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Oil & Gas

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Programme Régional de Conservation de la zone Côtière et Marine en Afrique de l'Ouest

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# Oil & Gas

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# **Extractive Industries and Sustainable Development:**
## Best Practice Fact Sheets for offshore Oil and Gas Development in the West African Marine Ecoregion

It is probable that all the continental PRCM countries have hydrocarbon reserves which will eventually become economically viable as the price of oil continues to increase. Similarly, all the ecoregion's countries face threats from the passage of the hundreds of tankers which traverse economically and socially critical fishing zones and frequently cause intermittent oil slicks to reach WAMER shores. Tools are available to help countries meet/mitigate current and future challenges but until recently, little information has been readily available.

These Fact Sheets are designed to promote economically, environmentally and socially responsible development of the hydrocarbon sector and reflect the priorities expressed by PRCM partners. They are oriented along several axes including: Capacity Strengthening, Risk Prevention and Management, and Public Awareness and Participation, Transparency and Equity.

Oil and gas development must overcome many hurdles before it can contribute to sustainable development. Valuable ecosystems which provide diverse critical and renewable services for millions of people need to be protected. Although hydrocarbons are non-renewable resources, if managed correctly, they can contribute vital income for sustainable development initiatives, improve the use of the marine environment, and decrease countries' dependence on increasingly expensive imported energy.

Even though the challenges are complex, proven solutions exist and these Fact Sheets provide an overview of some of the key issues and options. It is now up to the governments and civil societies of the sub-region to take advantage of them to change the 'resource curse' into a sustainable resource blessing.

## Recommendations

- **carry out strategic environmental assessments and involving coastal managers, the fishery sector and communities in identifying zones and periods vulnerable to seismic surveys;**
- **establish legal standards for seismic surveys;**
- **prohibit seismic surveying in shallow and vulnerable areas such as Marine Protected Areas, mangrove areas, estuaries and nursery areas important for the renewal of fish stocks;**
- **avoid seismic surveys during the migration of key species;**
- **prevent seismic surveys when cetaceans are in the area;**
- **require an environmental impact study before allowing any seismic surveying (in line with UNCLOS); and**
- **require companies to use the “soft start” technique.**

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# Looking for oil and gas

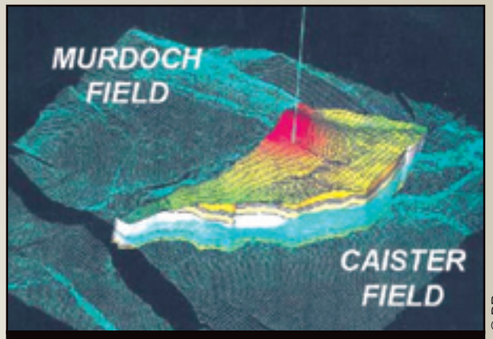
## Seismic surveys

A seismic survey involves firing pulses of sound energy through the layers of rock beneath the Earth’s surface and recording the energy that is bounced back. In a typical survey area of 100sq km, some 25,000 shots are fired. The recording of reflected pulses provides images of the sub-seafloor strata and gives geologists an idea of whether the area has oil or gas potential. If it does, a company may decide to go ahead with exploratory drilling (see information sheet on drilling and production).

there are many potential detrimental consequences. In general, the risks attached are poorly quantified – indeed, they are often unknown – and are likely to vary between different environments and organisms. Fortunately, techniques exist to minimize adverse impacts.
Laboratory studies on fish, turtles and marine mammals indicate that the sounds produced by seismic surveys can cause haemorrhages, and brain and hearing damage, if they are close to the airguns.

© DR

Survey vessel with airguns towed behind

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3D image of seafloor and sub-seafloor

## Impacts

Available evidence indicates that seismic sounds in the marine environment are neither completely without consequences nor are they certain to result in serious and irreversible harm to the environment. However, it’s true to say that in the huge range of effects between those extremes,

In the sea, of course, most species can swim away from the sound source, but even so, studies have revealed significant effects on fishery resources (see table below). Scaring effects in fish have been monitored, leading to a change in swimming patterns.

| Species | Gear type | Noise level | Catch reduction |
|---|---|---|---|
| Atlantic cod (*Gadus morhua*) | Trawl | 250 dB | 46-49% lasting at least 5 days |
| Atlantic cod (*Gadus morhua*) | Longline | 250 dB | 17-45% lasting at least 5 days |
| Atlantic cod (*Gadus morhua*) | Longline | Un-determined | 55-79% lasting at least 24 hours |
| Haddock (*Melanogrammus aeglefinus*) | Trawl | 250 dB | 70-72% lasting at least 5 days |
| Haddock (*Melanogrammus aeglefinus*) | Longline | 250 dB | 49-73% lasting at least 5 days |
| Rockfish (*Sebastes spp*) | Longline | 223 dB | 52% – effect period undetermined |

While catch reductions last just a few days, there is limited knowledge about the long-term consequences, which may be more profound if seismic surveys are carried out when fish migrate. Experts argue that during such periods, shoals (schools) may become dispersed and lose track of their migratory path. Moreover, when dispersed, the distinct advantage of swimming in a shoal is lost, and individuals or smaller groups can become easier prey for predators. As a precautionary measure some countries prohibit, and responsible companies refrain from, seismic surveying during migration periods.

It is widely recognised that marine mammals are particularly sensitive to seismic surveys, which can result in a permanent shift in their hearing threshold. In other words, they could become deaf to certain sound frequencies. Several studies have shown that whales and dolphins not only stop feeding and interacting, but also change their diving patterns. Sperm whales in the Gulf of Mexico appeared to move more than 50km away when surveys began. Similarly, sperm whales in the Indian Ocean stopped vocalising in response to seismic pulses that were fired more than 300km away.

Shallow areas such as estuaries, mangroves and coral reef ecosystems are particularly vulnerable zones and may need protection from seismic testing. These critical habitats harbour many species – corals and fish eggs, for example – that cannot swim away to escape the sound source. These organisms may well become exposed at close range to the airguns, leading to possible developmental arrest or abnormalities. However, this has been observed only in a small proportion of exposed eggs or larvae. While more research is needed on the impacts of seismic surveys in such habitats, many scientists have argued the case for a moratorium.

In short, seismic surveys have the potential to cause significant impacts on cetaceans, fish and other marine life forms – but for the most part, these impacts can be avoided if the industry applies responsible management measures such as spatial/temporal avoidance of critical habitats, refraining from surveying when cetaceans are spotted, and employing a “soft start”, whereby the noise volume is slowly built up to give any marine life the chance to move away.

# Regulations

Many companies looking for oil and gas in the West African Marine Ecoregion are relatively small, and have unclear corporate policies for responsible management measures. It is therefore important that countries introduce laws governing seismic surveys in order to prevent any easily avoided detrimental effects.

At the international level there are no specific regulations for seismic surveys, although the general principles outlined in the United Nations Law of the Sea (UNCLOS) do apply. Unlike other international treaties that apply only to chemical or biological substances, UNCLOS includes forms of energy in its definition of pollution. Because sound is a form of energy, the general duties described in UNCLOS should be considered for seismic surveys. Therefore, all member countries of the convention are obliged to:

- **protect the marine environment from any sort of pollution;**
- **prevent pollution from occurring;**
- **act with precaution; and**
- **carry out environmental impact assessments (EIAs) before allowing any polluting activity to take place.**

## Examples of national legal restrictions

A number of countries already restrict survey activities in their territorial waters. For example:

### Australia
- Prohibition of seismic surveys in sensitive habitats with a Marine Protected Area status.

### Canada and the United States
- EIA for seismic surveys.
- Keeping a certain distance between the survey ship and marine mammals.
- Prohibition of seismic surveys during times of the year when marine mammals are particularly abundant.

