

Offshore Drilling Activity in the Geographic Area of the Campos Basin

R I M A – Environmental Impact Report

Project:



E&P

Consultancy:



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Offshore Drilling Activity in the Geographic Area of the Campos Basin

1. INTRODUCTION

This Environmental Impact Report (RIMA) is intended to present the results of the Environmental Impact Study (EIS) of offshore drilling activity to be held in the Geographic Area of the Campos Basin.

The information will be presented in simple form and direct language in order to allow easy understanding of the activity, as well as the environmental consequences of its conduction.

This RIMA is structured to present information on the Environmental Licensing process of the Drilling Activity in the Campos Basin; the Activity, including its objectives, justification and alternatives; the Environment, i.e. the natural and socioeconomic features of the activity influence area; the Environmental Impacts resulting from the normal operation of the activity and those of uncertain occurrence; the Environmental Risks; the proposed Environmental Projects and the Mitigation Measures; and Final Considerations on the Environmental Study.

This RIMA and its associated EIS have been developed based on the project information provided by PETROBRAS, and according to the Terms of Reference ELPN / IBAMA No. 023/05. As the mentioned EIS, the RIMA was prepared by HABTEC Engenharia Sanitária e Ambiental, a consultancy firm specialized and legally entitled to the development of such studies and headquartered in the city of Rio de Janeiro, which is registered in the Federal Technical Registry of Activities and Instruments for Environmental Protection of the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), Registration No. 1.168/93, in accordance with Federal Law No. 6.938/81.

2. ENVIRONMENTAL LICENSING OF ACTIVITY IN CAMPOS BASIN

When the drilling activities have started in the Campos Basin (1971), Brazil has not had a specific environmental legislation that would control this activity.

Only in 1993, IBAMA proclaimed the Decree No. 101, imposing what were the procedures that should be observed in the licensing of activities of exploitation

and cultivation of the deposits of liquid fuels and natural gas. It was subsequently published, late 1994, the CONAMA Resolution No. 23/94. This resolution began to regulate the environmental licensing of such activity. At this time, the licenses were issued to each well to be drilled.

In 1997, the Brazilian National Congress established several changes in the oil sector regulation. The breakage of the state monopoly, the creation of the National Council of Energy Policy and the creation of the Oil National Agency - ANP were set.

In December 1998 IBAMA issued to Petrobras, a Preliminary Permit of Drilling, valid for one (1) year. This license authorized the drilling activity in all fields, blocks and exploitation areas belonging to Petrobras in the Campos Basin, the so-called "areas of Bid 0".

After this date, all the drillings made by Petrobras in blocks purchased in the auctions of the Oil National Agency (ANP) began to be licensed through the Licensing Office of Nuclear and Oil Activities of IBAMA (ELPN), currently the General Coordination of Oil and Gas (CGPEG), in Rio de Janeiro, being a license for each block.

Searching disciplinary measures necessary to the final regulation of the process of environmental licensing of the offshore drilling activities of oil wells carried out by Petrobras in the Campos Basin, was then signed, between IBAMA and Petrobras, the Conduct Adjustment Agreement (TAC) for drilling activities in the oldest blocks (from Bid 0) in the Campos Basin, which occurred on August 11, 2004.

Especially, the TAC has the following objectives:

- Regulate the wells already drilled, in operation and that would operate in the Campos Basin;
- Define study and information as necessary measures for the environmental assessment of the area affected by the offshore drilling of wells already drilled and to be drilled in the scope of TAC;
- Establish the guidelines to enable exceptionally the drilling of wells until a new drilling permit was issued, which would be considered settled and able to operate at any time, when authorized by IBAMA.

The drilling TAC presents certain drilling obligations that Petrobras shall meet, among which are:

- The development and deployment of a Project of Assessment of the Environmental Impacts of Drilling Activities undertaken until December 31, 2004;

- The development and deployment of a Project of Environmental Characterization of the Campos Basin;
- The submission of Quarterly Reports on drilling carried out;
- The conduction of exercises simulated against oil spill (PEI-BC);
- The presentation of projects of Media and Decommissioning;
- The presentation of Numerical Modeling of oil spills and;
- The accomplishment of public hearing.

On August 10, 2005, Petrobras and IBAMA signed the 1st Amendment to Drilling TAC of the Campos Basin, in order to make some changes in the original document, since the implementation of certain existing obligations were not viable.

3. WHO PERFORM THE ACTIVITY

The activity of offshore drilling in the Geographic Area of the Campos Basin will be held by Petrobras - Petróleo Brasileiro SA, a Brazilian company established in 1953 and whose mission is to serve business safely and profitably, with social and environmental responsibility in the activities of the oil, gas and energy industries, providing products and services tailored to the needs of its customers and contributing to the development of Brazil.

PETROBRAS, motivated by the fact that great part of the reserves of Brazil are in the deep sea basins, has achieved world-class excellence in exploitation and production technology development and application in deep waters, ensuring thus the implementation of the offshore drilling activity in the Geographic Area of the Campos Basin, according to its mission.

4. WHAT IS THE ACTIVITY

The activity consists of the annual forecast of drilling up to 120 wells toward the discovery of new oil fields, evaluation of areas already discovered and future oil production, being held for up to 26 platforms simultaneously.

The location of the activity is called Geographic Area of the Campos Basin, which was defined from the areas of exploration and production of oil in the Campos Basin, from the south of the state of Espírito Santo to northern coast of

the State of Rio de Janeiro (Figure 01), considering still the guarantee of emergency response to oil spills anywhere within it.

The Geographic Area of the Campos Basin has an extension of 19,768.47 Km², equivalent to almost five times the extension of the municipality of Campos dos Goytacazes / RJ, distant from 70 to 120 km from the coast with water depths ranging between 70 and 2800 m.

Add map in A3

Figure 01 *Location of the Campos Basin Geographic Area.*

Add map in A3

Figure 01 *Location of the Campos Basin Geographic Area.*

5. DRILLING ACTIVITY HISTORY IN THE CAMPOS BASIN

The oil exploration in the region of the Campos Basin was initiated in 1968 with the first well drilled in 1971. However, the first discovery was to come only in 1974 with the drilling of the discoverer well of the Grouper Field.

The need to rapidly increase the domestic oil production led Petrobras to put into production the well 3-EN-1-RJS (Sardelle number 1), situated 118 meters deep.

In 1979, in the fields of Grouper and Namorado (at a depth of 160 meters), were processed 60,000 barrels of oil per day, using a technology pioneer in the world at that time.

The year of 1984 marked the first discoveries by Petrobras in deep waters, as the Field of Marimbá and the giant field of Albacora. The second giant field in deep waters, Marlim, was discovered in 1985. Other discoveries followed one another increasing the reserves of the Basin, both in shallow water, as well as in deep water.

Also in 1984, it was decided the development of the production of so-called Northeast Pole of the Campos Basin, after the drilling of wells in the fields of Carapeba, Pargo and Vermelho.

The progressive domain of the technology for production at depths greater than 400 meters opened to Petrobras the prospect of extending it to deeper waters and beyond in the following years.

In 1986, the barrier of 1,000 meters of water depth in the drilling of wells and tests of oil production was surpassed. In 1987, the test in the deepest water in the world, 1565 meters, was successfully conducted. These accomplishments were achieved through the intensive use of modern drilling rigs.

The year of 1989 was marked by the discovery of the field of Barracuda, in water depths from 600 to 1000 m. Also, went into operation platforms of the Northeast Pole of the Campos Basin, from the simultaneous installation of seven oil production platforms.

In the following years, several fields were discovered, being the main ones the Marlim Leste (800 to 2,000 m depth), Caratinga (850 to 1350 m), Espadarte (750 to 1500 m) and Roncador (1500 to 1900 m).

Among these fields, the giant field of Roncador is distinctive, discovered in October 1996 and located in deep water, about 128 km from the north coast of Rio de Janeiro. This field has a vast area and huge existing oil reserves.

6. THE REASON FOR THE ACTIVITY

The implementation of the activity is necessary because:

- contributes to the Brazilian self-sufficiency in oil production since, in order to meet the expected increase in oil consumption by part of the society, it will require the drilling of wells to discover and develop future reserves;
- contributes to the socioeconomic development of the region, generating indirect jobs and boosting the local economy from the collection of taxes and fees, plus future royalties by enabling the production of new oil fields;

7. ABOUT THE ALTERNATIVES

The alternatives for carrying out activities in the Geographic Area of the Campos Basin include the use of various types of drilling rigs, as well as the analysis of the areas where the wells will be drilled.

The drilling of a well can be performed basically by platforms that are supported on the seabed or on floating platforms, depending on water depth.

Platforms that rest on the seabed drill to depths of up to 300 meters and can be of type Modular Probe (installed in Fixed Platform), Self-Liftable and Submersible (Figures 02 and 03).



Source: Petrobras

Figure 02 – Fixed Platform with modular drill installed.



Source: Petrobras

Figure 03 – Self-Liftable Platform.

The floating platforms are used in deepwater and ultra-deep (3,000 meters depth), may be the type of semi-submersible and drillship (Figures 04 and 05).



Source: <http://www.nsf.gov>.

Figure 04 - Illustrative Figure of a drillship.



Source: <http://www.offshore-technology.com>.

Figure 05 - Illustrative Figure of a semi-submersible platform

The information on the location more conducive to the drilling of wells is in function of the existence of reserves to be discovered in the future or existing ones to be developed.

8. HOW THE ACTIVITY WILL BE PERFORMED

The platform, also called drilling probe, is moved to the location of the well drilling by towing ships or by self-propelled.

The platform is positioned over the well and kept immobile throughout the drilling process. In very deep regions, it is necessary that the platform be provided by a computerized system that, with the aid of sensors that monitor the action of ocean currents, waves and winds, fires thrusters installed on its hull keeping it immobile, with no physical connection of platform to the seabed, except for the drilling equipment.

After the mobilization of the drilling platform, i.e., its transport and accurate positioning, is lowered so-called drill string, which has a drill bit attached at its lower end, initiating the opening of the well, from a hole on the rocks that are below the seabed. The well drilling takes place in several stages, with ever smaller diameters, as the same becomes deep. Each phase is coated with a steel and cemented to ensure support of the walls of the well and safe operation (Figure 06).

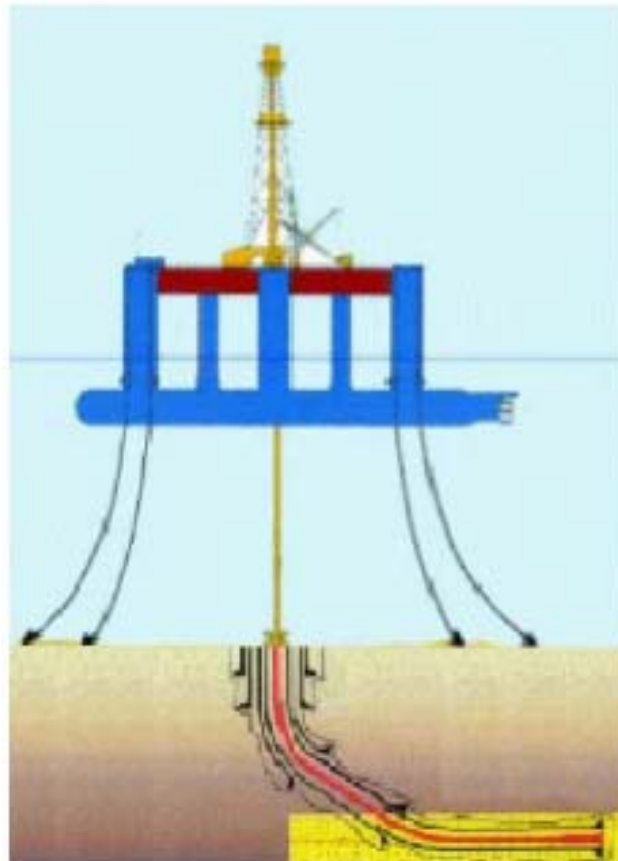


Figure 06 - Illustration of a well being drilled by an anchored floating drilling probe.

In order to control the operation, the so-called drilling fluid that is injected into the well from the pumping by the probe is used. From the well, the fluid returns to the probe by the space between the column and the shaft wall, bringing the crushed rock fragments (gravel). In the probe, the fluid is directed to specific equipments (sieves) for separation of the gravel, which is disposed in the sea. The fluid is then stored in tanks for further pumping back to the well (Figure 07).

