

RIMA - Environmental Impact Report - Petrobras

Maritime Drilling Activity in the Geographic Area of Espírito Santo (AGES)

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Introduction

The objective of this Environmental Impact Report (RIMA) is to inform on the findings of the Environmental Impact Assessment (EIA) accomplished to determine the likely effects of the Maritime Drilling Project within the Geographic Area of Espírito Santo.

Along this report, the reader will find information and data that allow understanding the project, the way it will be accomplished, the positive and negative impacts that it can generate – both in the environment and in the society–, as well as the measures already foreseen to increase the positive impacts and to mitigate the negative ones.



Enterprise:



Enterprise

PETROBRAS – *Petróleo Brasileiro S.A.* is a leading national company in the Oil Industry in Brazil that has developed and holds the state of the art technology of the world for oil exploration in deep waters. The company is considered one of the twenty top oil companies in the world.

UN-ES - the Exploration and Production Business Unit of Espírito Santo is one of the seven regional units kept by Petrobras in Brazil. With more than forty years present in Espírito Santo, it acts in a diversified manner onshore and in shallow and deep waters.

AGES extends from the north of the Espírito Santo Basin to the north of Campos Basin, as show in the following figure.

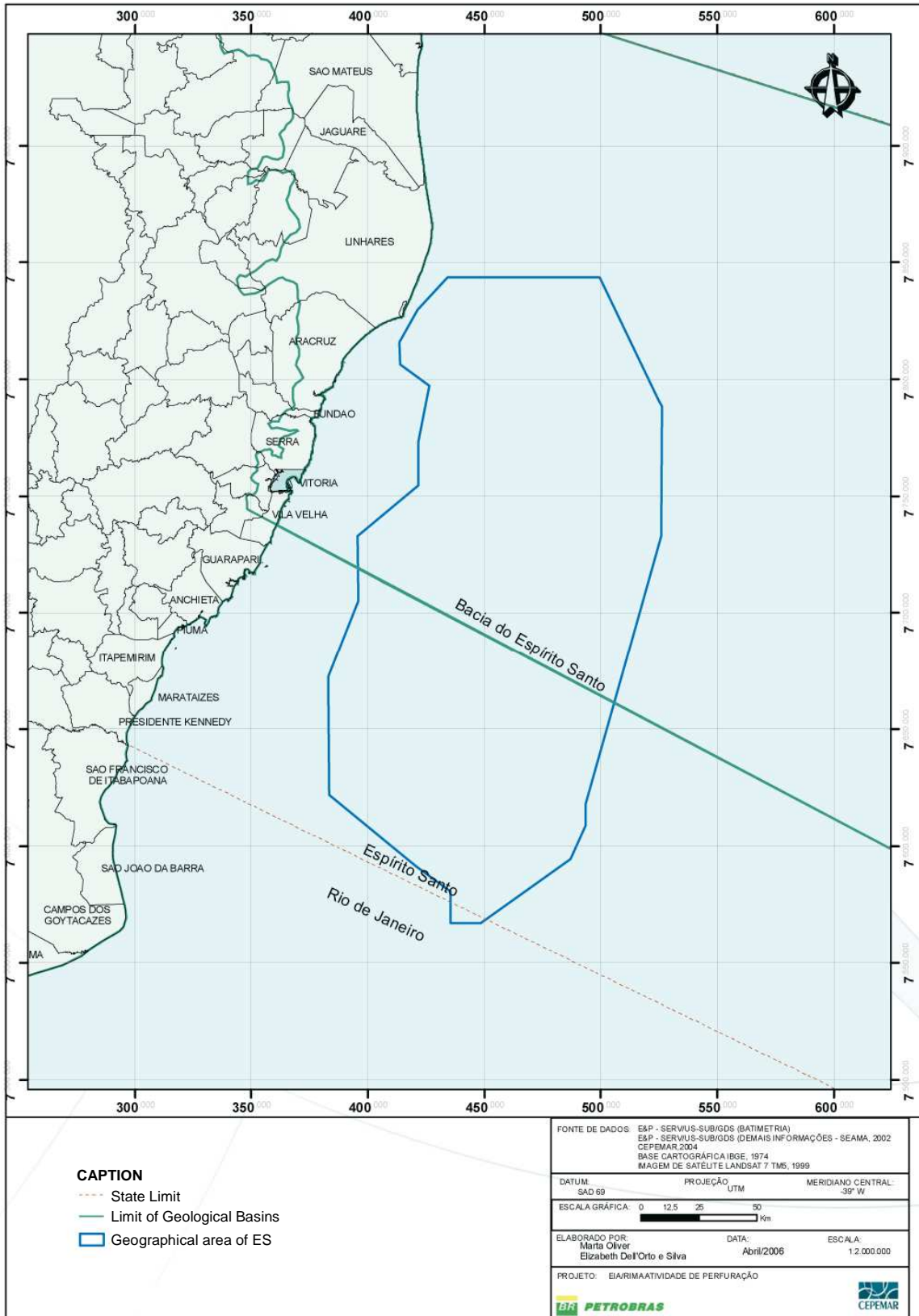
Maritime Drilling Project in AGES

This project will be developed by **PETROBRAS**, through **UN-ES**, to give continuity to the drilling activities of the oil and gas exploration and production wells in the Geographic Area of Espírito Santo (**AGES**). The objective of the enterprise is to find out new fields, evaluate the extension of these findings and, then, develop the oil and gas production in the area.