### Norway
- Prohibition of seismic surveys in fishing zones, observing a buffer zone of 50km around the outer edges of the fishing areas (surveys within these zones are only allowed when no fishing takes place).
- Prohibition of seismic surveys during fish migration periods.
- Prohibition of seismic surveys in shallow areas known to be nurseries for fish.

### United Kingdom
- EIA for seismic surveys.
- Prohibition of seismic surveys during the spawning and migration periods of commercial fish species such as the herring.
- Prohibition of seismic surveys if cetaceans are seen within 500m (surveys may therefore only be carried out in daytime and only when there is reasonable visibility).
- Survey vessels have to wait for 20 minutes after the last sighting of cetaceans before proceeding.

## Recommendations

- **develop a regional legal framework with neighbouring countries for the development of offshore oil and gas that includes the management and design of FPSOs;**
- **collaborate with other regional legal frameworks for the marine environment, e.g. the OSPAR convention for the North Sea and North East Atlantic or, HELCOM for the Baltic Sea;**
- **incorporate the IMO recommendation for double hulled FPSOs in domestic law and a regional legal framework;**
- **take notice of the Bureau Veritas survey on FPSOs as well as the impact assessment on FPSOs carried out by the US government and the recommendations of the expert panel on oil and gas development in Mauirtania;**
- **transpose the IMO safety guidelines for the Construction and Equipment of Mobile Offshore Drilling Units (MODU code) for the management of FPSOs and offshore drilling units to domestic law and a regional legal framework for offshore oil and gas development;**
- **designate an exclusion zone with a radius of at least 500 meters around the platform for all extraneous maritime traffic;**
- **impose sufficient liability insurance for oil spills or other types of pollution of the marine environment caused by FPSOs, terminal operations or drilling and production activities (cleanup, compensation, etc.).**

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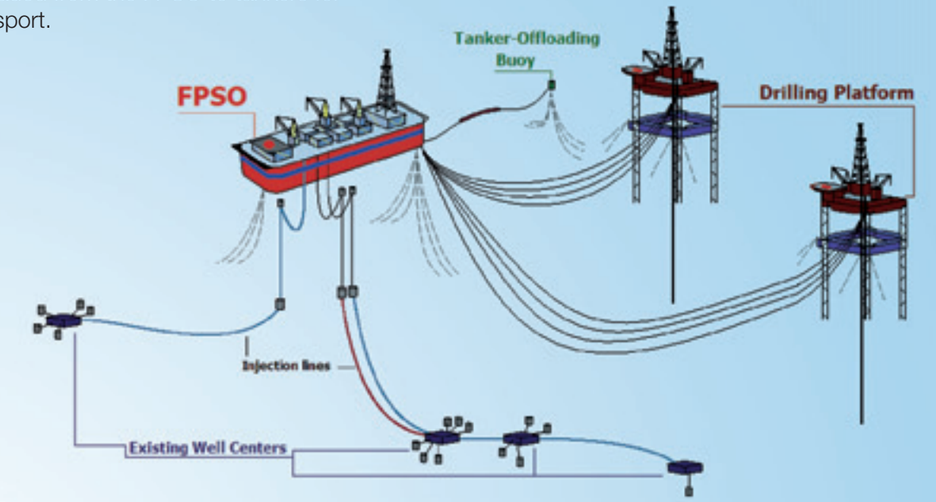
# FPSOs
## Floating Production, Storage and Offloading vessel

An FPSO system is an offshore production facility that is typically ship-shaped and stores crude oil in tanks located in the hull of the vessel. The crude oil is periodically offloaded from the FPSO to tankers for transport.




Today over 100 FPSOs are in use world-wide, with at least another 80 at the design stage. The first deepwater oil project in the West African Marine Ecoregion, the Chinguetti oil field in Mauritania´s EEZ, is developed with an FPSO.

Berge Helene, first FPSO in the West African Marine Ecoregion off Mauritania.

## Different kinds of FPSOs

There are 3 different kinds of FPSOs:
- FPSOs made out of former oil transportation tankers with a single hull configuration,
- FPSOs made out of former oil transportation tankers with a double hull configuration,
- New and purpose-built FPSOs with double hull configuration.

Today, single hulled oil tankers are cheaply available on the market as they will not be allowed to transport oil because of the double hull policy required by international shipping law (International Maritime Organisation, provision 13G of MARPOL 73/78). However, they can still be used as static production and storage platforms (FPSOs) for which international shipping law with regard to hull configuration is not applicable. This makes single hulled FPSO conversions an interesting development option for oil and gas companies especially for the smaller African deepwater fields where cost is critical to profitability. The FPSO, Berge Helene, in use off the Mauritanian coast is an example of such a single hulled FPSO conversion.

### Low cost - high risk

The hull of an FPSO may be punctured after a collision with another vessel in the same way as an ordinary oil tanker. Making proper risk assessments is difficult as historical data is lacking. The vast majority of FPSOs has only been put into service in the second half of the 1990s.

Several studies have been undertaken to assess the risks involved with the use of FPSOs. The well respected classification firm Bureau Veritas has performed a survey on half of the FPSOs in service. Their conclusions: FPSOs made out of former oil transportation tankers are unsuitable to serve as oil production and storage platforms. Structural and fatigue problems arise over time even in the calmest of conditions. Furthermore the study concluded that oil tankers are built to meet ship specifications, whereas offshore structures must always be designed for 100-year wave conditions. Additionally, an oil tanker has very specific loading criteria which do no match the more extreme and frequent loading and offloading sequences of an oil production and storage platform.

## Lack of International regulation, need for local solutions

Even if FPSOs look like ships and may actually be made out of former oil tankers, the status of the FPSOs as a “ship” in international shipping law is unclear. Application of the Conventions of the International Maritime Organisation (IMO) on FPSOs is under debate (see also information sheet on legal frameworks for offshore oil and gas development). Loopholes in the international legal frameworks need to be filled at the national and regional levels.

## Waste products

Typical ship waste products that are also produced by FPSOs are regulated by the IMO convention for the prevention of pollution (MARPOL 73/78) e.g. grey water, garbage, air pollution and oil content in deck and tank cleaning water.
There are no regulations at the international level for the most important waste products related to oil production and drilling (drilling fluids, cuttings, water and gas from the oil reservoir). These products are brought onboard the FPSOs and are then either, shipped to shore, discharged into the sea (with or without treatment) or re-injected into the oil or gas reservoir (see also information sheet on offshore oil and gas drilling and production wastes). Suitable management options for different regions need to be addressed at the national level.

## FPSO “ship” safety

The IMO has developed several guidelines and codes to maintain compatibility for FPSOs with international law for maritime safety. The Code for the construction and equipment of Mobile Offshore Drilling Units (MODU code) was developed to recommend the application of the International Convention for the Safety of Life at Sea - the SOLAS Convention.
Because the important provision 13G in Annexe 1 of the MARPOL Convention, the double hull requirement, is not applicable to FPSOs, the IMO nevertheless formulated a non-binding recommendation to only use double hulled FPSOs.
States that wish to have the same safety standards for oil and gas operations that also exist at the international level for conventional vessels should incorporate these IMO guidelines and recommendations into binding legislation at the national or regional level.

## Best domestic and regional law

All FPSOs used in the North East Atlantic are purpose-built and double-hulled. The US government issued studies leading to a policy to only allow newly built and double hulled FPSOs in the Gulf of Mexico.

## Safety zones

FPSOs in the North East Atlantic and the North Sea and offshore platforms in the Gulf of Mexico have safety zones with a radius of at least 500 meters around them to keep all maritime traffic a reasonably safe distance away.