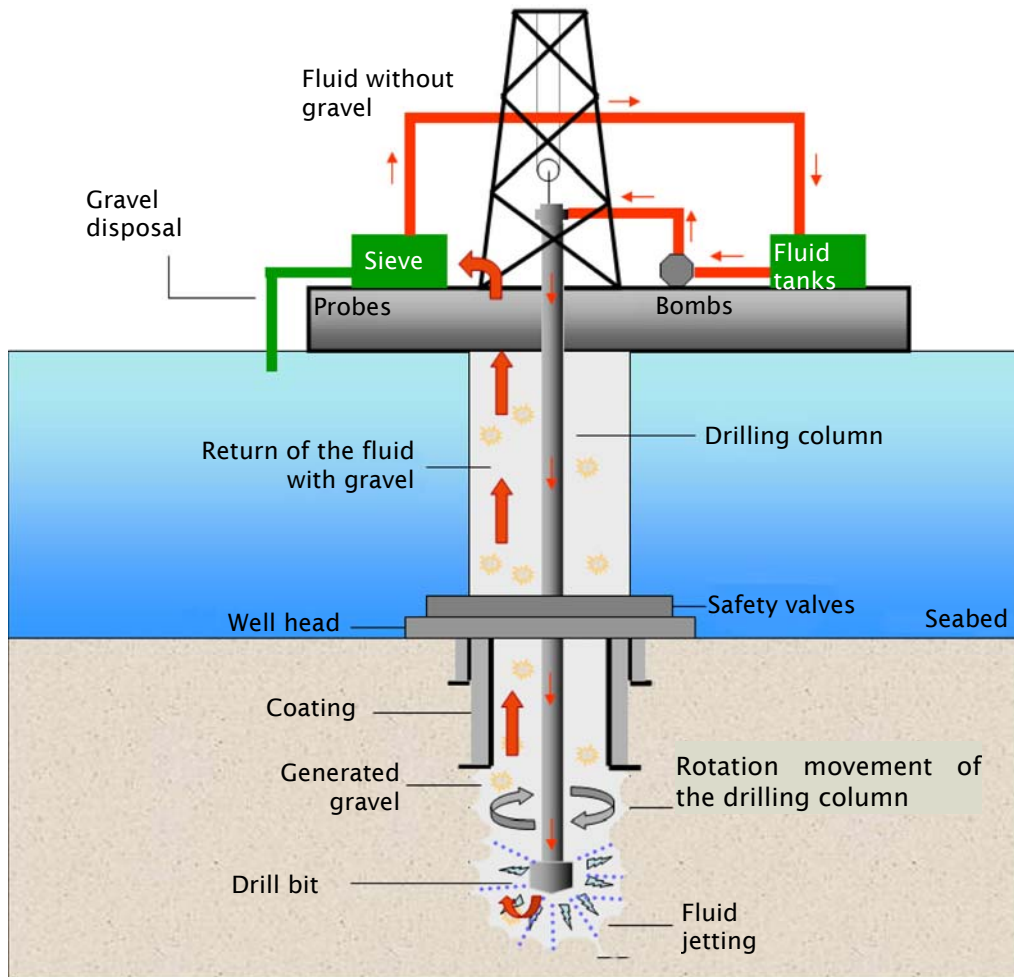


Figure 07 - Simplified scheme of drilling a well

The drilling fluids used in the activities of the geographical area of the Campos Basin will be of aqueous (using water) and non-aqueous base (the synthetic base, but have no oil in the composition).

Upon completion of drilling, the well is evaluated for its producer potential (quantity of existing oil and gas production capacity) and prepared ("completed") to produce safely and with the best performance possible over its productive life.

Finally, the drilling activities in the geographic area of the Campos Basin will have a land base of support (Customs Terminal of Imbetiba-Tai, located in Macaé)

for sending and receiving of chemicals, fuel, equipments, food and generated waste, which will be transported by a fleet of support vessels, including tugs and barges.

The airport of Macaé, operated by INFRAERO, and the Heliport of Sao Tomé, operated and owned by Petrobras will be used for loading and unloading of workers.

9. GETTING TO KNOW THE REGION INFLUENCED BY THE ACTIVITY

The area of influence is the representation of the entire region which could be affected in some way by the impacts caused by the offshore drilling activity in the Geographic Area of the Campos Basin. The term "area of influence" makes easier its representation on maps of the region where the activity is performed.

AREA OF DIRECT INFLUENCE (IDA)

The Area of Direct Influence is the area subject to direct impacts of the activity, based on the physical, biological and socioeconomic features of the environments found in the Geographic Area of the Campos Basin and the in the characteristics of the activity.

Thus, for the natural environment (physical environment and biotic environment¹) the Area of Direct Influence is represented by the Geographic Area of the Campos Basin itself.

For the socioeconomic environment², it was considered an area of 500 m distance around each drilling unit. This is the area of security for the conduction of the drilling activity, which is not allowed to approach fishing boats or any vessel other than to support the activity.

The determination of the safety area greatly reduces the possibility of approaching of fishing boats. In addition, the Geographic Area of the Campos Basin is quite distant from the coast (at least 200 km off the coast of the State of Rio de Janeiro and 280 km off the coast of Espírito Santo). It is important to remember also that these fishing boats are generally small and, therefore, focused on fishing in shallow waters, a condition quite different from that found in most of the region called Geographic Area of the Campos Basin³.

¹ Physical environment is the set of environmental characteristics (i.e. water temperature, rock types, climate). Biotic environment is a set of all the living beings who live in the region.

² Socio-economic environment is the way people of the region organize themselves, work and are assisted.

³ More than half of the Geographic Area of the Campos Basin is found at depths exceeding 200 m.

The Area of Direct Influence of socioeconomic environment is defined as the area represented by the Geographic Area of the Campos Basin itself, as well as determined for the natural environment (Figure 08).

AREA OF INDIRECT INFLUENCE (AII)

Unlike the Area of Direct Influence, which only considers the real impacts of the activity, the Area of Indirect Influence includes the area to be affected by a possible oil spill from the drilling activities (Figures 08 and 09). This condition is determined by simulation of an accident in oil spill that occurred during 30 days, and nothing was done by Petrobras to stop the leak. This simulation also considers winter conditions, as is in the winter when it has the worst weather and sea conditions in the region, allowing the oil to spread more rapidly and reach a greater area.

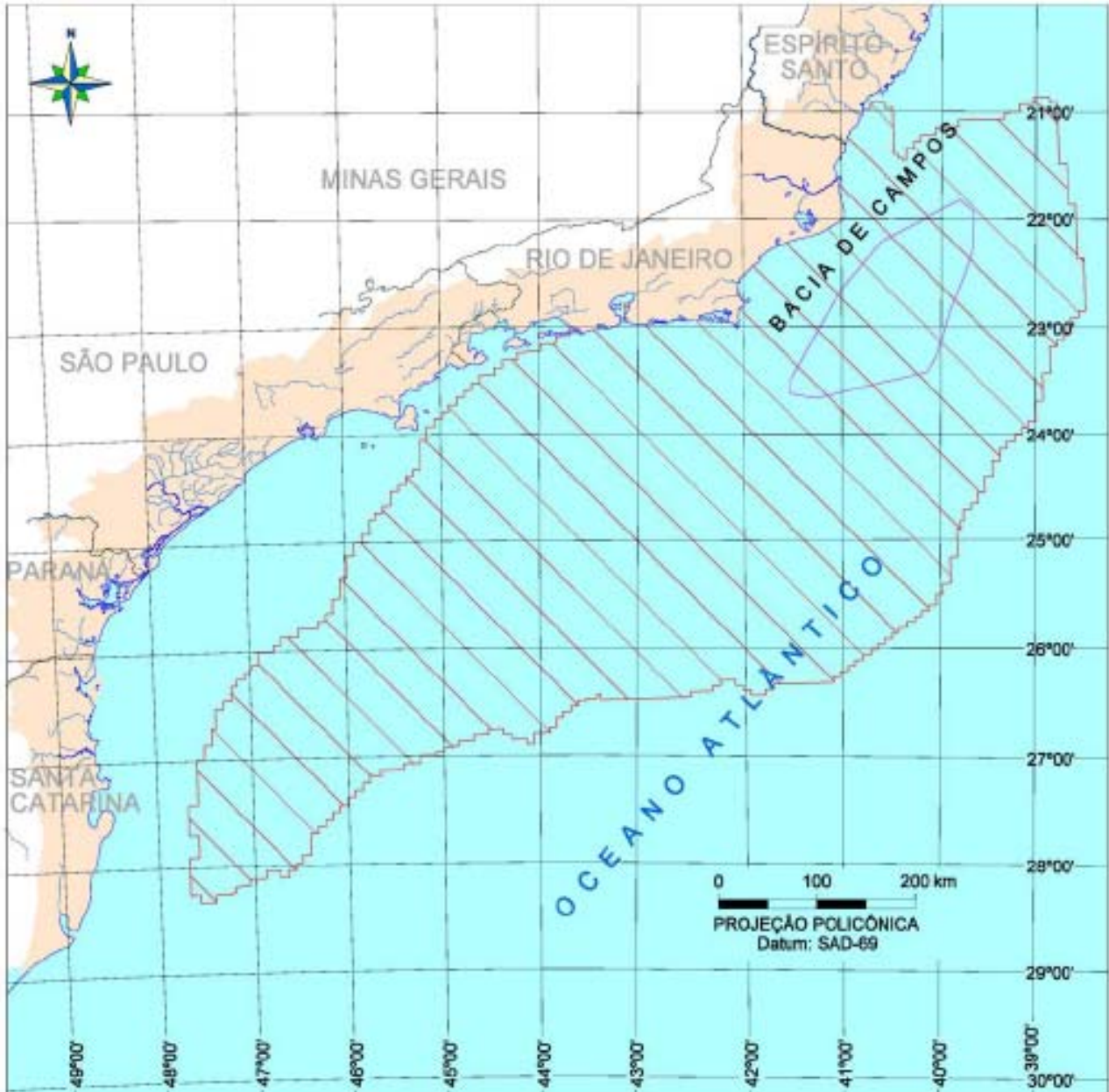
It is therefore used a computer program (so-called mathematical models), which calculates the likelihood (probability) for the slick to reach the spot at any point in the region. In other words, there is an idea of how far the slick can reach in the event of a leak. This program performs a series of pictures with the oil slick, even know the largest area as possible which could occur during this case, the winter.

After making the models, and after verifying the hypothetical largest slick, is defined then what is the Indirect Area of Influence of the activity. In the case of drilling activity in the Geographic Area of the Campos Basin were considered as All the areas that showed 10% or more chance of being hit by the oil, both for the natural environment and as also for the socioeconomic environment. This area covers the coastal regions (near the coast) and ocean, between the municipalities of Itapemirim, in the State of Espírito Santo and Itaguaí, in Rio de Janeiro (Figures 08 and 09).

Figure 08 Influence Area. A3

Figure 08 Influence Area. A3

AREA OF INDIRECT INFLUENCE - PHYSICAL AND BIOTIC ENVIRONMENT (*)



(*) NOTE: These areas of influence are bounded by the probability value range of the oil above 10%.

LEGEND:

-  **Area of indirect influence of the physical and biotic environment**

Figure 09 - Area of indirect influence of the physical and biotic environment

THE ENVIRONMENT

In this section of the RIMA are presented in summary form the characteristics of the physical, biotic and socio-economic environments that make up the environment of the area of influence of the drilling activity. It is important to detach that the illustrations presented propose only to offer examples of the subject being presented and do not represent the full diversity of physical, biological and socioeconomic factors in the region.

Physical Environment

To know the characteristics of the physical environment of a region, it is necessary to understand the behavior of the climate - such as wind patterns, frequency of cold fronts and temperatures that occur over the seasons; the movements performed by the ocean as the waves and speed and direction of currents; the characteristics of the seawater, such as temperature and salinity, besides characteristics of relief, contours of the coast, depth, seabed sediments, etc.

Thus, it is observed that the region where we anticipate the provision of the drilling activity (Figure 01), the climate is tropical with wet summers and dry winters. The waters of the Campos Basin near the coast (where there are beaches, estuaries, mangroves, etc.), which we call the coastal region, are rich in food, suffering the influence of rivers and lakes that flow into the sea. As in the ocean region, the water has low food. This influence of the rivers makes the water in the region near the coast are darker and less saline than the ocean water.

