular areas which are subject to accelerated environmental changes and development pressures;

(d) Make every effort to achieve substantial progress by the next Global Programme of Action conference in 2006 to protect the marine environment from land-based activities.

Para 33. Enhance maritime safety and protection of the marine environment from pollution by actions at all levels to:

(a) Invite States to ratify or accede to and implement the conventions and protocols and other relevant instruments of the International Maritime Organization (IMO) relating to the enhancement of maritime safety and protection of the marine environment from marine pollution and environmental damage caused by ships, including the use of toxic anti-fouling paints and urge IMO to consider stronger mechanisms to secure the implementation of IMO instruments by flag States;

(b) Accelerate the development of measures to address invasive alien species in ballast water. Urge IMO to finalize the IMO International Convention on the Control and Management of Ships' Ballast Water and Sediments.

Para 145 Deals with strengthening institutional frameworks for sustainable development at the national level:

States should:

(a) Continue to promote coherent and coordinated approaches to institutional frameworks for sustainable development at all national levels, including through, as appropriate, the establishment or strengthening of existing authorities and mechanisms necessary for policy-making, coordination and implementation and enforcement of laws;

Take immediate steps to make progress in the formulation and elaboration of national strategies for sustainable development and begin their implementation by 2005.

Annex 2 The full European Bank for Reconstruction and Development, Environmental Policy on : Mainstreaming environmental considerations through the EBRD's sectoral and country strategies and technical cooperation activities

37. Country Strategies

Each Country Strategy will reflect the EBRD's environmental mandate and will contain a section which describes the environmental implications and opportunities of the EBRD's proposals, including environmental technical cooperation activities. The section will refer to the EBRD's possible approach to address environmental issues through its projects. This section will draw upon the country's environmental strategies and planning (i.e. National Environmental Action Plans, EU accession strategies) and the environmental work of other international institutions, notably the World Bank and the EU, to describe the country's key environmental issues.

38. Sector Strategies

Each Sector Strategy will reflect the EBRD's environmental mandate as well as contain a section on the EBRD's possible approach for addressing environmental issues through sector-specific projects.

39. Strategic environmental assessments In addition to EIAs on specific projects, the EBRD may also carry out Strategic Environmental Assessments (SEAs) on the likely environmental consequences of proposed sector or country/regional plans or programmes which have the potential to significantly affect the environment.

The Bank defines "SEA" in accordance with the UNECE definition, which is anticipated for approval in 2003 as part of the Espoo Convention.

40. Technical cooperation (TC)

The EBRD will utilise its TC programme to mainstream environmental considerations in its projects. Specifically, the EBRD will develop, in close cooperation with other donors, assistance programmes and TC initiatives related to enhancing the sustainability of projects, public consultation as well as the environmental management capability of its private and public sector project sponsors. TC funds can also be used to finance strategic environmental studies. Stand-alone TC projects (e.g. those related to capacity building and institutional strengthening) will be undertaken, as appropriate.

Building partnerships to address regional and global environmental issues

41. Regional and global initiatives

Recognising that many of the environmental problems of its region of operations are global and transboundary in nature, the EBRD will continue to contribute to regional and international environmental initiatives that aim to address these.

42. The EBRD will, within the framework of its mandate, support through investments the implementation of Agenda 21 and of relevant global and regional agreements on environment and sustainable development, including the Framework Convention on Climate Change, the Kyoto Protocol, the Convention on Biological Diversity, the Convention on Environmental Impact Assessment in a Transboundary Context, and the Convention on Access to nformation, Public Participation in Decision-Making and Access to Justice in Environmental Matters. Each of these Conventions may furnish specific themes for environmental activities.

The EBRD will assist its countries of operations to incorporate relevant commitments under, and opportunities from, these international environmental agreements.

The full policy is available on:

http://www.ebrd.com/about/policies/enviro/policy/policy.pdf

Annex 3 Oil and Gas issues in the Niger Delta

The Niger Delta covers 70,000 $km^{2,}$ and that makes it one of the largest wetlands in the world. Nearly half of the Delta is covered in mangrove forests. Other wetland types in the complex are: Freshwater swamps and Barrier Island swamp forests.