The accomplishment of this project, together with others that are being developed throughout the country, will allow the continuous growth of the oil and gas production in Brazil, which is an important factor for the maintenance of the Brazilian self-sufficiency in the industry.

At the same time, the project will contribute for the socioeconomic development of the area, generating direct and indirect jobs, besides promoting the move of the economics, in accordance with the attraction of new companies and growth in the collection of taxes, fees and royalties.

The project foresees the drill of about 30 wells in the shallow, deep and ultra-deep maritime areas during the first year of activities. For the subsequent years, it is not possible yet to estimate the number of wells to be drilled as it shall depend on discoveries and assessments accomplished in the first year.



Conduct Adjustment Agreement

Since 1968, drilling activities are being accomplished in the area that includes Espírito Santo Basin and the northern part of Campos Basin. Up to 2005, about 260 wells were drilled, mainly at locals 10 to 2600 meters deep (shallow and deep waters).

In order to regulate the environmental licensing of these wells and allow the continuation of the drills, PETROBRAS and IBAMA entered into a Conduct Adjustment Agreement (TAC) in January 2006 about the drilling activity in the area, which will be effective until January 2009.

Besides issuing an authorization for the continuity of the activities, the TAC determined the accomplishment of some actions, such as:

Environmental Impact Assessment Project, aiming at identifying and assessing the environmental impacts possibly caused by the drilling activity;

- Environmental Characterization Project of the whole area, in order to provide a more detailed knowledge of the social and environmental characteristics of the onshore and offshore areas;
- Regional Environmental Monitoring Program, aiming at following-up the eventual effects of the future drilling activities on the socioenvironmental aspects of the whole area;
- Monitoring Project of Whales, Dolphins and Sea Turtles, so as to identify and assess whether the drilling activities have been presenting any effect on those species;

- Communication Projects to inform the fishing communities of the municipal districts of the area of influence about the drilling activity.
- All those actions were or are being developed.

It is important to highlight that all drilling platforms in operation in the area were previously approved by IBAMA.

For such, the following activities have been accomplished: analysis and management of risks of each activity; submission of the Individual Emergency Plans for fighting possible oil spillages at the sea; drills for fighting oil spill at the sea; presentation of the characteristics and equipment for pollution control and approval of all fluids required for the accomplishment of drills.

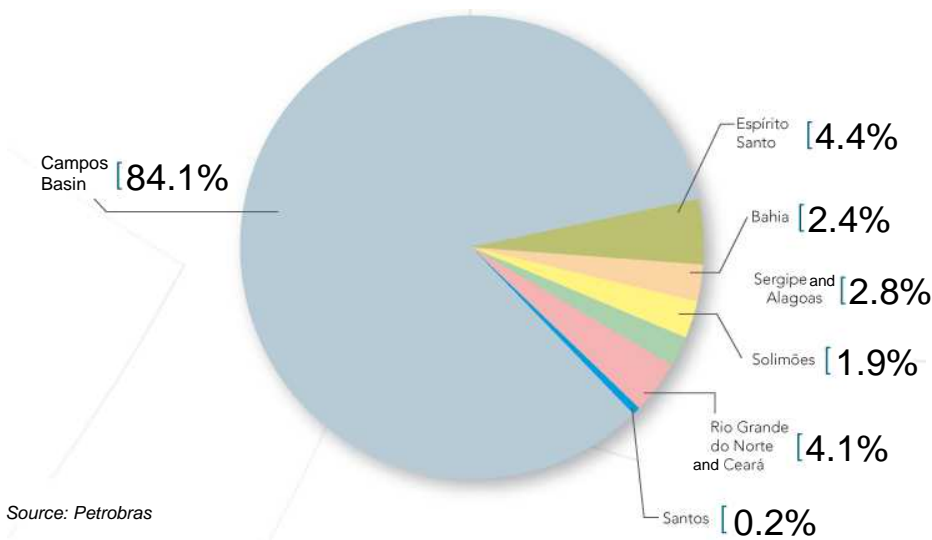
After the validity term of the drilling authorization issued by TAC, the drilling activity of oil wells in the area will only be able to continue upon the acquisition of a Prior Drilling License (LPPer). This RIMA is one of the documents that are an integral part of the process to issue the LPPer.

Contribution for the national oil industry

The drilling activities in AGES will significantly contribute for the increase of the exploration of oil reservoirs in Brazil, for the consolidation of Espírito Santo as a production hub and increase of the significance of AGES as a research object for future findings. Currently, there are about 60 wells in the region either in operation or drilled and ready to start their operation.

These wells are in the following fields: Golfinho, Jubarte, Cachalote, Baleias Franca, Anã and Azul, Peroá and Cangoá, in addition to Cação Field, which is oil producing field since the middle 1980's. AGES also has several wells with the presence of oil that are at an evaluation stage. With the start of the commercial operations of the offshore fields of Golfinho and Jubarte, Espírito Santo stood, in 2006, in the second place in production in the Country, with double of the volume of the one in the third place.