## Oil spill compensation

Oil spills can be caused by platforms-including FPSOs. This can happen when oil is offloaded from the FPSO to an oil tanker, if an FPSO is perforated by another ship as the result of an accident, or simply when an FPSO ruptures due to metal fatigue.
In any case, compensation is not covered by any international convention. The Civil Liability Convention or the Fund Conventions are exclusively written for oil spills caused by oil tankers and thus exclude all platforms.
That’s why the UN Law of the Sea (UNCLOS) stipulates the need for States to ensure that offshore oil and gas operators have sufficient insurance coverage for damages caused by offshore oil and gas platforms.

## Best practice

The United States has put in place an unlimited liability requirement for gross (or wilful) negligence for oil spills caused by oil tankers and also for all offshore oil and gas operations. All tankers trading in US waters and all oil and gas platform operators are required to demonstrate to local authorities (with Certificates of Financial Responsibility) that they carry adequate insurance to cover maximum financial risk. Unlimited liability provides a strong incentive within the private sector (insurance company - oil and gas companies) for self-regulation in addition to national supervision.

## Recommendations

- **carry out strategic environmental assessments in line with the Abidjan Convention and the Paris Declaration and involve coastal managers, the fishery sector and communities in identifying zones where oil and gas production should be prohibited;**
- **establish specific legal water quality standards;**
- **formulate similar mitigation measures to those already implemented elsewhere;**
- **prohibit production and drilling in vulnerable areas such as in or adjacent to Marine Protected Areas, mangrove areas, deep sea coral reefs, seagrasses, shellfish banks, estuaries and all nursery areas important for the renewal of fish stocks;**
- **require zero discharge regime, especially for produced water that is likely to impact the vulnerable areas cited above; and**
- **require independant environmental impact studies before allowing any drilling and production.**

**Recommended websites:**
**Global Marine Pollution Gateway**
**http://oils.gpa.unep.org/**

**United Kingdom Offshore Operators Association**
**http://www.ukooa.co.uk/**

**Environmental Impact of the Offshore Oil and Gas exploration and production**
**http://www.offshore-environment.com/**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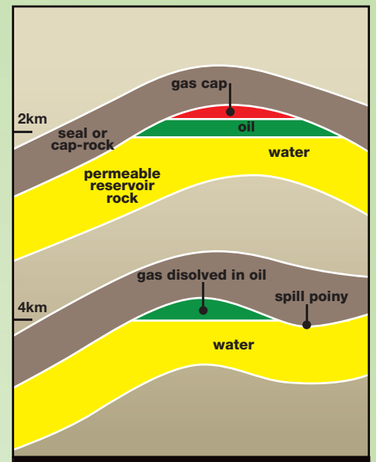
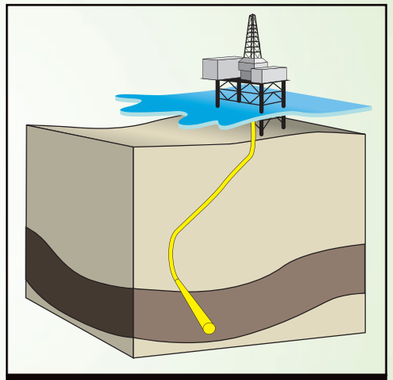
# Drilling
## and production

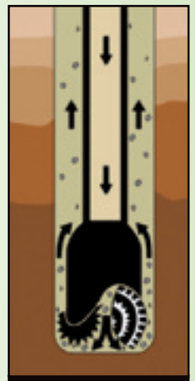
Hydrocarbon reserves are trapped underground in permeable reservoir rocks such as porous sandstone or fractured limestone. Movement towards the surface is stopped or slowed down by impermeable rocks such as clay, cemented sandstone and salt, which act as seals. A large water reservoir is situated underneath the oil and gas. As soon as seismic surveys reveal that such rock structures are likely to contain hydrocarbon reserves, exploratory drilling starts. Drilling operations also take place when production wells are drilled.
In the case of a large oil field, more than 50 production wells are typically drilled.

During drilling, a drill head at the end of a tube system penetrates the different rock layers. Fluids are injected into this tube system for lubrication, pressure and temperature control, and for the removal drilling debris (cuttings). These fluids can either be based on oil, synthetic compounds or water. Choice of fluids depends on the type of rock encountered during drilling, which means that during one single drilling different types of fluids are used. The mixture of fluids and cuttings (also called drilling mud) is pumped back to the surface. Part of the mud is reused and re-injected into the tube.



Cross-section of an oil and gas field (source: UKOAA website)


Berge Helene, first FPSO in the West African Marine Ecoregion off Mauritania.


Drilling in action


Drill head

Most significant sources of pollution generated during drilling and production stages are:

- **Drilling muds**
- **Geological formation water (also called produced water) pumped up with the hydrocarbons**
- **Gas**

## Drilling muds

Drilling muds are composed of a large range of different and complex chemical compounds. They 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 such as arsenic, barium, chromium, cadmium, lead and mercury. A production platform may discharge about 60,000 $m^3$ of drilling fluids and 15,000 $m^3$ of drilling cuttings.

The most common impacts observed during drilling activities are the smothering of bottom-dwelling organisms living in the direct vicinity of the drilling operations. Most research on the impacts consists of toxicity tests measuring direct and short-term effects on a limited number of seafloor organisms. This research concludes that water-based drilling fluids are the safest for the marine environment, whereas oil-based drilling fluids are the most toxic and most persistent in time; after 150 days only 5% is biodegraded.

## Geological formation water

Geological formation water (also called produced water) is by far the largest-volume by-product or waste stream associated with oil and gas production. All hydrocarbon reserves have varying volumes of water, which is also inevitably pumped to the surface during exploitation. In the first production year no production water may be extracted, but at the end of production volumes may reach 40,000 $m^3$/day. 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) and, on occasion, naturally occurring radioactive material. This reservoir water contains no oxygen.

Produced water can lead to serious pollution and cause unpredictable cascading effects on marine ecosystems. Of special concern are hydrocarbons that occur naturally in produced water, such as organic acids, PAHs, phenols and volatiles. These soluble organics are not easily removed from produced water during treatment on the platform. This means that these more or less dissolved compounds end up in the ocean if the waste stream is discharged to sea. Research on the ecological impacts of PAH content in production water has shown that it can affect fertility of male fish and delay spawning periods by several weeks. PAHs are carcinogenic and persistent in time, and moreover, accumulate in the food chain. PAH content in produced water from gas fields is on average much larger (up to 11 times) than PAH content in produced water from oil fields.

## Gas

Gas associated with oil fields is sometimes flared off (burnt and released into the atmosphere). Nigeria and Russia have long been two of the world's largest sources of flaring, which has contributed significantly to climate change and local pollution. It is best practice either to market the gas or to re-inject it into the oil reservoir – a process that is increasingly becoming the norm for oil production. Now, about 40% of gas is currently flared in Nigeria, compared with 80% in 1993 – this is an obvious improvement, but there is still a long way to go.

## International regulations

At the international level no specific regulations exist for waste products generated by drilling activities or production. Similarly, the regional Abidjan Convention lacks any precise norms for drilling and production waste, but it does recommend that member states carry out Strategic Environmental Assessments when developing their hydrocarbon resources.

Also, the general principles of the UN Convention on the Law of the Sea (UNCLOS) – of which all the sub-region's countries are members – apply to the waste products generated by offshore oil and gas development. Therefore governments should not only protect the marine environment from pollution, but also prevent it from occurring in the first place, act with precaution, and oblige companies to carry out independent environmental impact studies at all development stages.

Due to lack of detailed guidance at the international level, offshore oil and gas producing countries have created their own regulations nationally and/or regionally.