The mangrove forests of Nigeria rank as the largest in Africa, the third largest in the world. 7000 km^2, of the African total mangrove stock of 9,730 km^2, is found in the Niger Delta. The Delta is important for biodiversity and human survival. Up to 60% of fishes caught between the Gulf of Guinea and Angola breed in the mangrove belt of the Niger delta.

It is within the mangrove zone of the wetland that the richest oil and gas fields of Nigeria are currently located although many new oil and gas fields are also being opened offshore. In 1956, a Shell/British Petroleum joint venture discovered crude oil at Oloibiri, and commercial production began in 1958. Previously, Nigeria had been mainly a producer of cocoa, groundnuts, and other agricultural items. As the exploitation of oil resources continued in the postcolonial era, Nigeria became increasingly reliant on oil, and its reputation as an agricultural producer disappeared. Oil revenue now accounts for 90% of Nigeria's export earnings (almost $300 billion in the past 40 years). Today, there are 606 oil fields in the Niger Delta, with over 3,000 kms of pipeline (most lie exposed across the landscape of the Delta), linking 275 flow stations to various export facilities.

Environmental degradation

Deforestation

Oil exploration, field preparation, production and other activities require that access must be cut through mangrove forests for the passage of both man and equipment. Access methods include line cutting, clearing for base camps, drill sites, and pipelines. These activities remove a considerable amount of mangrove vegetation. When combined with bad road building practices that often lead to inundation of the forest when water is trapped on one side of the road, mangroves are suffocated by being inundated. Being starved of water also kills mangroves on the other side of such roads. Many instances of this are found in both the mangrove and rainforests of the Delta. Moreover, opening up the mangrove forest invites loggers and other poachers.

Oil spills

Oil spills in the Niger Delta has become both notorious and endemic. According to the US Energy Information Centre, more than 4000 oil spills have been recorded in Nigeria’s Niger Delta over the past four decades. The effects of these spills remain for years because there is no single case of where a spill has been properly and adequately cleaned up. Cleanup usually involved setting the oil ablaze. Oil spills continue regularly as a result mainly of breakdowns of old, poorly maintained pipelines and installations. Most pipelines in the Niger Delta are forty years old, rusty and in disrepair. They are generally laid on the surface criss-crossing the land in cumbersome clusters.

On average, three oil spills occur each month. Oil companies blame sabotage or people stealing oil for most of the spills. Independent researchers claim that these account for only about 15% of the spills, the balance is caused by poor engineering practises including failure to replace rotting pipelines and installations. In March 1998 a crude oil spill of more than

840,000 barrels occurred at Shell's Jones Creek Flow Station due to a pipeline failure. In 2000, Shell Nigeria reported 340 oil spills resulting in 30,751 barrels of oil being spilled.

Water pollution

In addition to oil spills, waste generated from exploratory drilling operations are disposed of indiscriminately often into drainage channels and waterways. Drinking water supplies from streams are often polluted with oil.

Air pollution and Climate change

The wasteful flaring of associated gas in almost all Nigerian oil fields produces large quantities of toxic chemicals as well as greenhouse gases. Until recently 86% of all gas was flared off depriving Nigerians of future energy supplies and adding to climate change problems. The flaring continues for 24 hours a day. Many communities claim that the night never comes and the rainfall is always acid. The combustion is not complete and oil droplets fall on waterways, crops, houses and people.

Soil pollution

Scientific investigations in the Niger Delta specifically associate oil contamination of the soil with low yield of arable crops.

Poverty

Although over $30 billion worth of oil and gas has been extracted from the Niger Delta, the people still live in miserable poverty. The rural poor depend disproportionately on renewable natural resources (fish, shellfish and other non-timber-forest-products) as well as environmental services for food, shelter and healthcare delivery.[*]

Cost of cleaning up the Delta

The costs of cleaning up the environmental and social problems in the Niger Delta, and restoring the Delta to the productive eco system it was before oil, will probably run into $ Hundreds of millions, and possibly $ billions.