Percentage of participation of the Exploration and Production Business Units in the total national production (December, 2006)



Justifications for the implantation of this project

TECHNICAL ASPECTS

PETROBRAS holds technical knowledge to accomplish that activity in an efficient way, with safety for the people and for the environment.

The technological advances developed in the last decades allow that the maritime drilling activity is only accomplished at the places with larger probability of existence of oil, ensured by accurate technical studies on the geological structures. PETROBRAS developed its own technology, both to do those and to accomplish the production in deep and ultra deep waters. That technology, which is internationally known for its efficiency and safety, is widely used in Brazil, accounting for more than 60% of the total of the Brazilian oil production.

ECONOMICAL ASPECTS

The first economical justification for the project is that it meets the national demand, reducing the dependence on imports. It has been estimated an average annual growth of 2.4% in the consumption of oil by-products and 14.2% of natural gas up to 2010. So, it is critical that Brazil keeps on investing in research and exploration of new reservoirs, aiming at the progressive and consistent increase of production.

Within that scope, the investment in AGES is outstanding as it is an area that has huge reservoirs. Besides, that enterprise will contribute for the following:

- increase income generation due to hiring of services and labor;
- foster the strengthening of the oil and naval industries;
- increase the municipal and state revenues, first of all due to the increase of ISS (Services Tax) payment by the services company in the drilling phase, and, later, with the generation of royalties to the State of Espírito Santo and municipal districts, in case of oil and gas findings.

SOCIAL ASPECTS

The expansion of the exploration and development of new oil fields will increase the generation of taxes, fees and, in the future, royalties for the Federal Government, States and Municipal Districts of the area. The investment of the royalties, pursuant to federal law no. 7525/86, shall be addressed to the health, basic sanitation and paving areas, being reverted, thus, in improvement of the life quality of the populations benefited from that.

Another important social aspect is the generation of direct and indirect jobs, being the selection of local labor a priority, especially for those activities that do need not specialized personnel. The demand for qualified personnel will cause an increase in the qualification of professionals in the oil industry. The continuity and enlargement of the drilling activities shall directly contribute to the maintenance or enlargement of the employment level in the oil industry area in the country.

Finally, the continuity of the drills in AGES is part of the integrated set of projects in that area that will contribute for the socioeconomic development of the State of Espírito Santo.

ENVIRONMENTAL ASPECTS

The development of oil exploration projects is followed by the accomplishment of environmental assessments – such as the Map of Coast Sensitiveness, performed by PETROBRAS in association with public and private universities – and, further, the development and implementation of programs, environmental projects, such as **MAPEM**, for instance. That set of actions has been contributing for the improvement of the knowledge on the ecosystems and natural resources in the areas in which the drilling activities are performed.

The drilling activity is also environmentally justified for allowing, in the future, the increase in the supply of natural gas, which is a cheaper and less pollutant fuel than others derived from non-renewable sources.

The drilling units chosen to act in that project have already operated in several blocks in the recent years, and they are provided with acknowledged experience and qualification, being certified on the requirements of the international and national standards with regard to environment, safety and health.

The Environmental Monitoring Project in Maritime Exploratory Drilling Activities (MAPEM) aims at evaluating the impact of the discharge of the drill cuttings with synthetic fluids into the sea; allows a greater technical and scientific knowledge of the Brazilian oceanic areas, which lack meteorological and oceanographic information. Besides, the information generated by those programs served as a base for a more accurate environmental assessment of the oil activities in the sea, being useful in futures processes of environmental licensing.



Jack Up Rig

All drilling fluids that will be discharged into the sea environment together with cuttings have been tested as to the toxicity aspect (acute and chronic) and were approved within the established ranges, and they do not pose damaging risk to sea life.

During the drills, all operating units will have their own Individual Emergency Plan (pursuant to Law No. 9966/00 and CONAMA Resolution No. 293/01), monitoring and following-up plans.

Besides, they will be integrated to the Emergency Plan of UN-ES and the residues management practices specified in the Master Plan of Residues of UN-ES.

Consistency of the Project with Industry Policies, Governmental Plans and Programs

The intensification of the oil production activities meets the premises of the National Power Plan, the objective of which is to increase the production to reduce the dependence of the country in relation to that product. The drilling of exploratory and production wells in AGES is also consistent with the government programs for the development of the oil industry, and it, inclusively, makes part of the commitment of PETROBRAS with the National Oil Agency (ANP).