Examples of national and regional regulatory frameworks

| | OSPAR Convention North-east Atlantic | Helcom Convention Baltic Sea | United States |
|---|---|---|---|
| Drilling muds | - oil based muds shipped to shore.<br>- water-based and synthetic-based muds are tested for toxicity prior to discharge.<br>- prohibition on discharging muds containing more than 1% of oil. | - oil based muds shipped to shore.<br>- water-based and synthetic-based muds are tested for toxicity prior to discharge.<br>- prohibition on discharging muds containing than 1% of oil.<br>- prohibition on discharging muds with more than 1 mg cadmium and mercury per kilo. | - oil-based muds shipped to shore.<br>- water-based and synthetic-based muds are tested for toxicity prior to discharge. |
| Produced water | - re-injecting into the geological formation in vulnerable areas such as estuaries and coastal areas.<br>- when discharged to sea oil content is lowered to 30 mg/L. | - re-injecting into the geological formation in vulnerable areas such as estuaries and coastal areas.<br>- when discharged to sea oil content is lowered to 30 mg/L. | - re-injecting into the geological formation in vulnerable areas such as estuaries and coastal areas.<br>- when discharged to sea oil content is lowered to 15 mg/L in Alaska, 18 mg/L in California, 29 mg/L in Gulf of Mexico. |
| Gas | either exploited or re-injected. | either exploited or re-injected. | either exploited or re-injected. |

## Recommendations

- **protect the natural resource base, human rights and sustainable development plans;**
- **establish an Inter-Ministerial Committee to oversee the extractive industries;**
- **improve governments' ability to negotiate with and manage oil companies;**
- **obtain international assistance in negotiations and management;**
- **carry out Strategic Environemental Assessments to ensuring stakeholder involvement and harmonization of development sectors (See SEA factsheet);**
- **strengthen environmental monitoring;**
- **ensure adequate legal infrastructure for controlling offshore oil operations;**
- **enforce all laws, conventions and treaties and cancel contracts when companies break laws;**
- **join the EITI (see below).**

The EITI (Extractive Industries Transparency Initiative - http://eitransparency.org - is a coalition of governments, companies, civil society groups, investors and international organisations which:

- **promotes equitable benefit sharing from the extractive industries;**
- **aims to improve transparency and accountability;**
- **has a robust yet flexible methodology.**

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# Good Governance
## and the Extractive Industries:
**managing non-renewable resources for sustainable benefits**

*The world depends on finite oil and gas resources to power its transport, homes and industries. But the use of these fossil fuels results in a range of environmental and social costs which need to be balanced against the benefits that oil can bring.*

*Key to maximising benefits and minimizing conflicts is good governance: decision-making based on transparency and the participation of a broad spectrum of stakeholders from government and civil society.*

## Oil and gas exploitation in West Africa

Because of social problems and declining oil reserves on land, most future oil and gas production in West Africa will be from offshore wells in sensitive marine environments which are critical for human livelihoods. Virtually the whole coastal zone has been divided into oil blocks.
This includes protected areas, key fish breeding and fishing grounds, and important tourism areas.

Hydrocarbons can produce vital income but the history of oil in Africa has been fraught with social and environment problems and often failed to contribute to sustainable development. Development of hydrocarbons has little impact on employment, because it's a high-tech capital-intense sector requiring a small number of highly skilled people. While oil exports generate little growth in other sectors, oil spills have badly damage sectors like tourism, fisheries and agriculture of producer countries and their neighbours.

Dr Emil Salim, chairman of the World Bank-funded Independent Extractive Industry Review (EIR), is highly critical of the extractive industries:

" Not only have the oil, gas and mining industries not helped the poorest people in developing countries, they have often made them worse off. 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."

The EIR suggests three broad policy requirements for the extractive sector: poverty alleviation; effective social and environmental policies; and respect for human rights.

## Governance problems associated with oil and gas production

Without good governance, the oil and gas industry impacts on people and the environment through:

- impacts on the economy which can have adverse social effects such as corruption, armed conflict, and the over-dependence on oil and gas for revenue to the detriment of other economic sectors (the “Dutch disease”)
- climate change; and
- operations on land and at sea.

Environmental problems often lead to civil disturbances and impact food security and people’s livelihoods. For example, poor management and governance of oil resources have already caused domestic and international conflicts in Angola, Cameroon, Chad, the Democratic Republic of Congo, Nigeria, Sierra Leone and Sudan.

Not all resource-rich countries have fared the same. Thirty years ago, Indonesia and Nigeria had comparable per capita incomes and both heavily depended on oil revenues. But today, Indonesia’s per capita income is four times that of Nigeria’s, which fell from US$302.75 in 1973 to US$254.26 in 2002. In 2008, Nigerian leaders declared that many problems they encountered in developing the oil sector could have been avoided if better governance and transparency had been established earlier.

## Time to act

The amount of oil in the world is finite, but demand continues to accelerate. As stocks diminish, prices will rise – and many countries’ development plans will be badly hit. The impact of a rapid rise in oil prices was clear in 2008 when the price per barrel jumped to $150, causing havoc among world economies. Experts predict $150-200 a barrel within a decade (www.globalsecurity.org/military/intro/oil.htm).

Developing countries will find the cost of imported oil and gas painfully high – this, too, will affect their development plans unless they use their own reserves carefully, reduce their consumption levels, increase their energy efficiency and invest in renewable energy resources. These decisions will have far-reaching consequences on how a country’s energy is generated, who has access to it and who benefits from it. Therefore, transparent decision-making is essential if public support is to be maintained and assured.

## UN concerns about governance

The UN Secretary-General was so concerned about governance problems surrounding oil development in West Africa that he appointed Mr. Ahmedou ould Abdallah as a Special Representative. He presented some of the critical issues associated with oil and gas development in 2004:

**Tensions** are caused by a scramble for highly priced oil, boundary disagreements, corruption and over-dependence on oil.

**Disputes** occur 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 revenue sharing;

The UN is trying to resolve disputes through “good governance” by:

- supporting democratic reforms in producer countries to minimise the risks of wars and increase stability in oil producing regions;
- providing arbitration and negotiation;
- encouraging the sharing oil resources/ revenue (e.g. Nigeria and Equatorial Guinea, Senegal and Guinea Bissau;
- promoting transparency (keeping the public informed, ascribing to EITI ( see below), and Publish what you Pay: www.publishwhatyoupay.org) to maximize benefits;
- recommending development projects which benefit all.

## Recommendations

- **invest in the protection of natural resources for present and future generations;**
- **establish an interministerial commission for extractive industries;**
- **implement measures to ensure that gas and oil investments do not distort the economy (exceed absorptive capacity) or communities;**
- **share benefits without compromising the ability to manage and apply laws;**
- **address domestic energy needs before allowing exports to take place;**
- **obtain the informed consent of local communities and ensure they profit directly;**
- **guarantee effective planning through SEAs and ESIAs;**
- **include the value of environmental and social services in cost-benefit analyses;**
- **use Best Available Technology (BAT) and to minimize atmospheric emissions (e.g. flaring), aquatic pollution (drilling fluids, ballast water etc.) and soil pollution;**
- **formalize transparency (EITI, PWYP);**
- **ensure that companies pay all fines and the government's rights to use company boats, vehicles and planes for monitoring.**
- **maximize the profits for the local economy: jobs, profit sharing, etc;**
- **ensure that the companies have a sufficient insurance for financial responsibility (unlimited coverage for serious infraction)**
- **insist that the companies repair all damage possible after closure;**
- **create and prefinance closure protocols; and**
- **ensure that a percentage of oil revenues are invested in renewable energy.**

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# Investments in hydrocarbons
## and renewable energy systems

*As the world's oil supplies become scarcer, prices will inevitably rise – and the poor will suffer most. If this situation is not addressed, serious social, environmental and political problems could result. That's why contracting needs to be open and transparent.*

Hydrocarbons are finite resources, but if managed correctly, they can contribute significantly to sustainable development. Investment in these resources should generate the best economic return for the country while protecting the environment and human rights.