The sediment of the coastal region is also heavily influenced by the continent, being a higher concentration of metals, such as iron, in these regions than in oceanic regions. The sand grains of the coastal region are thicker and larger, while in areas further apart, as ocean region, the pellet has smaller grains (such as that formed sludge).

Biotic Environment

The biotic environment is related to marine life in the region of the Campos Basin. So, there are related the different types of ecosystems present (ocean, beaches, mangroves, rocky shores, estuaries, lagoons, etc.), and the beings that inhabit these places such as fish, birds, turtles, whales and dolphins, crustaceans among others.

The knowledge of the conservation units present in the area is also important to allow a great care to these environments that are already protected by law.

Conservation Units

In the area of influence of the drilling activity in the geographic area of the Campos Basin there are 47 Conservation Units (CUs), as follows:

- 3 Federal;
- 10 State;
- 32 Local;
- 2 Private.

The coast between the cities of Armação dos Búzios and Arraial do Cabo (RJ-Lakes Region) has the largest number of Conservation Units (CUs). The figures 10, 11 and 12 respectively illustrate the location of the federal, state and local Conservation Units observed in the area of influence.

Figure 10 – Federal Conservation Units of the area of indirect influence A3

Figure 10 – Federal Conservation Units of the area of indirect influence A3

Figure 11 - State Conservation Units of the area of indirect influence A3

Figure 11 – State Conservation Units of the area of indirect influence A3

Figure 12 - Local Conservation Units of the area of indirect influence A3

Figure 12 – Local Conservation Units of the area of indirect influence A3

Major Coastal Ecosystems

Beaches - are important recreation areas, which occupy great part of the Brazilian coast. These are change zones of the terrestrial environment to the marine environment. Many organisms living on the beaches have direct economic importance, such as shrimp and crabs (crustaceans) and mussels and cernambi (clams), used as food. The beaches are the largest part of the coast between the towns of the area of influence (Figure 13).

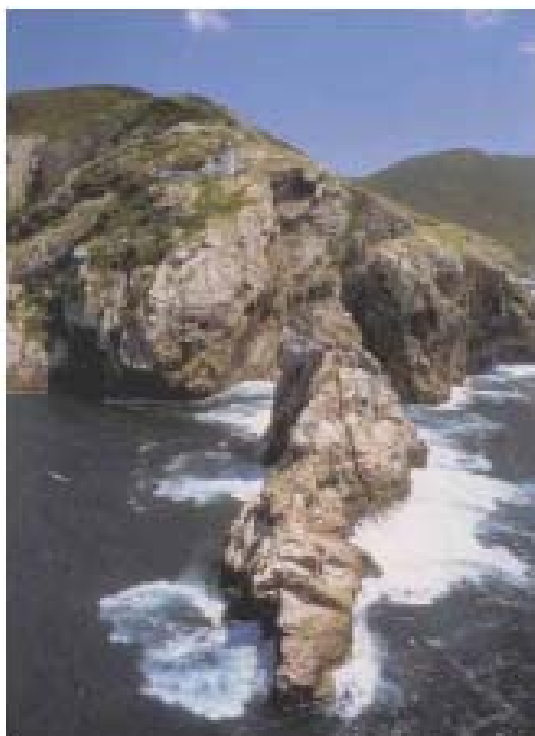


Source: <http://khattarkattar.blig.ig.com.br>

Figure 13 - Praia do Forno, Arraial do Cabo, RJ. Detail: sand bar vegetation

Rocky shores - are considered one of the most important coastal ecosystems because they are inhabited by many species of economic and environmental⁴ importance, such as mussels, oysters, crustaceans (crabs), algae and fish. As consequence, the rocky shores are places of feeding, growth and reproduction of many species. In the area of influence, there are numerous shores on the continent and the coastal islands (Figure 14).

⁴ It is understood as a species of environmental importance of the so-called endemic, endangered, rare, indicators of environmental quality and species that develop important role in the ecological balance of a given ecosystem.



Source: <http://www.castellobranco.com>

Figure 14 - Rocky Shore of
the Cabo Frio
Lighthouse

Estuaries - considered as the transformation zone of the fresh water environment (rivers or lakes) for salt water environment (beach, sea), the estuaries serve as great natural "nurseries", providing shelter and adequate space for the reproduction of many animals (i.e. crustaceans and fishes). In the area of influence, the estuary of the Paraíba do Sul River, considered the most important environmental of the country is found.

Mangroves - as well as the estuaries, are also considered real natural "nurseries", because they are suitable locations for the birth and growth of pups and juveniles, being of great ecological and economic importance. Because they are the most sensitive to changes caused by humans, the mangroves are considered by federal law, as areas of permanent preservation. In the area of influence, mangroves are present around the lagoons, estuaries and rivers, such as the river Una (Búzios), Barra de São João, Rio das Ostras, Sweet Lagoon (also in Oyster river, Macaé river, Barra do Furado, Paraíba do Sul river, among others).

Coastal lagoons - are ecosystems that contribute in a direct way for the maintenance of groundwater⁵, one of our freshwater sources. The coastal lagoons are also important fishing areas, cultivation of marine animals and recreation. In the area of influence were identified 39 lagoons including Jurubatiba Lagoon (Figure 15).

⁵ subterranean water deposit which is formed in relatively small depth (about 1-20m deep)



Source: <http://www.tuyuyu.com.br>

Figure 15 – Jurubatiba Lagoon

Wetlands - wetlands are defined as a set of freshwater, brackish or salt, may always be present during or just one or a few seasons. This makes that their soils are continuously impregnated with water or during part of the year. In the area of indirect influence of the project, highlights the area around the Restinga de Jurubatiba National Park, where there are large stretches of wetlands, also known as marsh.

Sandbanks - grow in flat and sandy (Figure 16) lands and form environments often associated with the mouths of great rivers. The shoals are environments with many plant and animal species. The importance of this environment in the North Region of the State of Rio de Janeiro was recognized with the creation of the first and most important conservation area, the Restinga de Jurubatiba National Park.



Source: www.tnstate.edu/ganter/B412%20Ch%201%20EcolInt

Figure 16 – Restinga de Jurubatiba National Park.

Coral reefs and shellfish - the environments formed by corals have a great capacity for absorption of some nutrients, causing the organisms to grow and later become a source of food for other organisms. The coral reefs are also important because they are areas of shelter and reproduction of algae, fish and some shellfish (e.g. scallops, oysters, clams and cockles).

The banks of mollusks occur mainly in the mangroves, rocky shores and beaches. Some of the species that are found on the banks of shellfish are of economic interest. The most exploited in the coastal region of Rio de Janeiro are the mangrove oyster, the bacucu or mangrove mussel, mussels, cockles and shellfish (Figure 17).



Source: <http://investigacion.izt.uam.mx>

Figure 17 - Shellfish.

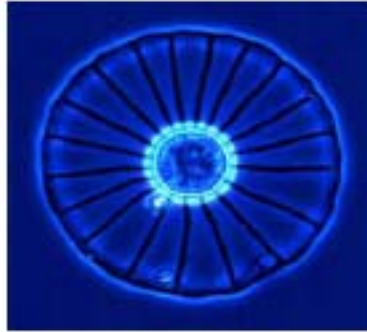
Coralline algae banks Coralline algae banks are marine habitats formed by the accumulation of calcareous algae (Figure 18). These banks cover about 15% of the seafloor in tropical regions, can be found up to 30 m depth and about 2000 m extension along the Brazilian coast. In the regions north of the state of Rio de Janeiro and south of the Espírito Santo, which are part of the influence area of the drilling activity, we can observe a large area covered by calcareous algae. In these areas, several other species of animals (e.g. mollusks) and plants (e.g. algae) grow attached to the banks of calcareous algae.



Source: <http://web.ukonline.co.uk/>

Figure 18 - Coralline algae.

Plankton - belong to this group of animals and plants which can not overcome the sea currents (Figures 19a and 19b). Some of them can only be seen using a microscope. They are extremely important because they serve as food for other marine animals (e.g., fish). They are also used to know whether the sea water has a change (environmental quality) or to know the ocean current that is passing through (water mass).



Source: <http://investigacion.izt.uam.mx>

A. Microscopic algae



Source: <http://www>

B. Microscopic animal

Figure 19 - Algae and animal found in the Plankton.

Fishes - in the area of influence of the activity there is a wide variety of fish species. Among them we can mention the ray viola, the albacore fish, the sardines, the grouper (Figure 20) and wreck fish. Some of these species are of great environmental importance and other of high economic value.



Source: www.fishbase.org

Figure 20 - Grouper

In addition to species of economic interest, in the area of influence are also found endangered species such as the blue shark (Figure 21A), the manta ray (or manta ray - Figure 21 B), the carcharias taurus, the viola ray and the sea-horse among others.



Source: www.goldenstateimages.com

A. Blue shark



Source: www.florananimal.ru

B. Manta ray

Figure 21 - Example of endangered fishes that occur in the area of influence of the activity.

Other items presented below deal with the fishes under two aspects, fisheries, also presented within the context of the biotic environment, treating only those species which are used as resources for the activities of artisanal fisheries in the region and; and the fishing item, presented the socioeconomic environment, which aims to explain more adequately on the fishing colonies located in the area of influence of the activity and the methods of fishing practiced by these colonies.

Benthos - are organisms that live on the bottom or within the sediment. It is a very diverse group, representing approximately 98% of about 250,000 marine species. They are economically important (e.g. shrimp), as well as serving as food for other organisms.

Marine Mammals - are represented by the whales, porpoises and dolphins, especially Southern Right Wales (Figure 22A) and Humpback Whale (Figure 22B), which migrate from the cold waters of Antarctica to the warm waters of the Brazilian coast to reproduce, and feed their baby whales, passing over the Campos Basin between July and November.



Source: <http://www.oceanalliance.org>

A. Southern Right Wales



Source: <HTTP://www.life.umd.edu>

B. Humpback Whale

Figure 22 - Whales that are seen in the area of influence of the activity.

Sea turtles - occurring five species of sea turtles along the Brazilian coast: loggerhead, green, leather, comb and olive. All of these turtle species occur throughout the area of influence of the activity, where they appear to feed. The migration of turtles along the Brazilian coast is associated with spawning, which occurs between the months of September to March. In the area of influence, there is record of spawning, only for the Loggerhead Turtle (Figure 23), being the northern beaches of Rio de Janeiro (especially the Barra do Furado and Farol de São Tome) used for spawning, between the months of October to March.



Source: <http://www.sosterravida.hpg.ig.com.br/figtarta2.jpg>

Figure 23 - Loggerhead Turtle.

Sea birds - several species of seabirds are observed in the area of influence of the activity, since the region of the Campos Basin is part of the migratory route of several of them, like the kelp gull and masked booby. (Figures 24A and B).



A. Masked booby (*Sulla dactylatra*)
Source: <http://www.danheller.com/images/>



B. Kelp gull (*Larus dominicanus*)
Source: <http://schmoker.org/BirdPics/>

Figure 24 – Examples of seabirds that are seen in the area of influence of the activity

Fishery resources - the most-caught fish in Brazil is the real sardine (Figure 25). In the State of Rio de Janeiro, the real sardine fishing is almost completely oriented to industry. Besides sardine, we highlight the skipjack, yellowfin, the slab, swordfish, dourado, sierra and the sauries. In Espírito Santo, there is fishing for grey triggerfish.



Source: <http://www.terravista.pt>
Figure 25 – Real Sardine.

Among other economically important species, are: the pink shrimp, sea-bob shrimp (Figure 26), squid and mussels. In the state of Espírito Santo, the fishing of crustaceans is very important.



Source: <http://www.recrefish.com.br/camarao.htm>
Figure 26 – Sea-bob shrimp.

Figure 27 illustrates the locations of ecosystems and areas of concentration of plants and animals considered of great importance.

Figure 27 – Coastal ecosystems and areas of concentration of plants and animals of great biological importance. A3

Figure 27 – Coastal ecosystems and areas of concentration of plants and animals of great biological importance. A3

Socioeconomic Environment

The knowledge of the structure of society established in the region where you want to install an activity allows effects to be assessed and evaluated. Thus, we seek to obtain further information such as existing infrastructure, the main economic and social activities, dynamics, among other data that will be of great value for the correct sizing of the positive and negative interferences associated with the new activity.