Other government initiatives already developed in AGES that are consistent with this project are also outstanding. They include:

- Program of Evaluation of the Sustainable Potential of Live Resources in the Exclusive Economical Zone (REVIZEE)– it studies the Brazilian marine area to propose the sustainable use of the economical resources of the sea. It is one of the goals of the 4th Industry Plan for the Sea Resources and it is among the responsibilities undertaken by the Brazilian government upon executing the Convention of the United Nations on Sea Right;
- National Plan of Coastal Management (PNGC) - supervised by the Ministry of Environment, Hydric Resources and Legal Amazon (MMA), it aims at the rational use of the marine resources, from the planning and integrated, decentralized and participative management of the socioeconomic activities in the Coastal Zone.
- National Program for Tourism of Municipal Districts – coordinated by EMBRATUR. It already caused the creation of the Municipal Tourism Council in several cities of the region, in order to foster the participation of local population in the search of alternatives for the use of the potential tourism, development of other industries and specialized labor and creation of natural parks;
- Center of Ecological Researches of Macaé (NUPEM) – developed with the agreement executed by UFRJ, PETROBRAS and the Municipality of Macaé. It makes infrastructure and resources available for researchers and students with works focused in the Ecology field in tropical areas. Since 1997, NUPEM is transferring the scientific knowledge that is produced to the communities of the researched area through training courses for teachers of the public network of the municipal districts;

- Brazilian Program of Preservation of Sea Turtles (TAMAR/IBAMA)– with a dynamic performance in the whole coast of Espírito Santo and in the northern coast of Rio de Janeiro, it aims at the protection of sea turtles. PETROBRAS has been a partner of TAMAR for over one decade, and it is inclusively a national sponsor.

The coverage area of this project also counts with several projects that foster sustainable economical activities, with prominence for the development of the fishing, horticulture, hotel, ports and tourism areas, besides the incentive to the qualification of local labor for the industry and commerce.

Main Characteristics of the Activity

STAGES

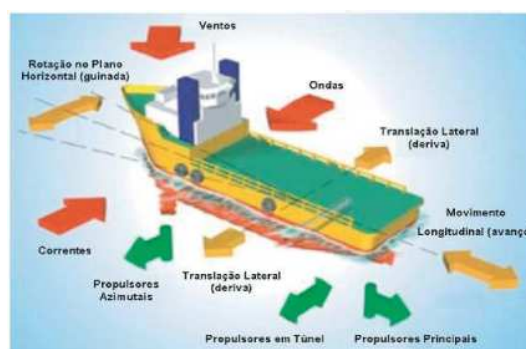
The drilling process of wells is accomplished in accordance with the following stages:

1. Rig Mobilization

The rigs are marine units equipped so as to accomplish drilling. At this stage, they are carried by their own engines or by tug boats and are placed at the drill local, where they shall remain up to the end of the process.

In the drilling activities at AGES, there shall be used 13 rigs, being 5 of it drill-ships, 6 semi-submersible platforms (for the actions in deep waters) and 2 jack-up rigs (for shallow waters).

The positioning of the rigs in deep waters will be accomplished, most of the time, by a dynamic positioning system that does not use anchors.

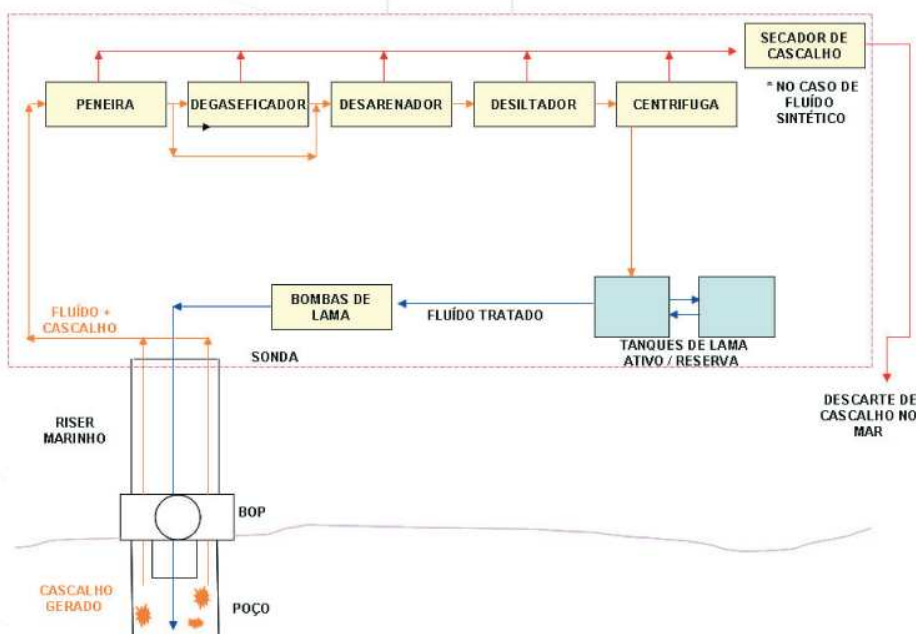


Operation Scheme of the Dynamic Positioning System

However, in some cases, it will be done by conventional mooring. For the wells in shallow waters (up to 100 meters), the rigs will be positioned by lifting legs, directly supported on the sea ground.

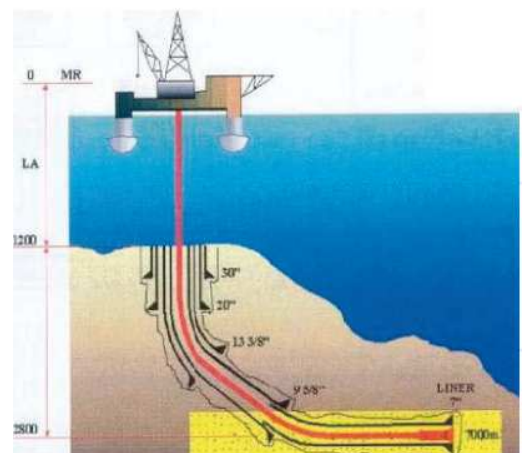
2. Well Drilling

The drilling is accomplished by a process that combines the application of rotation, weight and water force (by jetting) over the rock formations, using a bit connected to the end of a drill string. The rotation movement makes the drilling fluid be pumped inside the string up to the bit. That fluid comes back to the surface by the space that exists between the string and the wall of the well, bringing the fragments of the crashed rock (cuttings).