Oil and gas development requires large capital investment in geological surveys and identifying hydrocarbon resources before any commercial exploitation begins. Because investment risks are so high, and acquiring capital and expertise difficult, most developing countries grant development rights to foreign companies with very mixed results. The difference between a good and a bad contract can be measured in $ billions.

Percentage of revenues from oil operations received by governments

| Countries | % |
|---|---|
| Cameroon | 11 |
| Mexico | 31 |
| Canada | 35-50 |
| Côte d'Ivoire | 55 |
| Equatorial Guinea | 60 |
| Nigeria (deep water) | 65 |
| Gabon onshore | 73 |
| Sudan | 77 |
| Norway & Nigeria (onshore) | 84 |
| Iran | 93 |

## Differences in objectives and negotiating power

Many international extractive industries are more economically powerful than the developing countries with which they are negotiating, and the two often have conflicting objectives. Oil companies, for example, want to produce oil and gas at the lowest cost and the highest profit margin, whereas the host country's objectives may include public interest goals, quality of life, protection of the environment, economic growth, foreign exchange and full employment.

It is important to establish a national inter ministerial extractive industry committee, with its chairman appointed by the government, to deal with planning, SEAs, contracting, transparency and enforcement of laws. Some of the biggest problems have occurred when all the responsibility for developing oil, gas and mining is left in the hands of one ministry.

## Integration of hydro-carbon investments in National Plans

Extractive industries should be developed in the context of national sustainable development, poverty reduction and environmental plans, national and international laws, treaties and conventions.

## Foreign assistance should be sought when contracting

This can come from aid donors and from international lawyers, who can support government negotiating and contract review teams. There are two good example of this:

**Liberia:** A civil war fought mainly over natural resources devastated Liberia between 1989 and 2003. Then, in 2006, the new President set about renegotiating the contracts. She set up a review team and enlisted the International Senior Lawyers Project (ISLP), which offers pro bono help to developing and deserving nations.
Of the 95 contracts reviewed, 36 were cancelled and 14 were recommended for renegotiation. The new contracts produced significant gains for the state and the affected communities.

**Nigeria:** To control corruption Nigeria introduced a law in 2004 recognising the country's Extractive Industry Transparency Initiative (NEITI). In 2009 the initiative's executive secretary reported that as a result, $5 billion had been saved through fraud prevention in the first five years. Nigeria also created new Environmental control institutions and clamped down on pollution and enforcement of contracts.

## Contracts

Contracts can be divided into two basic types: concession licences and contractual arrangements. The differences arise from varying attitudes towards compensation, reward-sharing schemes (including levels of government involvement) and the levels of control granted to companies.
Under concession licences, the state owns all mineral resources, but the rights to produce the minerals are granted in exchange for royalty and tax payments.

## Joint Ventures

Two or more parties form a joint venture (JV) to develop oil and gas and agree to create a new company. Both contribute equity and share the revenues, expenses and control of the enterprise. JVs are often established between local and foreign companies (about 75% are international) but failure rates are 30-61%.
A typical example of a JV company is the Shell Petroleum and Development Corporation (SPDC) in Nigeria. This operates a JV agreement involving the Nigerian National Petroleum Corporation (NNPC), which holds 55%, Shell 30%, EPNL 10% and Agip 5%.
Problems arose when the company tried to recover operating costs from the state partner. Replacement of old pipes and installations was delayed for years. Corroded and leaking 40-year-old pipelines were left in the ground, creating serious environmental, social and human rights abuses. When the JV Company was found guilty of breaking gas flaring and oil pollution laws, the state had to pay 55% of the fines imposed.

## Production-sharing contracts

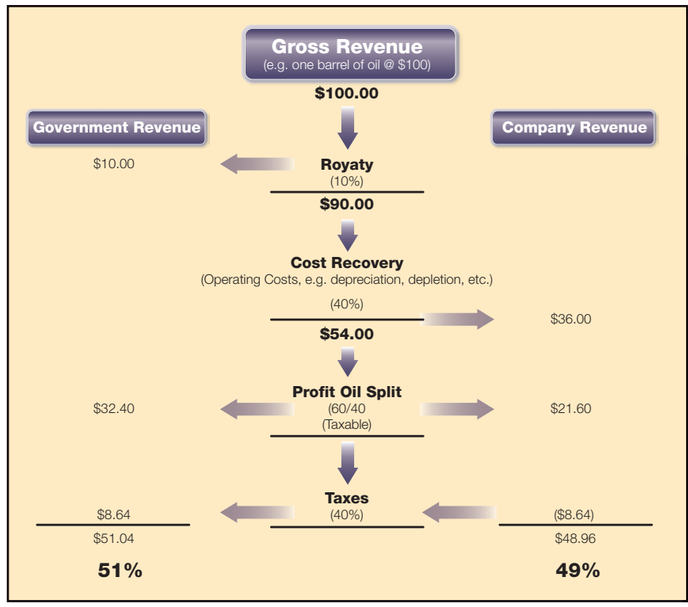
Under a production-sharing contract (PSC), mineral/hydrocarbon resources are owned by the state, which brings in a foreign company as a contractor to provide technical and financial services for exploration and development operations.
The main objectives of a PSC are to encourage foreign investors and to ensure equity between the revenue of the state and the profit of the company, while strengthening the state's management of operations.

The PSC is attractive to foreign firms because they can book the reserves in their balance sheets even though they don't own them. The attraction to producer countries is that they can share the profits without the risks and they can still insist on laws being respected without having to contribute to fines when the exploitation company breaks the law.

## Contract problems

Conflicts of interest between public and private partners have arisen over a range of issues including failure to follow national and international standards, human rights abuses, allowable expenses, taxation, fines, corruption and repatriation of profits.
Tendering can reduce corruption, but it is often the principal entry point for imposing "crony" contracts.

**A typical partnership model showing how revenue can be allocated to all parties**




Source: Adopted from Johnston (1994a).

**A single barrel of oil at $100 is tracked through a Production Sharing Contract, based on a model first developed by Johnston, 1994. A 10% royalty is applied. Operation costs, in which the company is allowed to recover costs out of net revenues, are limited at 40% of gross revenue less the 10% royalty. The remaining revenue is shared 60/40 in favour of the government. The company's pays a 40% tax rate. After taxes, the company's financial entitlement comes to 49%.**

## Recommendations

- **all those with a stake in protecting their coastal and marine environments should encourage their governments to propose PSSAs to the IMO;**
- **governments of the West African Marine Ecoregion should involve coastal managers and communities in identifying candidate areas and preparing proposals for PSSA identification and protection for submission to the IMO;**
- **where a sensitive and vulnerable site is shared by two or more countries, they should work together on a proposal and develop joint protective measures;**
- **the identification process of PSSAs should be used in Strategic Environmental Assessments for the offshore oil and gas industry;**
- **an exclusion zone with a radius of at least 500 meters should be designated around the platform for all extraneous maritime traffic;**
- **the IMO should recognise exclusion zones around FPSOs as Areas To Be Avoided (ATBAs).**

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# PSSAs:
## protecting the West African Marine Ecoregion from shipping impacts

*Particularly Sensitive Sea Areas (PSSAs) are areas of the seas and oceans that require special protection from maritime traffic.*

Marine areas of particular importance for tourism, recreation, traditional subsistence, science or education can benefit from PSSAs – which can also help preserve fishery resources by providing extra protection to coastal wetlands, estuaries, mangrove forests and other important habitats. Where these areas are threatened by maritime traffic, it is possible to obtain a PSSA designation from the International Maritime Organisation (http://www.imo.org/environment/mainframe.asp?topic_id=1357).

## According to international law

Within their 200 nautical mile Exclusive Economic Zone (EEZ), countries may not 'impair' a foreign ship's right of 'innocent passage'. But because international regulations generally apply to all ships wherever they go, it can be difficult to protect particularly sensitive areas.