The municipalities that are part of Area of Indirect Influence (AII) of the Offshore Drilling Activity in the Geographic Area of the Campos Basin are: São Francisco de Itabapoana, São João da Barra, Campos dos Goytacazes, Quissamã, Macaé, Carapebus, Rio das Ostras, Armação de Búzios, Cabo Frio, Arraial do Cabo, Casimiro de Abreu, Araruama, Saquarema, Maricá, Niterói, Rio de Janeiro and Itaguaí, in the State of Rio de Janeiro and the municipalities of Presidente Kennedy, Marataízes and Itapemirim in the State of Espírito Santo.

- Infrastructure

The resident population in the 20 coastal municipalities of the components of the Area of Indirect Influence is about 7.5 million inhabitants, and the municipalities of Rio de Janeiro and Niteroi represent 84% of this total.

In this context, the highlight of the city of Rio das Ostras is showing a population growth rate of 18% due to migratory movements recorded. It is noteworthy that the significant migratory movement observed for the city is associated with the growth of the region around Macaé, due to economic growth resulting from petroleum activities in the Campos Basin.

The rapid growth of cities in the region, the lack of organization of public services and the continuing economic downturn hamper and even prevent the various problems are solved, as the improvement or extension of services of urban infrastructure such as transport, piped water and sewage, housing and energy.

- Soil Use and Occupation

Although great part of the territory of the area of indirect influence is occupied by cities, there are several municipalities that have rural areas. According to information from IBGE (agricultural census 1995-96), from the total

area used for agricultural activities, the use of 59.7% of pasture area (natural and artificial) and 24.8% for crops (temporary and permanent) are detached.

- Productive Structure

The number of municipalities in the Area of Indirect Influence has driven the tertiary sector - trade and services, due to its location on the coast, its natural heritage and its high degree of urbanization. This tertiary sector has become the most dynamic of the local economies, both in support of tourism activities, as those deriving from the exploitation of oil and natural gas in the Campos Basin.

The construction industry occupies a prominent position in seven municipalities in the Area of Indirect Influence. Firstly, it has been Casimiro de Abreu, secondly São Francisco de Itabapoana, Araruama and Maricá and, thirdly, Campos dos Goytacazes, Rio das Ostras and Saquarema. In Macaé, the service is outstanding, contributing about 43% of local GDP in 2003.

The municipalities of the Area of Indirect Influence are recipients of royalties, which is a financial compensation paid by utilities that produce oil or natural gas. Its calculation is monthly and is made by the Oil National Agency (ANP).

Table 01 presents the annual sum of royalties collected between 2000 and 2004 by the states of Rio de Janeiro and Espírito Santo, established by ANP at the end of each year.

Table 01 - Total of Royalties collected in the States per year (R\$).

TOTAL OF ROYALTIES COLLED PER YEAR (R\$)					
State	2000	2001	2002	2003	2004
Rio de Janeiro	397.059.002,81	497.353.455,88	671.655.951,93	997.787.349,02	1.1 34.662.527,87
Espírito Santo	14.1 32.355,24	19.668.395,64	31.1 31.343,46	59.278.535,24	60.739.177,55
TOTAL	411.191.358,05	51 7.021.851,52	702.787.295,39	1.057.065.884,26	1.195.401.705,42

Source: ANP (2004).

Over the past four years, the annual sum levied by the State of Rio de Janeiro rose from R\$ 397 million in 2000 to somewhere around R\$ 1.1 billion in 2004, while, in Espírito Santo, has from R\$ 14 million (2000) for R\$ 60 million (2004). This increase represented a tripling in the collection of royalties in Rio de Janeiro and quadrupling of revenue of Espírito Santo. The municipalities of the Area of Indirect Influence received a total of R\$ 901,742,877.04 during the year 2004.

- Leisure, Tourism and Culture

The territory of the coastal Area of Indirect Influence (IIA) is widely used for activities related to tourism and leisure, the main attraction is the presence of many beaches and lagoons that exist there, providing a great condition for the practice of sport, recreational fishing or for consumption, and promoted cultural activities and historical and cultural heritage of the region.

This area attracts a number of tourists and vacationers quite significant, bringing local extraordinary dynamism, even in economic terms, generating employment and income for the municipalities of greater demand for tourism, such as the Lakes Region. The forms of tourism practiced in this age of All are the second residence, residence rental for season, occupancy / hotel and tourism business, the latter, especially in the northern state, the municipalities of Campos dos Goytacazes and Macaé.

- Fishing Activity

Fishing is an important economic activity in the municipalities that are part of the Area of Indirect Influence of the activity being conducted on an artisanal and industrial form. Predominantly craft, it is practiced in areas near the coast, bays and coastal lagoons. However, in contacts with the fishermen colonies, it was found that even small boats, in theory intended to artisanal fisheries (small trawlers, for example), move away from the coast in search of fish stocks, mainly due to reduced coastal inventories.

Industrial fishing takes place offshore, requiring larger vessels and infrastructure for the realization of fishing for long periods, but it is in many coastal regions, with the artisanal fishing.

The risks associated with petroleum activities make it necessary to create a security zone around the platforms and equipment used in this type of activity. This zone is called the exclusion zone, because it only allowed the entry of boats that provide support to the activity, extending for a distance of 500 m around the platform. Thus, in this area the fishing activity is not allowed. The creation of this zone is a determination of the Brazilian Navy.

The main social representatives concerning artisanal fishing activities are the fishing associations and colonies. Forty-three fishermen's associations and colonies were identified in the Area of Indirect Influence (Table 02).

Table 02 – Fishermen’s associations and colonies.

FISHERMEN’S ASSOCIATIONS AND COLONIES
Fishermen’s Colony Z-16 - Itacuruçá
Fishermen’s Colony Z-13 - Copacabana
Fishermen’s Colony Z-14 - Pedra de Guaratiba
Fishermen’s Colony Z-15 - Sepetiba
Fishermen’s Colony Z-10 - Ilha
Fishermen’s Colony Z-11 - Ramos
Fishermen’s Colony Z-12 - Caju
Fishermen’s Colony Z- 07 - Itaipu
Fishermen’s Colony Z- 08 - Itaipu
Free Fishermen’s and Friends Association of Praia de Itapúa (Itapúa Beach)
Fishermen’s Association of Jurujuba
Free Mariculturists’ Association of Jurujuba
Fishermen’s Association of Itaipuaçu
Fishermen’s Association of Ponta Negra
Fishermen’s Leisure and Culture Communal Association of Zacarias - Maricá
Fishermen’s Colony Z-24 - Saquarema
Free Artisanal Fishermen’s and Friends Association of Praia de Itaúna- Saquaquema
Free Artisanal Fishermen’s and Friends Association of Praia de Itaúna
Fishermen’s Association of Mombaça - Saquarema
Fishermen’s Association of Araruama
Fishermen’s Colony Z-5 - Arraial do Cabo
APAC- Fishermen’s Association of Arraial do Cabo
AREMAC - Association of Marine Extractive Reserve of Arraial do Cabo
ACRIMAC- Association of Seafood Collectors and Breeders of Arraial do Cabo
Fishermen’s Colony Z-4 - Cabo Frio
Free Fishermen’s and Friends Association of Praia do Siqueira - Cabo Frio
Fishermen’s Association of São João - Cabo Frio
Fishermen’s Colony Z-23 - Búzios
Fishermen’s Association of Manguinhos - Búzios
Free Aquaculturists Association of Águas de São João - Casimiro de Abreu
Fishermen’s Association of Barra de São João
Fishermen’s Colony Z-22 - Rio das Ostras
Fishermen’s Colony Z- 03 Macaé
Mixed Fishermen’s Cooperation of Macaé
Fishermen’s Association of Carapebus
Artisanal Fishermen’s Association of Quissamã
Fishermen’s Association of Barra do Furado
Fishermen’s Colony Z-19 - Campos dos Goytacazes
Fishermen’s Colony Z-02 - Atafona
Fishermen’s Colony Z-01 - São Francisco de Itabapoana
Fishermen’s Colony Z-08 - Marataízes
Fishermen’s Colony Z-10 D. Pedro I - Itapemirim
Fishermen’s Association of Itaipava District - Itapemirim

- Identification of Rollovers

The main sites of historic and cultural heritage of the region are located in the municipalities of Cabo Frio, Arraial do Cabo, Saquarema, Armação dos Búzios, Araruama, Macaé, Campos dos Goytacazes, Maricá, Quissamã, Casimiro de Abreu, São João da Barra, Rio de Janeiro, Niterói, Itaguaí, Rio das Ostras and Maricá, in the State of Rio de Janeiro, as also Itapemirim in the State of Espírito Santo. In these places, there is the presence of numerous archaeological sites⁶. The municipality of Rio de Janeiro is the one that contains the largest number of these important sites, with 108 sites.

Of the 361 recorded archaeological sites in the Area of Indirect Influence of the activity, only 44% are in the coastal strip. Some of these sites listed are located in the coastal strip near the beaches. This percentage is approximate because much information has a lack in the exactly distance from the site away from the coast.

Figure 28, below, presents the main socioeconomic characteristics of the area of influence of the project.

Figure 28 – Main socioeconomic characteristics of the area of influence of the activity. A3

Figure 28 – Main socioeconomic characteristics of the area of influence of the activity. A3

Environmental Sensitivity

Environmental Sensitivity is the set of environmental characteristics that make it necessary to their preservation and/or conservation. The determination of the environmental sensitivity of a region is made from the combination of the so-called "environmental factors" (animals, plants, ecosystems, etc.) and human activities (fishing, harbor, recreation, etc.). In case of oil ventures, such as the drilling activity in the Geographic Area of the Campos Basin, the sensitivity of these environmental factors is mainly attributed to a possible oil spill.

The areas affected by the drilling activity scheduled to be held in the Geographic Area of the Campos Basin was classified as high, medium or low sensitivity, according to the criteria presented in Table 03 below.

Table 03 - Classification of the environmental sensitivity of the area of influence of the drilling activity of Geographic Area of the Campos Basin.

CLASS	CRITERIA
HIGH	Regions with environments of great importance, characterized by an intense human activity in the presence of breeding and feeding of several species, and a coast zone made up of protected mangroves, lagoons, rocky shores and tidal flats
MEDIUM	regions with important ecosystems to be preserved, but where the human use is not as intense as in the previous case. The breeding and feeding area of animals is not observed and the coastal zone consists of beaches and exposed tidal flats ecosystems
LOW	regions with low considered environmental importance, by being less used by the man, they do not have breeding and feeding areas for animals and submit a coastal zone consisted of rocky shores, artificial structures (walls, pier) and/or exposed rock platforms. These ecosystems are little affected by environmental impacts and are easy to recover.

Thus, the environmental diagnosis allowed the preparation of an environmental sensitivity map, summarizing all relevant information about the environmental factors described in the region of the Campos Basin, and to allow, finally, areas classified as high, medium or low sensitivity according to the criteria shown in Table 03.

- Coastal Region

According to the environmental sensitivity map (Figure 29), the coastal region located between the municipalities of Maricá (RJ) and Itapemirim (ES) is considered of high environmental sensitivity. This classification is due to widespread presence of conservation units along the coastal region's diverse

ecosystems such as: reefs, mangroves, rocky shores, beaches, etc. This diversity of ecosystems, in proper state of preservation, allows the presence of breeding areas of animals, the occurrence of endemic⁷ and/or endangered⁸ species such as sea turtles, mainly loggerhead, passing through the region between October and March to lay eggs on the beaches between Quissamã and Campos dos Goytacazes.

The north region of the state and the metropolitan region of Rio de Janeiro are considered, from a ranking published in 2002 by the Ministry of Environment, as areas of very high to extreme environmental importance and that are priorities for the preservation of coastal lagoons, mangroves and sandbanks. It stands out in this area, the presence of the Restinga de Jurubatiba National Park, occupying lands in the municipalities of Macaé, Carapebus and Quissamã.

The archaeological sites, concentrated in Cabo Frio, Arraial do Cabo, Saquarema and Armação dos Búzios, increase the environmental sensitivity of the coastal zone. Some of these sites listed are located in the coastal strip near the beaches, so that the oil spills pose a risk to them.

The coastal region between Itaguaí and Niterói is considered as medium environmentally sensitive despite the presence of various ecosystems of great importance, these are, in large part, altered or modified by man. The entire region has beaches with very high biological importance, despite high rates of pollution that some of them show. Moreover, there is the presence of salt marshes (Jacarepaguá and Marambaia), exposed rocky shores (coast of Rio de Janeiro and Niterói, Cagarras islands, Itaipu and Tijucas) and breeding and nesting areas of sea and shore birds (Cagarras islands, Circle island and Marambaia).