Simplified Scheme of the drilling process

At the extent the well becomes deeper, it is required to cover it with steel pipes, in order to ensure the support of their walls and prevent the mixing of fluids. After the coating, the drilling continues in several phases with the use of bits of smaller diameters. The wells that have already been drilled in AGES had 3 to 5 drilling stages.



Scheme showing the drilling of a well with different diameters

The differences among the drilling stages depend on the well type (vertical, directional or horizontal), of its character (development or exploratory) and the operational conditions themselves.

3. Demobilization of the Rig

At the end of the drilling activity, all the drilling equipments are collected to the rig, which is carried to another well, either by using its own propulsion or by tug-boats.

4. Supplementary Stages

Logging: By the study that combines the depth and the type of rocks of the drilling site, it is prepared a graph that allows calculating the amount of oil and gas that exists within the well area.

Formation test: It assesses the production potential of the well, through the study of the characteristics of the natural formations, pressure and porosity.

Completion: they are operations that aims at equipping the well for the safe production of oil and gas and with the best possible performance along the years. Only the wells rated as economically feasible undergo this stage.

Well Abandonment: in case the studies show that the well is not economically feasible, it is plugged in order to prevent the entrance or exit of material at the drilled site.

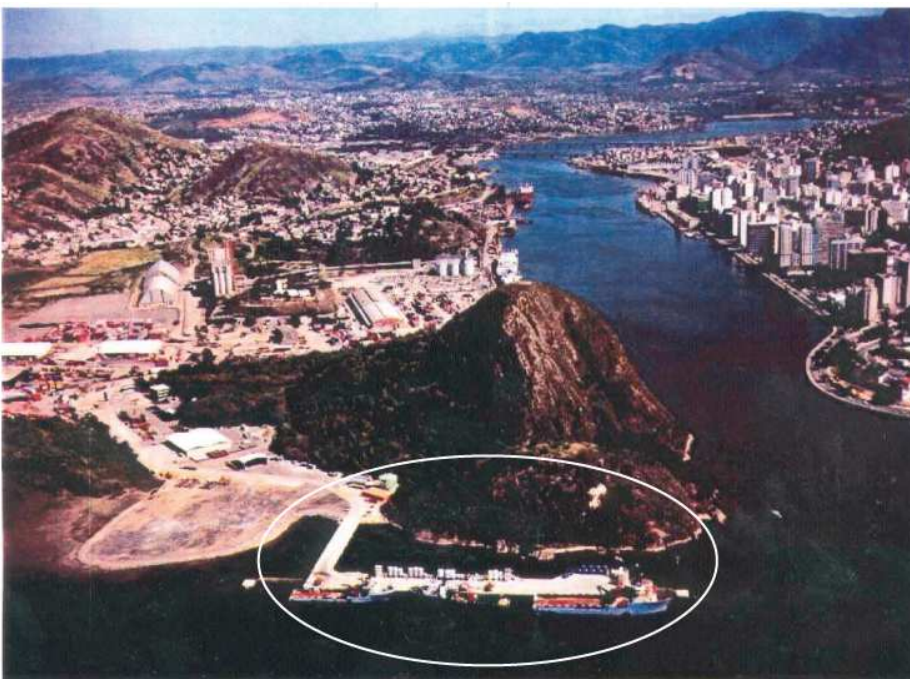
Infrastructure that supports the enterprise:

The supporting system to the drilling activities in AGES will count on the following infrastructures:

1. Terminal (Supporting Port)

The maritime supporting port to the operations in AGES will be the terminal of Companhia Portuária de Vila Velha (CPVV), located in the south of Vitória Bay, in Vila Velha. At that terminal, the supply operations of inputs and supplies will be accomplished to the drilling units, as well as the disembarkation of residues generated at the units.

The main inputs consumed at the drilling units are: diesel oil, used in the generation of energy and in the operation of engines; chemicals, which are, used as drilling fluids; water (drink and industrial); and food.



In first plan, aerial view of the Terminal of CPVV

2. Storage Areas of Inputs and Equipment

The storage of most of the inputs and raw materials will be under the responsibility of the supplying companies, which will periodically make the products available in the terminal of CPVV, in order to meet the units' demands.

Another part will be stored at CPVV, which has appropriate places.

The diesel oil to be consumed at the units will be transferred from the already existent tanks at the support terminal to the tanks of tugs that will carry the product to the tanks of the units.

3. Area of temporary storage of residues.

The residues generated in the drilling activities will be transported in tugs to the support terminal, where they will be picked up by the company Vitória Ambiental, which is responsible for their management. Each residue, in accordance with its particular details, will have a specific storage or will be specifically disposed in already existent structures, such as the industrial landfill and other facilities.