PSSA designation enables area-specific rules to be matched to local needs and conditions. The marking of PSSAs on nautical charts also serves to inform mariners of the need to take special care when approaching a sensitive area.

### Identifying PSSAs

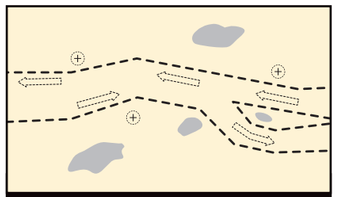
The criteria for PSSA designation are:

**Ecological:** Uniqueness, dependency, representativeness, diversity, productivity, naturalness, integrity, vulnerability.
**Social, Cultural and Economic:** Economic benefit, recreation, human dependency.
**Scientific and Educational:** Research, baselines and monitoring studies, education, historical value.

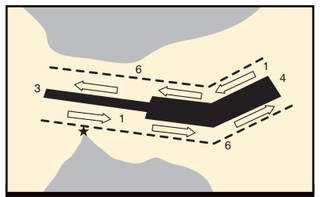
A proposal for a PSSA may only be submitted by a member government of the International Maritime Organisation (IMO). The petition should include an assessment of the area's vulnerability to damage by shipping activities, identify proposed measures to protect the area, and explain how those measures would work. It should further describe the oceanographic and ecological conditions that make the area sensitive to shipping impacts, and should indicate any other sources of environmental pressure – the development of offshore oil and gas, for example.

Identifying PSSAs is also valuable when preparing a Strategic Environmental Assessment that should precede offshore oil and gas development. Such PSSAs could benefit from special protection from the oil and gas industry be designated as no-go or restricted zones (see also SEAs fact sheet).

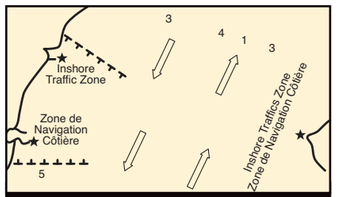
Through the IMO, various measures are available to better protect PSSAs from transiting maritime traffic. They include:



Two-way route within defined limits, providing safe passage for ships through waters where navigation is difficult or dangerous.




Traffic separation schemes which require ships to stay within designated lanes.




Inshore traffic zones and deep water routes to separate local traffic from transiting traffic. Pictures courtesy of Edward Kleverlaan IMO.

In addition, it is possible to impose alternative routes on passing maritime traffic. For example:

- **Recommended track:** A specially examined route that is as free from danger as possible, and along which ships are advised to navigate.

- **Area to be Avoided:** A routing measure involving an area within defined limits in which navigation is particularly hazardous and where it should be avoided by certain classes of ships or, indeed, all ships. (http://www.imo.org/)

Examples of other types of IMO measures are:

- **No anchoring area:** A routing measure covering an area within defined limits where anchoring is hazardous or could result in unacceptable damage to the marine environment.

- **Ballast water management area:** The establishment of an area for ballast water exchange. The purpose is to prevent invading organisms from infesting local ecosystems and causing irreversible damage.

- **Special liquid discharge restrictions:** These may cover oily waste, garbage or sewage water.

Special innovative measures may also be introduced to address specific local problems.

### Area-specific rules to increase maritime safety (SOLAS tools)

Many measures aimed at increasing shipping safety, such as alternative routing systems, can also be applied by coastal states in areas that do not qualify as a PSSA but where maritime traffic is particularly hazardous due to topography, shallowness or shipping intensity.

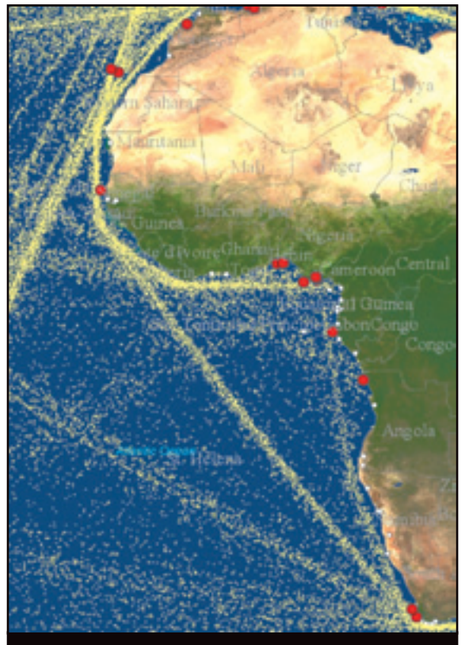
Because new offshore oil and gas fields can be a danger to shipping– governments may consider having them recognised as Areas To Be Avoided (ATBAs) or as Precautionary Areas under the International Convention for Shipping Safety (SOLAS). Then, vessels transiting the area would be warned to use extra care and/or follow a mandatory shipping route. Because the West African Marine Ecoregion is not well known as an offshore oil and gas development area, governments can make a strong case with the IMO for international recognition of offshore platforms. This may lessen potentially dangerous situations, especially if new oil and gas fields are near or within international shipping lanes.

## The West African Marine Ecoregion

Some of the world's busiest shipping routes pass through the West African Marine Ecoregion. Oil tankers heading to North and South America and Europe from the Gulf and African oil fields transport some 400-500 million tonnes of crude oil and refined products through the Ecoregion every year (http://oils.gpa.unep.org/framework/region-10-next.htm, http://www.mowca.org/).

The density of this maritime traffic constitutes an immediate threat to valuable marine ecosystems in the region. An accident involving an oil tanker would have devastating and long-term impacts on the well-being of millions of coastal people who depend upon fishery resources for their livelihoods. The tourism sector would also suffer if any oil spill were to reach resort beaches. Designating PSSAs in these areas would reduce the risks and lead to safer shipping.

Establishing a series of PSSAs in the region could also address chronic pollution generated by ships. Special discharge restrictions (especially of oil) could be imposed on passing vessels in and near critical habitats.



Ship routes from observed reporting positions (yellow dots). Courtesy Global Ballast Water Management Programme


West African Marine Ecoregion with Marine Protected Areas

## Recommendations

**SEA**

- **is sustainable development tool;**
- **helps maximize the benefits and beneficiaries of development activities;**
- **ensures coherence and coordination between all related and overlapping activities related to a sector or region;**
- **is base on transparency, stakeholder participation and dialogue;**
- **ensures that stakeholders are part of overall decision-making;**
- **provides a mechanism for conflict avoidance and resolution.**

**Acknowledgements**
The author wishes to thank Dr Robert Goodland and all other people whose papers he has quoted.

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# Strategic Environmental Assessments

## What are Strategic Environmental Assessments (SEAs) and why are they needed?

SEAs are high-level decision-making tools used to promote sustainable development. They ensure that one a group of development activities does not undermine others.

Strategic Environmental Assessment was formally recommended as a critical tool for countries wishing to develop the hydrocarbon sector by the Abidjan and Nairobi Conventions. This was because oil and gas had been found in many countries and oil development in one country can seriously impact other countries. Many fishers in West Africa are already affected by the damage caused by more than 6,000 oil spills to the Niger Delta mangroves – once one of the most important fish breeding grounds in the region.

SEAs help decision-makers broaden high-level planning from single-sectoral approaches (e.g. individually assessing oil and gas, mining, fisheries, tourism, etc.) to a broader, holistic and participatory approach across multiple sectors – for example identifying how offshore oil and gas development, coastal tourism, agriculture and fisheries together impact upon each other and marine ecosystems. SEAs look particularly at combined/cumulative impacts on people and the environment.

An SEA is undertaken much earlier than a project-level environmental and social impact assessment (ESIA). It provides for intersectoral and extensive public participation in decision-making and sets the standards for the ESIAs which follow.