The population growth in this region occurs mainly because of tourism activities and exploration of oil and gas in the Campos Basin. Moreover, the large number of animals and plants found in the mouths of rivers and mangroves of the region means that fishing is an important commercial activity and also an appeal to the livelihoods of some communities.

- Ocean Region

In the region of the continental platform (up to 200 m from the coast) in the Campos Basin, the classification of high sensitivity is mainly associated with the presence of animals in migration activity in some periods of the year. Marine mammals (whales) pass through the region between July and November. In this region, the benthic community (community inhabiting the seafloor, such as calcareous algae) is also considered of extreme biological importance, and this area is classified by the Ministry of Environment as a priority for conservation of

⁷ Species that exist only in a certain location (e.g. anchovy - only occurs on the coast of southeastern Brazil).

⁸ Extinction is the disappearance of species or species groups.

biological diversity. As it can be seen on a map of Environmental Sensitivity (Figure 29), although the entire area of the Campos Basin is very important for the conservation of species and ecosystems existing there, the classification of environmental sensitivity is variable. This variation occurs mainly due to the resilience capacity of the ocean environment, when compared to the coastal environment. Thus, in the ocean, where the movement of water occurs continuously, there is less sensitivity to environmental impacts related to the drilling activity, which increases towards the coast due to the increased difficulty of the environment to return to balance⁹ conditions

⁹ The term balance conditions refers to return to the environmental conditions similar to those found prior to suffering any change, and allowing maintenance of species and interrelationships typical of that environment.

Figure 29 – MAP OF ENVIRONMENTAL SENSIBILITY

Figure 29 – MAP OF ENVIRONMENTAL SENSIBILITY

10. ABOUT THE ENVIRONMENTAL IMPACTS

The environmental impacts were identified and evaluated from the analysis of the drilling activities of about 120 wells per year over a period of three years, provided they are held in the Geographic Area of the Campos Basin, in relation to the environment that can be affected. To better understand the evaluation of these environmental impacts, it is necessary to firstly define some terms (Table 04).

Table 04 - Terms used in the assessment of impacts.

USED TERMS	DEFINITIONS
ENVIRONMENTAL ASPECT	Action that interferes positively or negatively on the environment, e.g. disposal of gravel
ENVIRONMENTAL IMPACT	Any change in the environment caused by the activity, for example: change the benthic community due to the disposal of gravel
ENVIRONMENTAL FACTOR	Component of the natural (physical and biotic) and socioeconomic environment that is affected by the environmental impact, for example, the benthic community that was affected due to dispose of gravel
REAL IMPACTS	Those related to normal conduction of the activity.
POTENTIAL IMPACTS	Those related to an accident that is not expected to happen, or impact of uncertain occurrence.

Each impact was assessed according to some criteria which are presented below (Table 05). These criteria are evaluated in order together to assess the **MAGNITUDE** of an impact, which may vary from **low**, **medium** or **high**.

Table 05- Criteria for evaluation of the magnitude of the impact.

CRITRIA	DEFINITIONS
QUALIFICATION	Positive - when the impact results into environmental improvement. Negative - when the impact results into loss of environmental quality.
INCIDENCE	Direct - impact resulting of a simples relation between cause and effect. Indirect - impact resulting of a second reaction.
PERMANENCE OR DURATION	Temporary - impact it has neutralized effects in less than twenty years. Permanent - impact on the effects may remain even after ca. twenty years.
MOMENT OR TRIGGERING	Immediate - impact on the effects appear immediately after the action. Short term - impact on the effects that arise within one year after the action. Medium term - the impact where the effects occur at a time between 1 and 10 years. Long term - impact on the effects can only be observed long after the action (10-50 years)

Table 05 (conclusion)

CRITERIA	DEFINITIONS
DEGREE OF REVERSIBILITY	<p>Reversible - when the original conditions are restored.</p> <p>Partially reversible - when the original conditions are partially restored.</p> <p>Irreversible - when they are not restored to original condition.</p>
SPACE EXTENSION	<p>Local - when its effects are felt only in the development areas of the activity.</p> <p>Regional - when their effects go beyond the development areas of the activity , and are limited to the Campos Basin.</p> <p>Extra-regional - the ones whose effects go beyond the region of the Campos Basin.</p>
CUMULATIVE	<p>Simple - impact that has no interactions with other(s) impact(s).</p> <p>Cumulative - has some type of interaction with other(s) impact(s)</p>

The **IMPORTANCE** of the impact considered small, medium or large, was defined based on the assessment of the magnitude, as described above, and the classification of the environmental sensitivity of the impacted environmental factor, as shown in the matrix presented in Table 06.

Table 06 – Criteria for assessment of the importance on the impacts.

MAGNITUDE \ SENSIBILITY	HIGH	MEDIUM	LOW
High	Major	Major	Average
Medium	Major	Average	Minor
Low	Average	Minor	Minor

Finally, once identified and evaluated all the environmental impacts, were proposed measures, projects and plans that have as main objective to improve environmental quality. The measures presented in Chapter 12 of this document, are an important environmental management tool, which can reduce the consequence of environmental changes identified.

REAL IMPACTS

Aspect: Mobilization of drilling platforms

- Impact: Modification of benthic community

During the conduction of the drilling activity in the geographic area of the Campos Basin can be used up to 26 drilling platforms, and only seven of these

units use a positioning system with anchors that attach the seabed.

In places where the anchors are installed, can be observed a reduction in the density of organisms living on the seabed. Furthermore, the reconstitution of the community, after the end of the activities, happens differently from what happens today, due to changes in the local background.

This impact was considered negative, temporary or permanent and of medium magnitude and importance.

- Impact: Modification of the pelagic community

In general, drilling platforms and underwater rigid structures (such as pipes and fixed structures) attract marine organisms.

Thus, the positioning of the platforms and the permanence of these and its drilling columns temporarily attract the pelagic community (those living in the water column as e.g.: fish, turtles and dolphins), mainly in coastal waters.

In addition to this, the fact is that the noise generated by the drilling activities may exclude sensitive organisms, for example marine mammals (whales and dolphins). However, results of the Project of Marine Mammals and Turtles, held through a partnership between Petrobras, Humpback Whale Institute and Project TAMAR, did not indicate the removal of marine mammals (whales) and sea turtles (turtles) in the areas of drilling and oil production of the Campos Basin.

This impact was assessed as negative, temporary, of medium magnitude and great importance.

- Impact: Possibility of introduction of exotic species

They are considered exotic (invasive or non-native) organisms inserted accidentally or intentionally, in environments where there were not originally.

Although only a few exotic species were able to survive in a new environment, when they can establish, there are major threats to natural species in an area, causing serious damage to the economy and the environment and risks to human health.

The drilling platforms can act as a mean of transport of exotic aquatic species, due to the presence of: ballast tanks¹⁰ and underwater structures (e.g. ship hulls, anchors and subsea equipment). Furthermore, the platforms provide available area for the organisms (animal and plant) to settle, and could be transported from one area to another.

¹⁰ specific water storage tanks to provide stability to the platform.

In case the impact of exotic species occurs, it may cause changes of variable magnitude, reaching high values and importance in the case of a successful introduction into the environment.

Aspect: Creation of Security Zones

- Impact: Generation of conflict between the drilling and fishing activities

The presence of drilling platforms in the Geographic Area of the Campos Basin will cause a decrease in the areas of fishing activity, due to the prohibition of navigation of vessels within a radius of 500 meters around each unit.

These areas will be considered restricted to fishing activity, for safety reasons in order to avoid accidents, thereby reducing the area available for fishing, which is a negative impact. However, for being temporary and restricted to the area of fishing in the Campos Basin, this impact was considered of low magnitude and minor importance.

Aspect: Disposal of sanitary effluent

- Impact: Change in water quality

The release of wastewater (water from bathrooms and kitchens of the drilling platforms) can change the amount of food available in the water and let the water in the disposal site with a cloudy appearance. Thus, the wastewater (sanitary and those generated from the grinding of remaining food) from the normal activities of the operation of drilling platforms in the Geographic Area of the Campos Basin may cause changes in the water quality in the vicinity of these units.

The drilling activities in the Campos Basin are distributed by a wide area and moreover, the possibility of all the 26 platforms operating at the same time during the entire period of low activity. Considering also the fact that the surface sea currents of the Campos Basin conduct rapid spreading and dilution of effluents, this impact, although negative, was evaluated as temporary, low magnitude and minor importance.

- Impact: Change in marine biota

As previously mentioned, the disposal of effluents is expected to generate an increase in food supply and the state of water may become murkier. The Increase of the amount of feed water for the duration of drilling activities will cause an increase in plant and marine animals. Since the increase in turbidity (increased amount of sediment in the water column) may cause a decrease in the penetration of light in water, reducing the growth of microscopic plants (phytoplankton) in the area. This impact was classified as negative, but temporary, low magnitude and minor importance.

Aspect: Generation of solid waste

- Impact: Pressure on the infrastructure of the final disposal of waste

The structure needed for the conduction of the marine drilling activity with the operation of the drilling platforms and the presence of workers, end up generating solid waste. Thus, during the whole period of the activity, it is expected to generate paper, plastic, oily waste (e.g. dirty rag oil), food waste, glass, office supplies, hygiene, among others.

All the generated solid waste will be packaged, stored, transported and will have their final disposal as recommended by specific Brazilian and international standards. No solid waste will be launched in the sea, being all directed to the mainland from the support vessels that will be involved in the activities of the Geographic Area of the Campos Basin.

The pressure on the places of destination to their final disposal on land was classified as a negative, permanent, medium magnitude and importance.

Aspect: Air Emissions

- Impact: Change in the air quality

The operation of drilling platforms emits pollutants into the atmosphere due to electric power generation system, which comprises generators powered by fuel such as diesel oil. Thus, the burning of fuel for power generation produces pollutants that are released into the air from smokestacks. The substances most

commonly issued are: nitrogen oxides, sulfur oxides, carbon monoxide (CO), carbon dioxide (CO₂), total particulate matter (TPM) and total hydrocarbons (HCT).

The modeling studies conducted for the offshore drilling activity in the Geographic Area of the Campos Basin indicated that these substances are emitted at rates much lower than those required by Brazilian law to maintain air quality. Moreover, the fact that they are operating in high seas, off the coast, allows any pollutant emitted to be quickly dispersed, having its low concentration in a short time, since it has no barriers (like mountains, which act as barriers to Wind on the mainland) and thus has constant winds. Thus, this impact was considered negative, temporary, low magnitude and minor importance.

Aspect: Disposal of gravel

- Impact: Modification of the physical marine components

This impact considered the following: drilling of up to 120 wells, the area environmental characteristics, types, volumes and toxicity (potential of being or not toxic to marine organisms) of used fluid, and extension of the area of deposition of the gravel at the bottom of the sea.

Thus, the impact on the physical marine environment can be classified as regional, negative, short-term, temporary and direct. Depending on the local sea conditions, volume and type of disposal, this impact can be fully reversible. In this way, the impact value was considered of medium magnitude.

This impact was considered of great importance, since it also affects the benthic community that is present in the disposal site, and is characterized as having high environmental sensitivity.

- Impact: Modification of the benthic community

The disposal of gravel containing any fraction of drilling fluid on the seabed can affect the organisms of the seabed.

When deposited at the bottom, along with the gravel, the fluid used in the drilling process is now available for these organisms, and possibly for some of the organisms that feed this community, and may affect the entire food chain, successively and cumulatively.

The impact was considered negative and of medium magnitude, and great importance.

- Impact: Modification of the pelagic community

The results of tests carried out for the fluid expected to the drilling activity in the geographic area of the Campos Basin indicate that these fluids are not considered toxic if used within the limits and conditions and if they are easily dispersible in water. The disposal can also increase turbidity (increasing the amount of sediment in the water column), which can affect both the plankton and fish.

According to sea conditions, the fluid spreading may be rapidly, reducing the possible influences on the environment generated by the disposal.

Thus, considering the area affected by the disposal of gravel and fluid, this impact was considered negative, but temporary and reversible. This is because when the discharge is interrupted, the environment recovers the original conditions. Thus, this impact was classified as of low magnitude. Its importance was rated as medium due to the high sensitivity of the organisms involved.

Aspect: Demand for inputs and services

- Impact: Increased demand on the activities of trade and services

The mobilization, drilling and removal operations of probes in the Geographic Area of the Campos Basin will cause the displacement to the region of the support base of people involved in the activity.