Oil activities in the Marine Environment

A lot of the newer oil and gas fields are being exploited offshore from Oil platforms. There are problems with the environmental performance on the platforms and it is claimed, even by some oil company workers, that the environmental standards are far below those in the Gulf of Mexico. Oil spills occur from tanker loading/washing and from off shore oilrigs. Some of these go unreported and are not cleaned up. Rubbish is often thrown into the sea from the rigs, which is completely against Nigerian laws. New double-hulled FPSOs are being built to work in Nigerian waters.

Nigeria has taken virtually all the US Oil and Gas legislation without many amendments and turned it into Law in Nigeria. The problem is the enforcement of the laws.

[*] Extracts from a paper by Professor Emmanuel Obot, Director of NCF, with some additions by Clive Wicks

Annex 4 Basic documents and guidelines concerning environmental practices in offshore oil and gas activities (from UNEP website http://www.oilandgasforum.net/)

		Topic			
Organisation	**Document**	**Env. Impact Assess-ment**	**Env. Manage-ment**	**Env. Techno-logies**	**Env Reporting**
E&P Forum/UNEP:	Environmental Management in Oil and Gas Exploration and Production (1997)	**X**	**X**		**X**
IUCN/E&P Forum:	Oil and Gas Exploration and Production in Mangrove Areas (1993)		**X**	**X**	
ARPEL:	A Guideline for the Disposal and Treatment of Produced Water			**X**	
ARPEL:	A Guideline for the Treatment and Disposal of Exploration and Production Drilling Wastes			**X**	
ARPEL:	Guidelines for an Environmental Impact Assessment (EIA) Process			**X**	
AEPS (Arctic Council)	Arctic Offshore Oil & Gas Guidelines (1997)		**X**	**X**	
E&P Forum:	Exploration and Production Waste Management Guidelines (1993)			**X**	
E&P Forum:	Guidelines for the Development and Application of Health, Safety and Environmental Management Systems (1994)		**X**		
E&P Forum:	E&P Forum Guidelines for the Planning of Downhole Injection Programmes for Oil-Based Muds Wastes and Associated Cuttings from Offshore Wells (1993)			**X**	
E&P Forum:	Quantitative Risk Assessment Data Directory (1996)			**X**	
E&P Forum:	The Physiological Effects of Processed Oily Drill Cuttings (1996)			**X**	
E&P Forum:	Technologies for Handling Produced Water in the Offshore Environment (1996)			**X**	
E&P Forum:	Production Water: Current and Emerging Technologies (1994)			**X**	
E&P Forum:	North Sea Produced Water: Fate and Effects in the Marine Environment (1994)	**X**		**X**	

Petro-Maritime Consultants	Operational Discharges from Offshore Oil and Gas Exploration and Exploitation Activities: Regulatory Requirements and Enforcement Practices (1997)		**X**	**X**	
World Bank	Environmental Guidelines 1988, 1995		**X**	**X**	
World Bank	Offshore Hydrocarbon Resource Drilling Operations –Effluent Guidelines 1983			**X**	
API:	Chemical Treatments and Usage in Offshore Oil and Gas Production Systems, Offshore Effluent Guidelines (1989)			**X**	
API	Safety and Environmental Management Programme (Semp) (1993)		**X**		
IAGC:	Environmental Guidelines for World-wide Geophysical Operations (1992)	**X**	**X**	**X**	
The Joint Links Oil and Gas Consortium	Polluting the Offshore Environment (1996)	**X**		**X**	
WWF	The Application of Strategic Environmental Assessment in Relation to Offshore Oil & Gas Resource Exploration (1998)	**X**		**X**	
WWF	The Application of EIA in Relation to Offshore Oil and Gas Exploitation (1998)	**X**		**X**	
APPEA	Environmental Implications of Offshore Oil and Gas Development in Australia-The Findings an Independent Scientific Review (1994)	**X**	**X**	**X**	
E&P Forum	View of environmental impact assessment	**X**	**X**		
WWF	Environmental Best Practice and the Move Toward Zero Discharge in the offshore oil and gas industry			**X**	
OGP	Implementation of HSE Management Systems Workshop Proceedings (1999)		**X**		
OGP	HSE Management - Guidelines for working together in a contract environment (1999)		**X**		
SustainAbilty' and UNEP	Engaging Stakeholders 1998:The Non - Reporting Report (1998)				**X**
SustainAbilty' and UNEP	The Oil Sector Report (1999)				