4. Air Support Terminal

The embarkation and disembarkation of employees from the maritime drilling units will be accomplished by helicopter from Airport Eurico Sales, located in the City District of Goiabeiras, in Vitória, ES, which is operated by INFRAERO and owned by the Federal Government. That airport has a specific area for landings and take-offs of helicopters and it has been already operating that type of transport.



Aerial view of the airport of Vitória from where helicopters take-off to Petrobras' drilling units

It is foreseen there will be two weekly flights for each unit. PETROBRAS has already built a small terminal in an area close to airport Eurico Sales in order to exclusively serve the transportation of passengers of the maritime units of AGES.

5. Supporting Vessels

A fleet of different types of vessels – tug boats, cargo vessels, supply boats and motor boats – will be used to provide support to the maritime drilling activity of AGES. Those embarkations will carry equipment, chemicals, fuels, residues and food.

It is estimated a weekly average of one boat trip of the supporting vessel to each well to be drilled in order to carry supplies, in addition to three trips per drilled well, in average, to supply inputs, such as drilling fluids. If there are wells that are being drilled simultaneously within the same area, the same ship will serve more than one unit, what will reduce the average number of trips per well.

Considering that the activities will occur at several places that have not been fully defined, a wide area was established where the routes of the supporting vessels may be established, departing from Vitória Bay to any local of AGES.

Forecast of employment creation

The drilling of each well creates 291 jobs, being 3 professionals for the management area and 288 for the drilling area itself. As the project forecasts the drilling of several wells at the same time, the number of workers hired shall be greater. However, it is not possible yet to accurately define the amount of people that will work in those activities.

For the management area positions, it is required college degree level, except for the supporting technician, who is only required to have high school degree.

For the drilling professionals that will work in shift regime, it is required the high school degree with technical level. The position of follow-up geologist requires college degree.

Most of those work positions will be filled by permanent employees of PETROBRAS and the companies that own the drilling units.

However, the maintenance of those jobs it can be deemed generation of employment as it contributes to keep the employment level at the region.

The generation of new jobs will occur, mainly, due to the increase of the activities of outsourced companies focused in serving the supporting needs to the enterprise, such as: logistics, transport, technical services, hotel, food, among others. Finally, the volume of resources used shall move the local economies, generating new indirect employment positions.

Those indirect employment positions shall be created mainly in the municipal districts of Vitória, Vila Velha and Serra, which will center most part of the supporting activities to the enterprise.

The following table presents an estimate of the employment positions required for a well drilling.

Work wells foreseen per professional category - Offshore Drilling (at the sea)

Regime	Professional Category	Work Positions
1. Administrative	Planning / Follow-up Engineer	1
	Support Technician	1
	Planning / Follow-up Geologist	1
Subtotal		3
2. Shift: (there are 4 work shifts)	Follow-up Geologist	4
	Chemical technician	4
	Service Inspection Technician	4
	Rig Responsible	4
	Driller	4
	Derrickman	4
	Floorman	16
	Mechanic	4
	Electrician	4
	Operation Assistants	12
	Welder	4
	Maintenance Supervisor	4
	Nurse	4
Subtotal (per shift)		72
Total per rig	(4 shifts x 72) + 3 management	291

Source: PETROBRAS – Apr/2006.

Technological Alternatives

MARITIME DRILLING UNIT – Due to technical and operational reasons, at AGES, there will be used jack-up rigs and floating rigs (semi submersible and drill ship).

DRILLING FLUIDS – At AGES, there will be used water based and synthetic fluids. That choice was made taking into consideration the characteristics of the geological formations of the well area. The water-based fluids use water as solution and they are effective in almost all the cases. The synthetic fluids that do not have oil in their composition, will be used when the water based fluids can not be used. They have the same efficiency in drilling as the oil based fluids, being more appropriate to the environmental quality of the operations.

Drilling Locations

The optimal locations to drill wells are identified based on geological and geophysical studies. Those locals have reservoirs that will be discovered and/or restricted in the future, and, also, the existent ones, which will be developed.

Management of the Atmospheric Emissions, liquid effluents and residues

The drilling activity of oil wells, just as any other industrial activity, generates atmospheric emissions, liquid effluents and solid residues. In compliance with PETROBRAS' environmental policy and law, those materials will be properly managed in order to avoid a possible degradation of the environment, reducing the negative impacts of the activities.

The atmospheric emissions will be generated, basically, by the internal combustion engines of the drilling units, which use marine diesel oil. The management of those emissions will be, mainly, preventive. In other words, the central objective is to reduce the emissions through the compliance with a severe Program of Preventive Maintenance for all equipment.

The drilling activity at AGES will generate the following types of liquid effluents: Water base fluid, synthetic fluids, oily water, sewage and cuttings produced upon drilling the wells.