As a result of it, it is expected to happen the indirect impact on trade activities and services in this region. Also related to this aspect occurs increased tax revenues. This impact was assessed as positive, temporary, of low magnitude and minor importance.

- Impact: Generation of taxes and increase of the local, state and national economy

With the activity, it will be needed to purchase a variety of materials and equipments, which will cause the increase in tax collections, both locally and regionally. It is envisaged mainly the increase of tax revenues linked to the movement of goods (ICMS), the purchase of industrialized products (IPI) and the provision of services (ISS), thus resulting in increased municipal, state and federal revenues.

This impact was assessed as positive, temporary, of medium magnitude and minor importance.

- **Impact: Pressure on the Maritime Traffic**

During the mobilization phase, it can be expected interference with the maritime traffic due to the displacement of drilling platform of the coastal region to the region of the wells to be drilled. Likewise, during the withdrawal phase, it may be expected to occurrence of similar impacts, with the displacement of the same to other areas.

During the period of activities, it is estimated the occurrence of support vessels travel between the lease and the basis for ground support. Although negative, this impact was considered temporary, of low magnitude and minor importance.

- **Impact: Pressure on the Air Traffic**

During the period of drilling, helicopter trips will occur between the air support bases and drilling platforms, for transportation, embarkation and disembarkation of personnel who are working in the activity.

Since these trips already occur in the area is not expected, therefore, a significant increase in air traffic.

This impact was assessed as negative, temporary, of low magnitude and medium importance.

- **Impact: Pressure on the Road Traffic**

For the development of the drilling activity, it is anticipated the possibility of road interference occurrence in the stretch located between the ground support base and the locals for procurement of materials and equipment or final disposal of waste from the drilling platforms, due to the increased movement of cargo vehicles.

The movement increase of cargo transport vehicles may cause interference with local road traffic. This impact was considered negative, temporary, of low magnitude and minor importance.

- Impact: Pressure on the infrastructure of sea transport and increased demand on the shipbuilding industry

The development of drilling activities will lead to increased demand for use of infrastructure of sea transport due to the constant connection between the drilling platforms and the ground support base for the supply of all materials (food, fuel, office material, etc.) necessary for workers and their activities and transportation of generated waste.

This impact was assessed as positive, temporary, of medium magnitude and importance.

- Impact: Stimulation of the airline industry

At all stages of development of the activities the transport of personnel for the drilling platform will be necessary. Thus, the activities may contribute to the stimulation (increase) in the airline industry with the increased use of this mean of transport. The purchase and lease of aircraft and the increasing need for maintenance services, pilot services and flight attendants are natural consequences of this process.

This impact was assessed as positive, temporary, of medium magnitude and average importance.

- Impact: Pressure on infrastructure of road traffic

The services related to transportation of cargo and passengers will suffer slight increase, to the extent that the transportation of employees to board at the airport, heliport or at the base of support should occur by means of passenger transport lines already operating in the region.

The transport of material by road will be done by trucks. Thus, carriers of loads, headquartered in the region, increase the number of freight contracts, due to the need to transport materials, equipment and waste that is generated during the drilling activities.

All maintenance and repair activities of vehicles of transport of passengers and cargo will be encouraged in the region in each increased need for more transport, due to oil activities in the sea.

This impact was assessed as positive, temporary and of low magnitude and minor importance.

- **Impact:** Pressure on the harbor infrastructure

The development of the drilling activities put a strain on the infrastructure of ports that already exists in the region. This will happen because of the need of using a ground support base for the drilling platforms. The development of the drilling activities may also facilitate the shift from land to the sea and to the land again for personnel, installed on drilling platforms in case of any impediment to realization of personal transportation by air.

The cargo handling at the port terminal to be used by Petrobras must meet all sorts of material and equipment to be used in support operations.

This impact was assessed as negative, temporary, of low magnitude and minor importance.

Aspect: Demand for manpower

- **Impact:** Job Creation

Considering only the generation of manpower related to the direct employment generated by the activity, the impact could be considered less important. However, the indirect job creation and maintenance of various cargos currently occupied heighten the importance of this impact.

In the drilling of wells in the Geographic Area of the Campos Basin, it is estimated that there will be about 130 professionals embedded in each of the 26 drilling platforms, who will work in shifts. Considering the simultaneous operation of the 26 drilling platforms, there is a total of 3400 jobs guaranteed.

This impact was assessed as positive, temporary, of medium magnitude and major importance.

Aspect: Demobilization¹¹ of the drilling platforms

- **Impact:** Change in marine biota

The withdrawal of the drilling platform provides for the pelagic community (plankton and nekton) a positive impact since the environment can reach a new ecological balance. This balance is similar to the one present before the interventions promoted by the arrival of the structure of the offshore drilling platforms in the Geographic Area of the Campos Basin.

¹¹ Demobilization: removal of the drilling platform of the location of drilled well.

The completion of the activity will require the removal of the anchors, which represents a negative impact on the benthic community, even if that return to the affected community. The possibility of further modification of the seabed will alter the structure of this community, which makes this impact negative.

Both the positive and the negative factors of this impact were considered permanent and major importance.

- Impact: Possibility of introduction of exotic species

The withdrawal of 26 drilling platforms means that at the completion of the drilling activities, the platforms will follow to another location, ocean or coastal.

This withdrawal can act in the cycle of introduction of exotic species through the dispersal of benthic organisms fouling on submerged structures, characterizing this as a negative impact. Thus, as assessed by the mobilization of the activity, this impact is negative and can obtain a major importance in cases of successful introduction events and events that change in a relevant way the balance of the affected region.

Aspect: Drilling Activity

- Impact: Perspectives for increased production of hydrocarbons

The drilling activities will enable the increased production of oil and secondary products, contributing to meet the increased need for fuel in the country.

The results of the activities in the geographic area of the Campos Basin may be critical for the maintenance of self-sufficiency once, in order to meet the expected increase in oil consumption by society, it will require the drilling of wells to discover and develop future reserves.

This impact was assessed as positive, temporary, of medium magnitude and major importance.

Conclusive Synthesis of the Real Impacts

According to the impact assessment matrix (Table 07), there is a total of 24 real impacts, including 11 directly related to the natural environment (physical and biotic) and 13 to the socioeconomic environment.

An analysis of the Impacts Assessment Matrix indicates that the vast majority of impacts were classified as: negative; the direct impact; temporary; local or regional; short-term and reversible. Thus, it is expected that, in general, once you have finished the drilling activity in an area, it returns to its original condition of environmental quality.

Although most of the impacts are focused on the socioeconomic environment, it is in this environment that you look at the positives aspects, which justify the implementation of the activity. Example of this is the increase that might occur in the Brazilian oil production capacity. It should also consider that activities in the oil area have great ability to move the state's economy, especially in the municipalities of the area of influence.

As to magnitude, with the exception of the impacts of the possibility of introduction of exotic species, all others were classified as low to medium.

The occurrence of eight impacts of major importance is directly related to the location of the Geographic Area of the Campos Basin as part of this area is considered by the Ministry of Environment as being of high environmental sensitivity, especially for the benthic community.

Insert Table 07 in A3

Insert Table 07 in A3

POTENTIAL IMPACTS

The assessment of potential impacts to the offshore drilling activities in the Geographic Area of the Campos Basin was performed taking as basis the following situation: oil leak for 30 days without control actions by Petrobras, of fifteen wells located at points along the entire perimeter of the polygon defined for the Geographic Area of the Campos Basin. The maximum area potentially affected was defined from the overlap of patches of oil spill of 15 wells.

Thus, it is important to note that a scenario like this has unique didactic character, so that it is able to obtain a forecast of areas that could be affected in the event of an oil spill from any point located on the polygon defined to perform the offshore drilling activity in the Geographic Area of the Campos Basin.

In this context, were assessed the potential impacts generated by the range of patches of oil in coastal regions affecting marine plants and animals, as well as socioeconomic activities in the region, as described below. It is important to highlight that in case of a catastrophic spill, involving a well uncontrolled for 30 days (scenario being evaluated on the following impacts), it is expected a great impact and changes of great importance in all the environmental factors existing in the region, leading in this case to a classification of high magnitude and major importance to almost all of the impacts identified, as can also be observed in the Potential Impacts Assessment Matrix, presented in Table 08 at the end of this item.

- Impact: Changes in the water quality

With the shedding of large volumes of oil in the sea, it is observed that the water quality is more affected in the surface. The main changes are the change of its color, odor and transparency. These changes may prevent even the use for navigation.

Although these impacts have been assessed as a high magnitude and major importance, it is regarded as temporary and partially reversible.

- Impact: Changes in the air quality

If there is a large oil spill, some of that oil will evaporate and cause changes in the air quality. This change would be similar to one caused by a high concentration of vehicles.

This impact was assessed as temporary, reversible, although of medium magnitude and importance.

- Impact: Changes in the sediment quality

There are two main ways to sink the oil, there are: (i) through its union with small particles suspended in the water column; and (ii) from its absorption by animals that feed by filtering water, which causes the accumulation of oil in its body. After the death of these animals, the oil returns to the environment, as it is deposited in the body itself.

When the oil sinks, it can accumulate in sediments and may remain there for years.

This impact was assessed as temporary, reversible, although of high magnitude and major importance.

- Impact: Interference in coastal lagoons and wetlands

Depending on the weather and sea, and considering the characteristics of the coast of the Campos Basin, the oil could reach coastal lagoons and wetlands in the region, affecting plants and animals that live there.

Thus, this impact was considered of high magnitude and major importance, being, however, temporary and reversible.

- Impact: Interference in the areas of sandbank

The oil will reach part of sandbank vegetation by contact with the beaches or estuaries present in the sandbanks and that are linked to the rivers and the sea in the region. The sandbanks are classified as important areas for the conservation, given the ecological functions they perform.

This impact was assessed as temporary, reversible, however, of medium magnitude and major importance due to the sensitivity of this ecosystem.

- Impact: Interference in the mangroves and estuaries

Mangroves and estuaries are considered ecosystems highly sensitive to changes resulting from an oil spill. Both animals (e.g. shrimps, crabs and mollusks) as also plants of wetlands may be affected. Because of the retention characteristics of the oil and natural recovery time, this impact was assessed as permanent, partially reversible, of high magnitude and major importance, by inducing changes in biota from other ecosystems and in the fishing economy.

- Impact: Interference on the rocky shores

Due to the dynamic action of the sea, the rocky shores exhibit a high rate of recovery when compared with other coastal marine ecosystems. However, it can lead influence to organisms.

The areas of shores potentially affected in case of accidents include the shores of Arraial do Cabo (which house the Marine Extractive Reserve of the State of Rio de Janeiro), Cabo Frio and Rio das Ostras, all sightseeing of the Lake Region.

Thus, this impact, although temporary and reversible, was classified as of high magnitude and major importance.

- Impact: Interference on the sandy beaches

The presence in the area of indirect influence of this activity of conservation units protecting beach strips enhances the biological importance of this type of ecosystem.

If it arrives to the beaches, probably a part of the oil will be dissolved by action of the waves, while great part will penetrate in the sediment. This penetration of oil, besides interfering with existing organisms also changes the sediment, thus reducing the amount of oxygen.

This impact, although temporary and reversible, was assessed as of high magnitude and major importance.

- Impact: Interference in the Conservation Units (CUs)

The CUs present in the area of indirect influence of the activity protect various types of marine ecosystems, such as: sandy beaches, rocky shores, sandbanks, lagoons, islands, dunes, marshes, estuaries and mangroves.

Since the overall goal of creating Conservation Units is to preserve the environmental quality of the environment, if there is an accident, this impact was assessed as permanent, of high magnitude and major importance.

- Impact: Changes in the planktonic communities

The effects of an oil spill on the planktonic community (microscopic plant and animals) will vary depending on the type of organism attained. The effects are greatest in most sensitive organisms such as phytoplankton, which serve as food for other organisms in the food chain. These effects can be felt even in fishes but in a smaller scale.

This impact was assessed as temporary and reversible, although of medium magnitude and major importance.

- Impact: Changes in benthic communities

The oil spilled in the sea can affect the ability of organisms to breathe and feed, either by ingestion of oil as the lack of food, due to the reduction of the amount of plankton in the water.

This impact was assessed as permanent, partially reversible, of high magnitude and major importance.