Annex 5. List with several relevant conventions that were signed by countries of the West African Marine Eco Region

		Cape Verde	Gambia	Guinea	Guinea Bissau	Mauritania	Senegal
IMO	Convention 48	X	X	X	X	X	X
	Amendments 91		X				
	Amendments 93	X	X	X		X	X
	SOLAS Protocol 78			X		X	X
	SOLAS Protocol 88						
	STCW Convention 78	X	X	X		X	X
	STCW-F Convention 95						
	MARPOL 73/78 (Annex I/II)	X	X	X		X	X
	MARPOL 73/78 (Annex III)	X	X	X		X	X
	MARPOL 73/78 (Annex IV)	X	X	X		X	X
	MARPOL 73/78 (Annex V)	X	X	X		X	X
	MARPOL Protocol 97 (Annex VI)						
	London Convention 72	X					
	London Convention Protocol 96						
	Intervention Convention 69					X	X
	Intervention protocol 73					X	
	CLC Convention 69		X			X	X
	CLC Protocol 76					X	
	CLC Protocol 92	X		X			
	FUND Convention 71		X			X	
	FUND Protocol 76						
	FUND Protocol 92	X		X			
	FUND Protocol 2003						
	OPRC Convention 90	X		X		X	X
	HNS Convention 96						
	OPRC/HNS 2000						
	Anti Fouling 2001						
	Ballast Water 2004						
	UN Convention against corruption	X					X
	Abidjan Convention	X	X	X	X	X	X
	UNCLOS	X	X	X	X	X	X
	Stockholm declaration 1972	X	X	X	X	X	X
	Rio declaration 1992	X	X	X	X	X	X
	Basel Convention	X	X	X		X	X

Source: official websites of the conventions

About the authors

The authors are members of the IUCN Commission on Environmental, Economic and Social Policy (CEESP). At present they are establishing a Working Group within the Commission on Participative Management of Oil and Gas Development.

Sandra Kloff is a marine biologist and studied the role of Antarctic micro algae in global warming processes and researched the impact of marine pollution on species composition of micro algae in a coral reef ecosystem. In 1995 she initiated a research programme for the Dutch Royal Tropical Institute (KIT) on the proliferation of aquatic vegetation in the lower Senegal River Basin. From 1998 until 2000 she worked for the IUCN in Mauritania as an assistant project manager in the regional programme for the conservation of coastal wetlands. She currently works as a consultant. She provided technical advice to local stakeholders on aquatic weed management in Nigeria (UK Department for International Development – DFID), Senegal (KIT; Direction of National Parks) and Mauritania (KIT; Diawling National Park). She worked in Spain and Gibraltar with environmental groups on coastal zone planning, offshore oil development and atmospheric pollution arising from heavy industries. Since 2001 she also provides technical advice to stakeholders in Mauritania on offshore oil development.

She is member of:

- the steering committee of the Mauritanian NGO Mer Bleue. Mer Bleue is comprised of fishery community members and scientists that advocate for an equitable and sustainable use of the marine and coastal environment.
- Ecologistas en Acción, a union of environmental grass-root organisations in Spain.
- The Environmental Safety Group in Gibraltar

Clive Wicks has worked in the environmental movement, mainly for WWF (World Wide Fund for Nature), for the last 17 years following 25 years experience of working in Africa with an international company latterly as a company Director. He is currently a Conservation and Development Consultant working on the impact of oil, gas and mining industries. He represented the WWF at G8, World Bank, IFC (International Finance Corporation), UNEP (United Nations Environment Programme), EU (European Union) and UNDP (United Nations Development Programme) meetings, on extractive industries and has worked on Oil and Gas issues in many countries including Alaska, Bolivia, Canada, Cameroon, Georgia, Indonesia, Mauritania, Nigeria, Russia, etc. He was the co-project supervisor for a WWF project on Criteria for Oil, Gas and Mining Companies working in areas of high biodiversity, which produced “To Dig or Not to Dig”. He also worked with the Mining, Minerals and Sustainable Development Project (MMSD), Large Scale Waste and Biodiversity Committees in a private capacity.