The management of those effluents will be made separately:

- Oily water of the engine room: it will be collected and forwarded for treatment at the Oil / Water Separator. The treated effluent will only be discharged into the sea when the content of oils and grease is inferior to 15 ppm (parts per million), in compliance with the legislation;
- Sewage: it will be discharged after treatment at the Sewage Plants installed at the platforms;
- Water base drilling fluids: they will be discharged directly into the sea, provided they have oil content equal to or smaller than 1%;
- Synthetic drilling fluids: they will not be discharged into the sea, being transferred for reuse in other drilling rigs or collected to proper drums / tanks and disembarked to receive proper treatment onshore for their reuse;
- Cuttings produced upon well drilling: When the drilling is used with water based fluid, the cutting generated will pass through the Solid Treatment System before being discharged into the sea. In case the used fluid is synthetic, the cuttings will undergo a treatment process comprised of cutting drier and Solid Treatment System. Those processes clean the cuttings, removing the maximum fluid that stuck to it.

Several types of solid residues are generated in the drilling activities, from ordinary garbage, derived from day-by-day actions in the platforms, up to hazardous residues, generated during the operations of the activity.

The whole management of residues will be performed in compliance with the Residues Management System (SIGRE) already used by PETROBRAS UN-ES. The objective is to provide a proper discharge of all residues generated in their onshore and offshore units in compliance with the Environmental Legislation. SIGRE is totally computerized, what allows the recording and tracking of residues from their generation up to their final discharge.

The collected residues will be sent to the terminal of Companhia Portuária de Vila Velha (CPVV), and forwarded to Vitória Ambiental, a company specialized in residues management.

The drilling units that will act in AGES will generate the same types of residues usually generated in other units, as shown below.

Residues to be generated in the drilling units and their forms of final destination.

RESIDUE	CLASSIFICATI ON NBR 1004/2004	FINAL DESTINATION
Industrial Batteries	Class I	Recycling
Empty plastic non-contaminated drums	Class II-B	Recycling
Plastic drums contaminated with oil or chemical products	Class I	Industrial Landfill
Oily ludge	Class I	Industrial Landfill
Cartridges of printers / copy machines	Class I	industrial landfill
Organic food residue	Class II-A	Discharged into the sea
Fluorescent lamps	Class I	Decontamination
Sisal ropes	Class II-A	Industrial Landfill
Aluminum cans	Class II-B	Recycling
Wood	Class II-B	Reused
Used lub oil	Class I	Refining
Residue of the Health Service	Class I	Landfill for Health Residues
PPEs	Class I	Industrial Landfill
Non-contaminated paper and cardboard	Class II-B	Recycling
Oil-contaminated paper and cardboard	Class I	industrial Landfill
Recyclable plastic	Class II-B	Reuse or Recycling
Residues contaminated with chemical products	Class I	Industrial Landfill
Residues contaminated with oil / grease	Class I	Industrial Landfill
Electric Scrap	Class II-B	Recycling
Ferrous and not ferrous metallic Scrap	Class II-B	Recycled at steel plant
Glass	Class II-B	Recycling
Ordinary waste (home)	Class II-A	Sanitary Landfill
Sweeping residues and paper towels Eraser	Class II-A	Industrial landfill
Glass and wool fiber Fiber	Class I Wool - Class II-B	Industrial Landfill
Pyrotechnic signs	Class I	Industrial Landfill
Hoses and short hoses	Class II-B	Industrial Landfill
Piles and ordinary batteries	Class I	Industrial landfill

Perspectives in case the enterprise is not performed

In short, the failure to accomplish the drilling activities in AGES will significantly affect the growth of the production capacity of national oil and the pursue to meet the internal consumption demand for by-products in the most varied sectors of the economy.

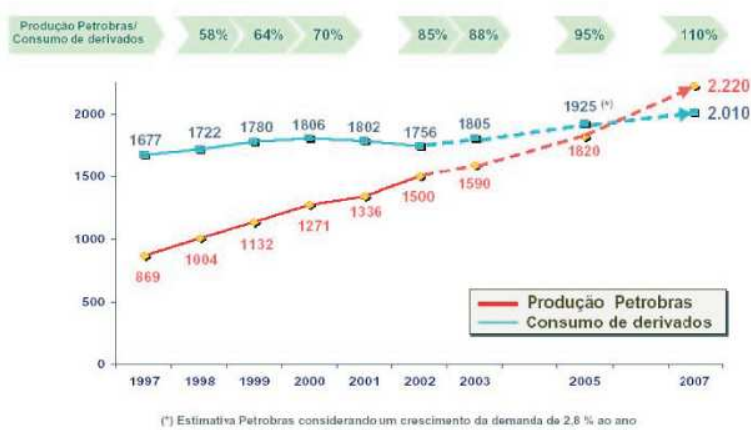
Nowadays, the oil is already the main source of energy used in the world and, according to studies accomplished by several experts, the demand for oil in Brazil tends to grow even more in the next years. In other words, if the country does not increase its internal production, it will become dependent of the oil imports.

This, in spite of the risks and impacts associated to the oil industry, the current trend is the promotion of the exploration of the reservoirs. Confirming the justifications already presented for that project, it is further pointed out that:

- Brazil is currently considered as one of the most attractive countries in terms of growth for this industry;
- PETROBRAS is recognized as a company that holds state of the art technology in the area and it can lead those activities in compliance with the best practices;
- this enterprise comprises drilling wells for the development of fields and blocks with acknowledged production capacity, besides the exploratory drilling activities, once PETROBRAS has in this area a series of exploratory concession agreements undertaken with the National Oil Agency (ANP).