- Impact: Changes in nektonic communities

An eventual accident involving an oil spill would cause alteration/removal of fishes, whales and turtles. The effect of oil could even cause a decrease in the number of animals in the affected region.

For large marine mammals (whales) and sea turtles, a large spill could cause alteration of passage routes of individuals that occur in the area. This impact was assessed as temporary and reversible, although of medium magnitude and major importance.

- Impact: Changes in seabirds communities

In the case of a spill, the direct contact with the oil is considered the leading cause of death of birds.

Birds that spend much of their time flying over the sea surface or diving for food would be most affected by the spill. Changes in these communities may also occur due to decreased food, in this case, the fishes.

This impact was assessed as temporary and reversible, although of high magnitude and major importance.

- Impact: Interference in the breeding of chelonians, birds and fishing resources

In case of an accident with oil spill, the areas where turtles and seabirds lay their eggs, in addition to the points considered important for the conservation and preservation of fishing resources (e.g., sardines and shrimp), would be affected in the stretch between Cabo de Sao Tome and Arraial do Cabo, in the State of Rio de Janeiro. There may, for some time, reduce the number of individuals of the species that are affected.

This impact was assessed as temporary and reversible, although of high magnitude and major importance.

- Impact: Interference in fishing activities

In the event of occurrence of a major accident, interferences may occur with both the ocean fishing as also with coastal fishing, due to the direct effect of oil on fish stocks.

This impact was assessed as temporary and partially reversible, although of high magnitude and major importance.

- Impact: Interference in tourist activities

The tourism-related activities represent an important source of employment generation and income of the area of indirect influence of this activity. The mere disclosure of an accident involving an oil spill could decrease the arrival of tourists to this region, with the consequent loss of money to the coastal cities affected.

This impact was assessed as temporary and reversible, although of high magnitude and major importance.

- Impact: Intensification of the maritime traffic

In case of an oil spill, the occurrence of direct interference on the boat traffic in the affected area can be predicted, once the movement of the spot can eventually lead to changes in the navigation routes, because of the positioning vessels and equipment to attend to the incident.

This impact was assessed as temporary reversible, although of low magnitude and minor importance.

- Impact: Intensification of the air traffic

In the event of an oil spill there will be an increase in the number of air trips to and from the drilling platforms, according to the transport equipment and specialized personnel.

In view of the good infrastructure of air transport in the vicinity of this area of activity, the effects of this impact would be temporary, reversible, of low magnitude and minor importance.

- Impact: Pressure on the harbor infrastructure

The harbor infrastructure may be affected as a result of some changes in routes of ships, and may be needed other ports than those usually used. This itinerary changes may eventually lead to overloading of some ports. In the event of a major accident, the port closest to the spill should suffer an additional pressure on its infrastructure, because of the increased number of boats that will participate in operations to contain the slick.

This impact was assessed as temporary, reversible, of low magnitude and minor importance.

- Impact: Pressure on the infrastructure of final disposal of waste

In combat operations to an oil spill, solid waste contaminated with oil are generated, which are stored, transported and intended, following the existing national and international standards. A large oil spill in the Geographic Area of the Campos Basin would generate a large volume of oily waste.

This impact is considered temporary, partially reversible, of medium magnitude and importance.

- Impact: Interference in human settlements located in the path of oil spots

The occurrence of an oil spill may increase the risks of work accidents with workers from platforms operating in the geographic area of the Campos Basin and other areas affected by oil spills. Furthermore, due to the possibility of reaching the oil in coastal areas, the routine of the population there concentrated may be modified.

This impact was assessed as temporary and reversible, although of high magnitude and major importance.

Conclusive Synthesis of the Potential Impacts

All impacts identified from an accidental occurrence are of a negative nature, although they are temporary and reversible, mostly. Reversible because, after the shedding is contained, it is expected the environment returns to the similar conditions as the original. The recovery time of the environment will be higher or lower depending on the affected site.

In a general review of the impact assessment matrix impact presented in Table 08, it can be seen that most of the environmental effects identified was considered of average to high magnitude and major importance.

It is also noted that the significance of impacts is variable in the socioeconomic environment. But most of the impacts in the natural (physical and biotic) environment were considered of great importance.

In relation to the natural environment, it is worth noting, also, an influence of these impacts as a whole over the fishing and tourist activities. A spill of this nature will generate impacts on the fishes (fishing) and on ecosystems attractive for tourism in the region, such as beaches, sandbanks, rocky shores, etc.

Finally, this assessment does not take into account the actions to combat the spill foreseen in the Individual Emergency Plan (PEI), which would reduce the magnitude of impacts associated with a possible oil spill.

Table 08 – Potential Impacts Assessment Matrix.

No.	POTENTIAL IMPACT	ASSESSMENT CRITERIA						
		INCIDENCE	SPACE EXTENSION	PERMANENCE	MOMENT	REVERSIBILITY	MAGNITUDE	IMPORTANCY
PHYSICAL ENVIRONMENT								
1	Changes in the water quality	D	E	T	Mp	Pr	A	G
2	Changes in the air quality	D	E	T	Cp	R	M	M
3	Changes in the sediment quality	0	Re	T	Mp	R	M	G
BIOTIC ENVIRONMENT								
4	Interferences in the coast lagoons and wetlands	D	Re	T	Cp	Pr	A	G
5	Interferences in the sandbank areas	D	Re	T	Cp	Pr	M	G
6	Interferences in the mangroves and estuaries	D	Re	P	Cp	Pr	A	G
7	Interferences in the rocky shores	D	Re	T	Cp	Pr/Ir	A	G
8	Interferences in the sandy beaches	D	Re	T	Cp	R	A	G
9	Interferences in the Conservation Units	D	Re	P	Cp	Ir	A	G
10	Interferences in the planktonic communities	D/I	Re	T	Cp	R	M	G
11	Interferences in the benthic communities	D/I	Re	P	Cp/Lp	Pr	A	G
12	Interferences in the nektonic communities	D/I	E	T	Cp	R	M	G
13	Interferences in the seabird communities	D/I	E	T	Cp/Mp	R	A	G
14	Interference in the breeding of chelonians, birds and fishing resources	D/I	E	T	Cp	R	A	G
SOCIOECONOMIC ENVIRONMENT								
15	Interferences with the fishing activities	I	E	T	Mp	Pr	A	G
15	Interferences with the touristic activities	I	E	T	Cp	R	A	G
17	Intensification of the maritime traffic	I	Re	T	Cp	R	B	P
18	Intensification of the air traffic	I	E	T	Cp	R	B	P
19	Pressure on the harbor infrastructure	I	E	T	Cp	R	B	P
20	Pressure on the infrastructure of final disposal of waste	I	E	T	Cp	Pr	M	M
21	Interference in human settlements located in the path of oil spots	D	Re	T	Cp	R	A	G

LEGEND
Incidence
D = Direct
I - Indirect

Space Extension
Re = Regional
E = Extra-regional

Permanence
T = Temporary
P = Permanent

Moment
Cp = Short term
Mp = Medium term
Lp = Long term

Reversibility
R = Reversible
Pr - Partially Reversible
Ir - Irreversible

Magnitude
A = High
M = Average
B - Low

Importance
G = Major
M = Average
P = Minor

11. ABOUT THE ENVIRONMENTAL RISKS

The analysis and management study of environmental risks aimed to identify and assess, qualitatively, the dangers arising from the operation of the drilling platforms in the Geographic Area of the Campos Basin.

The analysis includes the application of techniques widely used by the oil industry, such as historical analysis of accidents and Preliminary Hazard Analysis (FPA), in order to classify hazards according to their probability and consequences.

Among the conclusions of historical analysis of accidents, it is emphasized that the majority of spills involve small quantities released. Although the loss of well control is the type of accident more worrying in a drilling activity, it is observed that the probability of its occurrence has decreased over the years, as indicated by some international studies on accidents, possibly due to technological evolution of the oil industry - which has been developing more efficient and safe equipment - in addition to the implementation of measures to control the risks involved.

The studies indicate that, in general, the accident assumptions are classified as medium risk and may present high probabilities associated with small consequences, and vice versa.

After assessment, the risks are managed so as to be reduced to tolerable levels. Accordingly, procedures are expected to reduce their likelihood (periodic inspections, maintenance, hiring skilled manpower, training, registration and investigation of accidents, etc.) and consequence (training and activation of the Individual Emergency Plan).

12. WHAT ARE THE MITIGATION MEASURES AND THE ENVIRONMENTAL PROJECTS

To ensure that drilling activities to be performed do not harm the environment so that it cannot recover itself, have been proposed actions that have the objective to reduce negative impacts or enhance positive impacts caused by the activity. In the first case they are called **mitigation** measures and, in second, **potentiating** measures. When multiple actions work together to achieve a certain goal, they are organized into so-called projects or plans. When they act separately, they are called, simply, environmental measures.

Table 09, below, shows the impacts related to development of the drilling activity, followed by the measures proposed to reduce or enlarge their effects on the environment:

Table 09 - List of impacts related to drilling activity, type of action to be taken and corresponding environmental measures.

IMPACT	TYPE OF ACTION	MEASURE
Change of the benthic community due to the positioning of platforms	Mitigation	Use of drilling platforms that use mostly dynamic positioning system - which can remain in place without the use of anchors.
Change of the pelagic community due to the positioning of platforms	Mitigation	Implementation of the Regional Environmental Monitoring Project. Continuation of the Marine Mammals and Turtles Project, already implemented by Petrobras in partnership with the Instituto Baleia Jubarte and TAMAR.
Possibility of introduction of exotic species	Mitigation	Careful monitoring of what is being done, both in Brazil as also in the rest of the world, in relation to this issue. The goal is to identify new technologies that are practical, safe and efficient and can reduce the possibility of introduction of exotic species.
Generation of conflict between the drilling activities and the fishing activities (Creation of Security Zones)	Mitigation	Establishment of direct communication channel between Petrobras and the communities involved and distribution of material for the population of the region with information about the activity. Such actions are expected in the Media Project
Change in the water quality (Disposal of sanitary effluent)	Mitigation	Implementation of the actions foreseen in the Pollution Control Project
Change in the marine biota	Mitigation	Implementation of the actions foreseen in the Pollution Control Project
Pressure on the infrastructure of final disposal of waste (solid waste generation)	Mitigation	Implementation of the actions foreseen in the Pollution Control Project
Change in the air quality (air emissions)	Mitigation	Implementation of the actions foreseen in the Pollution Control Project
Change of the components of the physical marine environment (Disposal of gravel)	Mitigation	Implementation of the actions foreseen in the Pollution Control and Environmental Monitoring Projects
Change of the benthic community	Mitigation	Implementation of the actions foreseen in the Pollution Control and Environmental Monitoring Projects
Change of the pelagic community		

(to be continued)

Table 09 (conclusion)

IMPACT	TYPE OF ACTION	MEASURE
Increased demand on the activities of trade and services	Potentiating	Give priority to the purchase of products and use of services of the municipalities belonging to the area of influence.
Tax generation and improvement of the local, state and national economy		
Pressure on the maritime traffic	Mitigation	Implementation of the actions foreseen in the Media Project
Pressure on the road traffic	Mitigation	The cargo vehicles should follow the flow of vehicles already using the roads nearby and avoid the peak periods of local traffic.
Generation of jobs	Potentiating	Give priority to the hiring of local manpower.
Change in the marine biota (Withdrawal of drilling platforms)	Mitigation	Implementation of the actions foreseen in the Environmental Monitoring Project
Accidental oil spill	Mitigation	Execution and control of the risk management measures and implement the actions foreseen in Individual Emergency Plan.

ENVIRONMENTAL PROJECTS

Together with the deployment of the drilling activities in the Geographic Area of the Campos Basin, environmental projects are proposed, whose objective, as explained earlier, is to mitigate (reduce) or control the negative impacts and enhance (increase) the positive impacts. The development of these projects is one of the requirements of the Environmental Agency and are designed conform the guidelines proposed by IBAMA. The following are the environmental projects to be implemented by Petrobras:

Environmental Monitoring Project

The Environmental Monitoring Project is divided into two phases that are intended to identify the impacts of the offshore drilling activity on the quality of seawater, sediments and biological communities on the Campos Basin. The implementation of the Environmental Monitoring Project will help to control the impacts listed below:

- Change of the benthic community;
- Change of the pelagic community;
- Possible introduction of exotic species;
- Changes of components of the physical marine environment.

The Environmental Monitoring Project has been prepared in compliance with the guidelines of CGPEG / IBAMA and intends to contribute to technical and scientific knowledge about the region.