SEAs can also ensure that the development of the oil or mining sector is aligned with the principles in national strategies for poverty reduction and sustainable development.

## Benefits of SEA

Strategic Environmental Assessments complement and facilitate subsequent project-level ESIAs. They are undertaken by governments to assist in participatory decision-making and are best coordinated by an inter-ministerial committee. They can also be undertaken at a district or provincial level if several extractive activities are envisaged in the same region.

SEA identifies the main groups of governmental, civil society and private sector stakeholders and provides a platform for dialogue and learning to find their common interests. For example, in WAMER hundreds of thousands of artisanal fishers, as well as commercial fishing companies and an expanding tourism market, all depend upon maintaining the health of their marine and coastal resources. It also helps forge consensus on the most relevant issues – for example protecting key fishing and fish breeding zones and key habitats like mangroves and sea grass beds.

## Definition of SEA

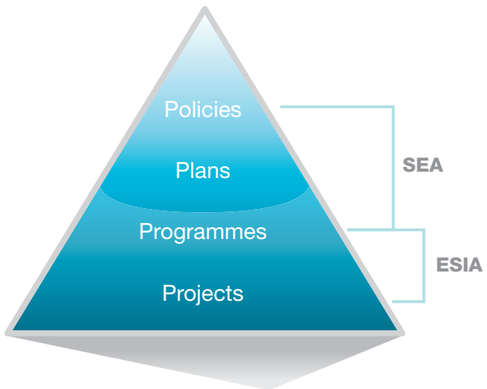
1. The Strategic Environmental Assessment is a flexible process: proactive, participative, and systematic.

The SEA focuses on three main classes of work:

a) **Policies, legislation** and other rules governing actions;

b) **Plans and strategies,** including regional, watershed and sectoral plans (e.g. new or revised national water, mining or hydrocarbon codes, a new poverty reduction strategy, etc.); and

c) **Programmes,** or sets of coordinated projects, rather than specific individual projects themselves, partly because specific projects are identified at the conclusion of the SEA. If a number of projects – for example oil and gas or mining – are proposed for a region, the SEA tackles the region as a whole, gaining lessons learned from similar projects already in the region, such as cumulative impacts.




2. An SEA should be scheduled as early as possible – the sooner the better- preferably as soon as the decision is taken to draft a policy, plan or programme, and well before individual projects have been identified in order to ensure the participation of different ministries and civil society stakeholders.

3. The SEA is designed to identify, predict, report, prevent, compensate or otherwise mitigate the economic, social, health and environmental implications of the policy, plan or programme being assessed. It enhances the benefits of the policy, plan or programme, and is particularly effective in preventing expensive and damaging errors.

4. The SEA is a decision-making tool designed to promote better projects, postpone questionable projects, and help cancel the worst projects in a programme or sector. It also helps decision-makers to select among alternatives. Effective SEAs rank alternatives in a sector in one or more orders of quality (for example, more rather than less sustainable; lower negative social impacts rather than higher).

5. The SEA is totally transparent and fully participatory, as mandated by the UN Aarhus Convention. Free, prior and informed consent (FPIC) is the goal.

6. The SEA complements conventional ESIA of individual projects. A project-level ESIA takes a proposed project and assesses the environmental implications. ESIAs that follow SEAs will be faster and cost less because only better projects will have been taken up.

Many SEAs have been carried out with good examples in Ghana (Guide to Strategic Environmental Assessment www.cea.lk/pdf/SEAGuideline.pdf), Mauritania, Sierra Leone, the UK, Norway and Canada.

Differences between an SEA and an ESIA

| ESIA | SEA |
|---|---|
| Is reactive to a specific development proposal. | Can be proactive in a way that informs development proposals and can address geographic regions or technical sectors |
| Focuses on project-specific impacts. | Enables the creation of a framework against which impacts and benefits can be measured. |
| Has a well-defined beginning and end, and informs a particular development decision. | Can ensure that the right information is available to inform multiple decisions over a period of time. |
| Assess the direct positive and negative impacts of a single proposed activity. | Enables cumulative impacts to be assessed and identifies implications and issues for sustainable development. |
| Focuses on the mitigation of impacts. | Enables a focus on achieving and maintaining a chosen level of environmental quality. |
| Emphasises the reporting of impacts in a document for decision-making purposes. | Is seen more as a “process” than a “product”. A written report and a mechanism for continued collaboration are produced. |

DEAT (2007), Strategic Environmental Assessment Guideline, Integrated Environmental Guidelines Series 4
ISBN: 978-0-9802694-0-6. See also OECD Guidelines (http://www.oecd.org/dataoecd/4/21/37353858.pdf.)

## Recommendations

- **establishment of a CAC should be required by government in order for the project to be in legal compliance,**
- **the CAC should exist for the lifetime of the project or projects,**
- **sufficient funding is essential,**
- **a citizens group can be independent with industry funding, with proper safeguards. Funding should come with no strings attached,**
- **the CAC should represent all stakeholder groups that are potentially affected by the project,**
- **board members should be appointed by, stakeholder groups and be independent of industry or government,**
- **board members do not have to be experts,**
- **cooperation works better than confrontation,**
- **agreeing on how to disagree reduces conflict,**
- **a clear mission and identity should be established early on.**

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# Citizens' Advisory Councils
## for oversight of extractive industry

### Introduction

In many developing nations, large-scale extractive projects often receive insufficient governmental and citizen oversight. While petroleum and mining companies have significant financial, technical, and political resources with which to advance their business interest, most developing governments and civil society often do not. In the absence of effective oversight, companies have been known to lower social and environmental standards to reduce costs and maximize short-term financial returns, leaving local people, the environment, and governments unfairly disadvantaged and exploited.

To correct this problem, local citizens need to be involved in the oversight of industry operations that affect their lives, Thus, governments should require the establishment of independent, representative *Citizen Advisory Councils* (CACs) to provide informed public oversight for the extractive sector, to be funded either from government resource revenues or from industry.

While government regulators and industry are not required to adopt the CAC's advice, many recommendations will likely be adopted if they result from thorough research and vetting. All of the CAC's work should be open to the public. Interested citizens can attend and provide public comment as well. A robust public outreach and communications effort should be developed.

### Structure and Function of a CAC

A CAC should be structured to give local citizens a direct voice in the corporate and governmental decisions that affect them and their communities. The group should become "*the eyes, ears, and voice*" for the local public on industry issues.

#### Board of Directors:

A CAC should be directed by a Board of Directors (either volunteer or paid), consisting of members representing all stakeholder communities potentially affected by the project. These board seats might, for instance, represent fishing, conservation, tourism, communities, etc. Representatives should not be chosen by industry or government. A CAC may also have non-

voting, members from relevant governmental agencies. The Board should meet regularly, and at each meeting representatives of industry and government should be asked to report on their operations and listen to citizens concerns. This regular interchange is vital to the interest of each constituency, and results in a constructive climate for problem solving. The board is responsible for hiring staff, making policy recommendations, and allocating the annual budget.

**Staff:**

The day-to-day activity of the CAC is the responsibility of a paid staff and can include an executive director, deputies, communications manager, community liaison, finance manager, project managers, and administrative assistance.

**Committees:**

Much of the work by a CAC can be conducted by Board appointed technical committees. The committees recommend actions to the Board, and conduct research approved and financed by the Board.

**Responsibilities:**

The broad mission of a CAC is to enable citizens to ensure the highest standards of environmental and social responsibility of an industrial project. The CAC should be empowered *to provide oversight on all aspects of extractive industry development in their region* - permitting, exploration, production, transportation, refining, public revenue collection, risk management, and environmental compliance. The CAC should provide oversight, advice, and advocacy on issues such as where to allow development, rates of reserve extraction, Best Available Technology (BAT) standards, accident prevention and response, legal liability, environmental monitoring, revenues and taxes, etc... It should have a voice in the selection of export routes and transportation methodologies and should review and submit written comments on all project operations.

The CAC should commission independent scientific studies and reports on issues of relevance to the public, the media, government agencies, legislative bodies, and the industry. Conducted jointly with government and industry, this research will foster a more cooperative spirit among these groups, minimizing conflict and contention.

**Funding:**

Substantial and stable funding for such a group is critical. The budget should be commensurate with the CAC's responsibilities. One thing that distinguishes the CAC concept from other advisory structures, is that the CAC has sufficient funding to conduct its work. Typically, about 1/3 of the annual budget is devoted to staff; 1/3 to administration (office rent, supplies, equipment, audits, etc); and 1/3 for research and contracts.

There are several possibilities for financial support including direct funding (e.g. endowment) by the extractive industry or government (with sufficient safeguards against outside bias and control). Lacking direct support by the extractive companies, the International Financial Institutions (IFIs) could require companies receiving loans to establish and fund such independent, credible public participation as a condition of their loan. In the short-term, assistance of an outside, philanthropic NGO can be solicited.

**Avoiding corruption and co-option:**

To prevent financial corruption, a CAC should commission annual, independent financial audits and report results in their publicly available annual reports. As well, clear conflict of interest and disclosure policies for directors and staff should be instituted. CAC members should remain accountable to their respective stakeholder groups, and have high standards of transparency and openness. The citizens groups represented in a CAC control the process - not government or industry.

## Conclusion

Given the obvious benefits to democratic governance and sustainable development,
it is recommended that governments require the establishment of Citizens Advisory Councils. Such councils will provide an unprecedented level of *transparency* and *informed public participation* with regard to industrial activities - an important prerequisite to achieving a prosperous, equitable, just, and sustainable society.

## Recommendations

- **undertake comprehensive risk and vulnerability assessments;**
- **require operators to carry sufficient insurance to cover potential clean-up and compensation;**
- **ratify relevant international treaties and conventions;**
- **insist on the highest safety standards for all operations, including drilling, storage, transferring, and transportation;**
- **ensure independent SEA and ESIA;**
- **establish National Oil Spill Fund;**
- **ensure adequate response equipment and regular training of operators and responders.**


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# Oil Spill Prevention and Response

*It is important for governments to identify risks caused by major oil spills, minimise those risks as much as possible, and sufficiently prepare for a major spill should it occur.*

## Oil Spill Risk Assessment

Once a major oil spill has occurred, restoring spill-injured ecosystems and economies is very difficult. Although governments must prepare to respond to spills, their most important responsibility is to prevent such events.

For spill prevention, it is necessary to identify areas that are at significant risk. An Oil Spill Risk Assessment should identify all potential causes, locations, sizes and types of hazardous substances that may be spilled, as well as potential flow characteristics and trajectories. The risk assessment should include a systematic analysis of ship types and traffic patterns, cargoes, and identify navigational characteristics that may increase risks. In addition, all petroleum facilities – floating production, storage and offloading (FPSOs), terminals, offshore platforms, onshore and offshore pipelines, etc. – should be thoroughly analysed.

This analysis will identify where risks of significant oil pollution events lie (including cross border) and where government preventive action should focus.

In addition, the Risk Assessment should include a detailed analysis of all environments, species and human communities at risk from such major spills.

## Oil Spill Risk Reduction/Mitigation

With the results of the spill Risk Assessment, governments should require the implementation of cost-effective risk reduction/mitigation measures. For oil and gas tanker traffic, such measures may include:

- ship traffic management/monitoring systems;
- weather restrictions for entering/leaving port or loading/unloading;
- additional navigational aids (buoys, lights, etc);
- ship vetting standards (double- hulls, redundant steering and engine systems, etc);
- enhanced pilotage requirements for hazardous waterways;
- rescue and/or escort tugs on standby for tanker transits;
- enhanced inspection protocols while tankers are in port; and
- placing spill booms around tankers during loading/offloading.

Spill risk reduction protocols should be instituted for all other potential spill sources, (terminals, pipelines, platforms, FPSOs, etc). These include independent engineering audits commissioned by the government; regular inspection and maintenance of all facilities; and the requirement for Best Available Technology.

## Oil Spill Response/ Contingency Plan

In addition to mitigating/reducing spill risk as much as possible, governments must prepare for a major spill. *They should develop a National Oil Spill Contingency Plan, and require all petroleum facilities and ship owners to have their own Oil Spill Contingency Plan approved by the government.*

Contingency Plans should include a detailed plan for all spills, and take into account a maximum probable discharge. They should be structured in a three-tier system based on size of spill:

- Tier I – response just with local assets;
- Tier II – requiring additional assets from in-country organisations; and
- Tier III – requiring assistance of international oil spill response consortia.

Oil Spill Contingency Plans should include the following:

1. Securing the Spill Source to stop further release of oil by, for example, offloading/lightening of ruptured tankers, capping wells, clamping pipelines, etc.

2. Response Planning Standard – including a requirement for operators to be capable of recovering 300,000 barrels of oil from the sea surface within 72 hours, including all equipment and personnel on standby to accomplish such a task.

3. Response Organisation – including personnel who will respond to a spill, the notification and command system, their training, and the financial contracting authority. All spill response contractors and their equipment on-hand should be identified.

4. A National Oil Spill Fund should be established to finance oil spill prevention and response efforts, based on a nominal tax of perhaps US$0.05 a barrel on all petroleum produced, imported or shipped through their borders. The fund should be available for all governmental efforts in spill prevention and response, including emergency response.

5. Spill Containment – sufficient oil booms, skimmers, storage equipment, personnel, and spare parts for recovered oil to be on standby and inspected regularly. In addition, materials for personnel protection from hazardous materials should be placed in strategic locations.

6. Dispersants Protocols –Dispersants should be approved for use only in offshore areas where the water depth is more than 100m, where the oil/dispersant mix will not contact any sensitive environment such as the sea bed, mangroves and reefs, and when winds are in the 10-20 knot range with 0.5-1m wave height.

7. Ignition Protocols – detailing where and under what conditions igniting a spill is approved. These must include the presence of a sufficient fire boom, and the isolation of any burning oil which may ignite additional oil (e.g. oil still aboard a tanker or in tanks at a terminal).

8. Shoreline Cleanup – including a plan for recovering oil that comes ashore, including:
- cleanup technologies to be used (including bioremediation);
- skimmers/storage barges to receive recovered oil;
- equipment to be used; and
- personnel (and their support and training) for any shoreline cleanup.

9. Waste Disposal – to identify locations and methodologies for disposing of recovered oil and oiled material, including re-processing recovered oil into useful products (pavement, refining, etc.).

10. Wildlife Response – a plan to deal with wildlife in and around the spill area, including:
- how and when to attempt to recover injured wildlife (without scaring un-oiled wildlife into the spill);
- keeping un-oiled wildlife away from the path of the slick;
- sanitation protocols to avoid disease transmission in holding facilities, and
- release protocols (zoos, into the wild, etc.).

11. Spill Drills – governments should require all operators to respond to spill drills (announced and un-announced). Training of all response personnel should be required, as well as pre-contracting and training local residents to assist in a spill response.

12. Damage Assessment – a comprehensive environmental, socio-economic assessment of spill damage, identifying the agencies to be involved, the studies and data collection to be conducted, and collection of economic impact information from businesses to support claims for compensation to the spiller, their insurer or the international oil spill compensation regimes (e.g. International Maritime Organization) to which the government is party.

13. Restoration – under this plan, various environmental restoration measures are employed (a) to restore any population injured by the spill; (b) to replace or substitute the injured resources; or (c) to provide a positive environmental offset.

14. Regulatory Review – governments should regularly review their oil spill prevention, response and liability standards for consistency with the highest international standards.