The implementation of the Environmental Monitoring Project and the subsequent dissemination of information generated by monitoring will increase knowledge about the local environment, as well as assess the possible effects caused by the drilling activity, helping in making decisions on environmental management of the Basin Field.

Pollution Control Project

Besides being a requirement of IBAMA, the Pollution Control Project is one of the activities that have been established by Petrobras in its Security, Environment and Health Policy. This project aims to ensure the maintenance of environmental quality in the area of influence of the activity, making proper management of solid waste, liquid effluents and air emissions generated by the activity, thus reducing the impacts caused, listed below:

- Change of the water quality;
- Change of the marine biota;
- Pressure on the infrastructure of the final disposal of waste;
- Change of the air quality;
- Disposal of gravel.

The Pollution Control Project also addresses the proper disposal of all liquid effluents and solid wastes generated by the operation and also provides maintenance routine activities, which ensure the better functioning of the equipments.

The Pollution Control Project is divided into three parts, namely:

- Management of Air Emissions;
- Management of Liquid Effluents and;
- Management of Solid Waste.

The management of Air Emissions will be done indirectly by controlling the correct functioning of the combustion engines and by complying with the Preventive Maintenance Programs (Periodic Maintenance) for equipments that generate air emissions.

Regarding the liquid effluents, each type is treated in the most appropriate way. The oily water from the machine room will be collected and forwarded to the Water / Oil Separator (SAO), and the treated effluent is discarded at sea only if the amount of oil and grease (TOG) is in compliance with current environmental legislation.

The sewage generated in the Drilling Probes will only be discarded after treatment in sewage treatment stations, installed on the platforms themselves.

The food leftovers will be crushed into smaller particles than 2.5 cm before being discarded at sea, as established in Convention MARPOL 73/78. Since the aqueous based drilling fluids that are no longer used (excess) are dropped directly into the sea, with oil content of less than or equal to 1%, since they dissolve readily in water and exhibit toxicity to the environment within the requirements of environmental agency. The non-aqueous base drilling fluids will not be discarded in the sea, they are transferred for reuse in other drilling probes, or collected in drums/tanks suitable for receiving and landed on the ground treatment which allows the reuse thereof.

The gravel produced in the drilling of wells will pass through Solid Treatment System before being discarded at sea.

All recyclable waste collected in the Petrobras drilling platforms will be forwarded to the Selective Collection Program of the Campos Basin. The other waste generated in platforms of Petrobras will be temporarily stored in the Pipe Park and in UTROC, where they will be transferred to appropriate disposal.

Media Project

The Media Project aims to maintain an open and direct channel of communication and information between Petrobras and the population of the area of influence. This channel will serve to provide information about the activity, its positive and negative environmental impacts, on environmental projects to be implemented and on the mitigation measures adopted.

This project will help to reduce the expectation of the population in relation to the activity and the questions that might appear, especially those related to the fishing activity.

The Media Project will run from the beginning of the activity, improving the relationship and facilitating the integration process between the company and the public involved. The project activities include the dissemination of advertisements on the activity in major newspapers and radio stations in the area of influence, the conduction of a meeting with the fishing communities of the Area of Indirect Influence, the distribution of information about the activity and the creation of the Green Phone channel for complaints and suggestions from the community.

Project of Environmental Education and Project of Environmental Education of Workers

The Projects of Environmental Education and Environmental Education of Workers are being consolidated and will later be presented and implemented by Petrobras.

Individual Emergency Plan (PEI)

The Individual Emergency Plan contains the response actions to be taken in case of accidents involving oil spills and those responsible for implementing these responses, in addition to available equipment and materials.

Plans have been developed for all drilling platforms containing the response actions for incidents on board of the same, beyond the emergency plan for the Campos Basin (PEI- BC), which provides additional procedures for responding to oil spills in the sea.

Among the planned response actions to be executed, can be highlighted:

- monitoring;
- containment;
- collection;
- dispersion of oil slicks.

The actions also include the communication between those involved in combating the accident, including the authorities and the population of the region, as well as the operations for the protection of vulnerable areas and cleaning areas possibly affected.

The Plan provides that actions are taken according to the size of the oil spill. For it, it can be used local (in the drilling platforms themselves), regional (including action of boats to contain and collect oil, dedicated to the Geographic Area of the Campos Basin), national (by CDA's - Environmental Protection Centers, located in Brazil) resources and, if still necessary, international resources (at center of international response - CCA, located in the United States).

Risk Management Program (PGR)

This program includes measures to reduce the risks involved in drilling, i.e., the probability of accidental hypotheses occurrence and/or consequence with the potential to cause environmental damage identified in the Risk Analysis. The outcome measures refer basically to the inspection and maintenance of equipments, employee training, record and investigate of accidents, among others.

Besides the projects listed above, other environmental precautions are being adopted as exact measures, such as:

- The use of drilling platforms with dynamic positioning system - which eliminates the use of anchors - is one of the exact measures adopted in this project. The use of this system decreases negative impacts of anchoring on benthic marine organisms (organisms that live in the substrate - under the sea);
- The careful monitoring of the advances that have been used by national and international organizations will help in identifying new technologies that are practical, safe and efficient and that can reduce the possibility of introduction of exotic species;
- The cargo vehicles should follow the flow of vehicles already using the roads nearby and avoid peak periods of local traffic, which will reduce the negative impact on local traffic;
- It will be prioritized the purchase of products and use of services that are from the area of influence of the project, as a measure that will empower (increase) the positive impact on boosting the regional economy. For the same reasons, the project will give priority, where possible, to hiring skilled local manpower.

13. FINAL CONSIDERATIONS

The preparation of the Environmental Impact Study of the Offshore Drilling Activity in the Geographic Area of the Campos Basin has highlighted the environmental interferences of this activity.

The evaluations presented support the view that the real impacts (associated with normal operation of drilling platforms) resulting from the activity will occur mostly in the ocean environment. The potential impacts (relating to any oil spill) can occur both in the ocean environment as also in the coastal environment.

All the real impacts incidents on the natural environment (physical and biological) are negative, 30%, of minor importance. The main impacts associated with the natural environment were related to the placement and removal of drilling platforms and the disposal of gravel. However, as required by IBAMA, were provided by Petrobras environmental precautions to be taken during these phases of activity, besides mitigation measures for these impacts.

To the socioeconomic environment, real positive as well as negative impacts have been identified. Among the real negative impacts that occur on the socioeconomic environment, most were considered minor importance.

The potential impacts generated by an oil spill accident are always negative, both for the natural environment (physical and biological) as to the socioeconomic environment. However, the potential impacts that occur on the natural environment can be considered more important than those occurring on the socioeconomic environment.

The oil exploration in Brazil, especially concentrated in the Campos Basin, certainly represents an important interference in the environment. On the other hand, the social and economic benefits that this activity is capable of generating are also important. Therefore, it is very important to implement measures that allow the exploitation of these resources in a sustainable manner, without the light of its purpose and in a way that ensures the conservation of the environment. To this, there is the name of sustainable development. The offshore drilling activity in the Geographic Area of the Campos Basin has been developed to promote this development in a sustainable manner.

One can then consider that the mitigation measures, preventive or corrective, which were proposed in this environmental study, if implemented properly and correctly, will contribute to environmentally feasible.

14. TECHNICAL STAFF

The following shows the relationship of Petrobras staff responsible for preparing the Environmental Projects presented in the Environmental Impact Study of the Offshore Drilling Activity in the Geographic Area of the Campos Basin.

Un	N A M E	PROFESSIONAL AREA	PROFESSIONAL REGISTRATION	REGISTRATION IBAMA
Petrobras - Rua Morais e Silva, 40 / 10º andar - Ed Ouro Negro - Maracanã Contact Phone: (21) 3876-3784				
1	Ana Paula Athanzio Coelho	Pollution Control Project	CRQ-03 n° 03314958	198420
2	Ana Maria Scofano	Environmental Monitoring Project	(*)	273878
3	Celso Alleluia Mauro	Environmental Monitoring Project	CRQ-03 n° 0341 1 583	97224
4	Marcelo Felício dos Santos	Environmental Monitoring Project	CRBio - n° 42116/02	558583
5	Mariana E. Romaguera Machado	Pollution Control Project	CRQ-RJ n° 03212784	210581
6	Patrícia da Silva Cotta	Environmental Monitoring Project	CRBio - 02 n° 21223/02-D	196503
7	Ricardo Alves de Souza	Environmental Monitoring Project and Pollution Control Project	CRQ-RJ 0331 5190	199585
8	Roseane Dias de Medeiros Vidal	Media Project	CREA-RN n° 1003-D	209733

(*)Experts whose professions do not have Class Counsel

Below it is represented the relationship of Habtec staff responsible for preparing the Environmental Impact Study of the Offshore Drilling Activity in the Geographic Area of the Campos Basin.

Un	N A M E	PROFESSIONAL AREA	PROFESSIONAL REGISTRATION	REGISTRATION IBAMA
HABTEC - Rua 13 de Maio, 13/ sl. 1.508. Contact Phones: (21) 2533-0188 e (21) 2532-4340				
1	Alexandre Affonso	Environmental Law	OAB: 100422	198420
2	Alline Figueira de Paula	Biotic Environment - AIA - Measures	CRBio-02 32.31 1 /02	307456
3	Ana Cristina Gonçalves Cupelo	Project - Physical Environment	(*)	198769
4	Anderson Eduardo Silva de Oliveira	Biotic Environment - RIMA	CRBio-02 38.505/02	339543
5	Caroline Anne Purcell	Biotic Environment - AIA - Measures	CRBio-02 32.509/02	199066
6	Clarissa Cunha	Activity Identification - Project, Area of Influence - Biotic Environment - AIA - Measures - RIMA - Technical Coordination	CRBio-02 38.194/02	267293
7	Daniel Dias Loureiro	Physical Environment - AIA	(*)	635935
8	Domingos Nicolli	Physical Environment - AIA	CREA/RJ 52.005-D	199040
9	Edna da Silva Coutinho	Socioeconomic Environment - RIMA	(*)	755606

(to be continued)

(conclusion)

10	Giselle da Silveira Abílio	Project - Physical Environment - AIA - Measures - Alternatives Analysis	(*)	521176
11	Guaraci Sathler	General Coordination	CREA/RJ 17.289-D	199068
12	Izaura Cristina F. de Almeida	Project	CRQ - 0331 5260	362642
13	Juliana Lenz César	AIA	CRBio-02 n° 15994/02-D	199077
14	Juliano Fonseca Rezende	Socioeconomic Environment	(*)	927504
15	Karen Lopes Dinucci	AIA - Measures - Alternatives Analysis - RIMA	CRBio-02 29340/02-D	199217
16	Letícia Benevides Liberatori	Project - Alternatives Analysis	CRQ-03 03315530	512318
17	Luiz Cláudio Cosendey Silva	Physical Environment - Modeling- AIA	(*)	239267
18	Maitê Freire de Medeiros	Physical Environment	(*)	508168
19	Nice de Vasconcelos	Project - Alternatives Analysis	CRQ -03 n° 0331 5601	766369
20	Paula Aprigliano	Biotic Environment	CRBio-02 n° 32772/02	216398
21	Paulo Fernando Rezende	Area of Influence - AIA - Measures	(*)	41948
22	Pedro Selig Botafogo	Biotic Environment	CRBio-02 no 38466/02	332167
23	Renata Albuquerque Duailibe	Environmental Law	OAB/RJ 114137	212026
24	Ricardo Lima Tavares	Management	CREA/ES 2.785-D	1985 74
25	Viviane Severiano dos Santos	Area of Influence- Biotic Environment - AIA - Measures	CRBio-02 2365/02	210150

AIA - Environmental Impacts Assessment

(*)Experts whose professions do not have Class Counsel

This responsible staff had a support team, listed as follows:

SUPPORT TEAM

Adeilson Barboza Nascimento - Setting and Final Edition	Leonardo de Souza Dias - Designer and Projector
Aline Martins - Socioeconomics Trainee	Luciana Flaeschen - Setting and Final Edition
Álvaro Soares Campos - Setting	Paula Leal Freitas - Engineering Trainee
Anderson Lima dos Santos - Oceanography Trainee	Sílvia Barbosa da Silva - Designer and Projector
Erick Coelho Gripp - Biology Trainee	Rodrigo Felipe Junior - Setting
Júlia Lopes Fernandes da Costa - Biology Trainee	