The following graph shows an estimate made from investment and development forecasts in an evolution scenario of the oil production by PETROBRAS and the national demand between 1997 to 2007. The activities forecasted for the maritime drilling at AGES are included in the estimates of increase of national production defined in this graph.

Produção de Óleo da Petrobras x Demanda Nacional



Estimates of the oil production and national demand (1997-2007)

Area of Influence of the Activity

The area of influence of the whole area that can be affected by the activity. In order to make the presentation and the form of influence easier, the area was divided into Area of Direct Influence and Area of Indirect Influence.

1. Area of Direct Influence (AID)

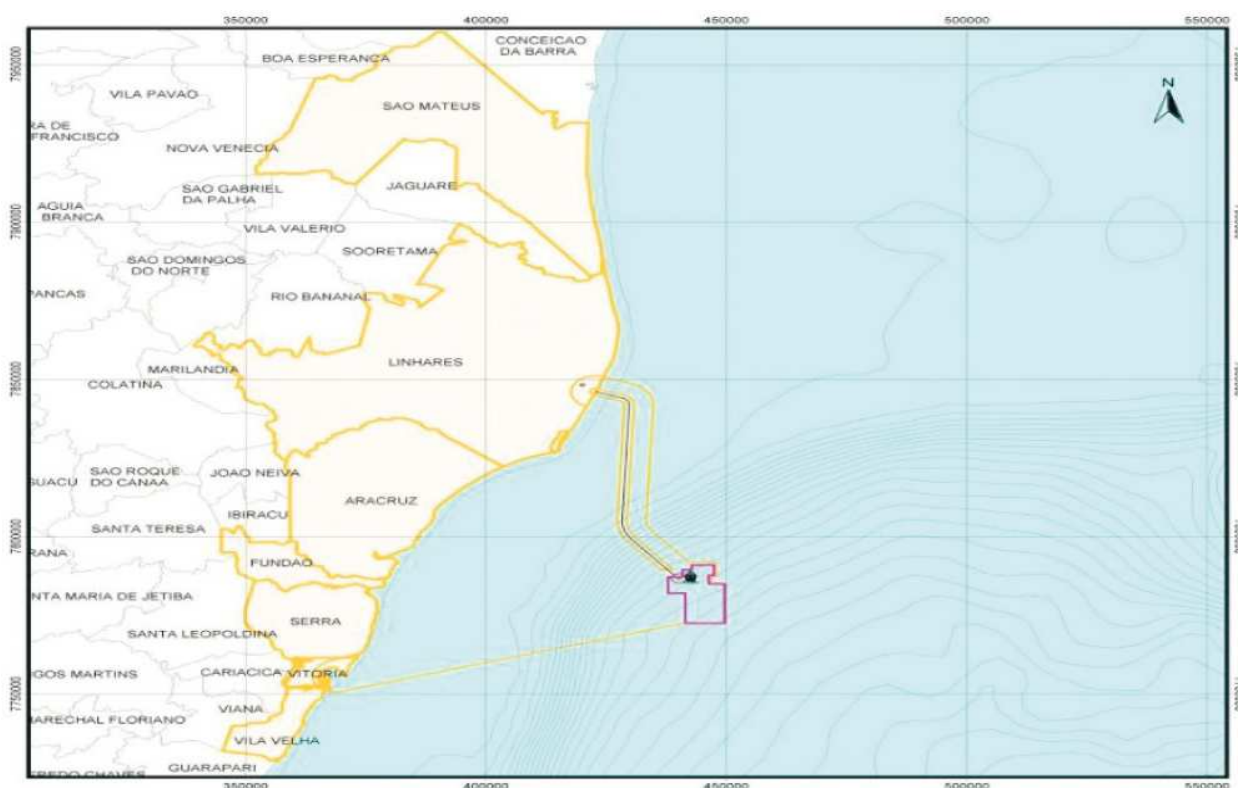
To delimit the AID there were considered actions that will be accomplished under an ordinary operation and that may affect the physical, biotic and socioeconomic aspects. The main ones are:

- Discharge of cuttings – it can affect the place where the cuttings will be discharged and also the area of dispersion of materials, which creates a feather of cuttings and mud. That situation was identified through a study that makes the simulation of feather dispersion. The study showed that the affected area comprises the proximity of wells, and it is always inside AGES.
- Maritime transport of equipment and inputs– it will be accomplished between the support port and the drilling units, and it may interfere in the fishing activities, generating conflicts with the fishing communities that act in the area, affecting, thus, the socioeconomic environment.
- Area of exclusion of 500 meters around the platforms – where it is forbidden, by international legislation, the accomplishment of other activities, inclusively fishing. The exclusion areas are inside AGES.

- support Facilities – concentrated in the municipal districts of Vitória, Vila Velha and Serras, those facilities can affect the socioeconomic environment due to the increase of activities of ports, airport, treatment of residues and management offices of PETROBRÁS.

Therefore, the AID was delimited covering the entire AGES and the municipal districts of Vitória, Vila Velha and Serra, which have supporting facilities to the development of the drilling activities.

Area of Direct Influence (7 Municipal Districts)



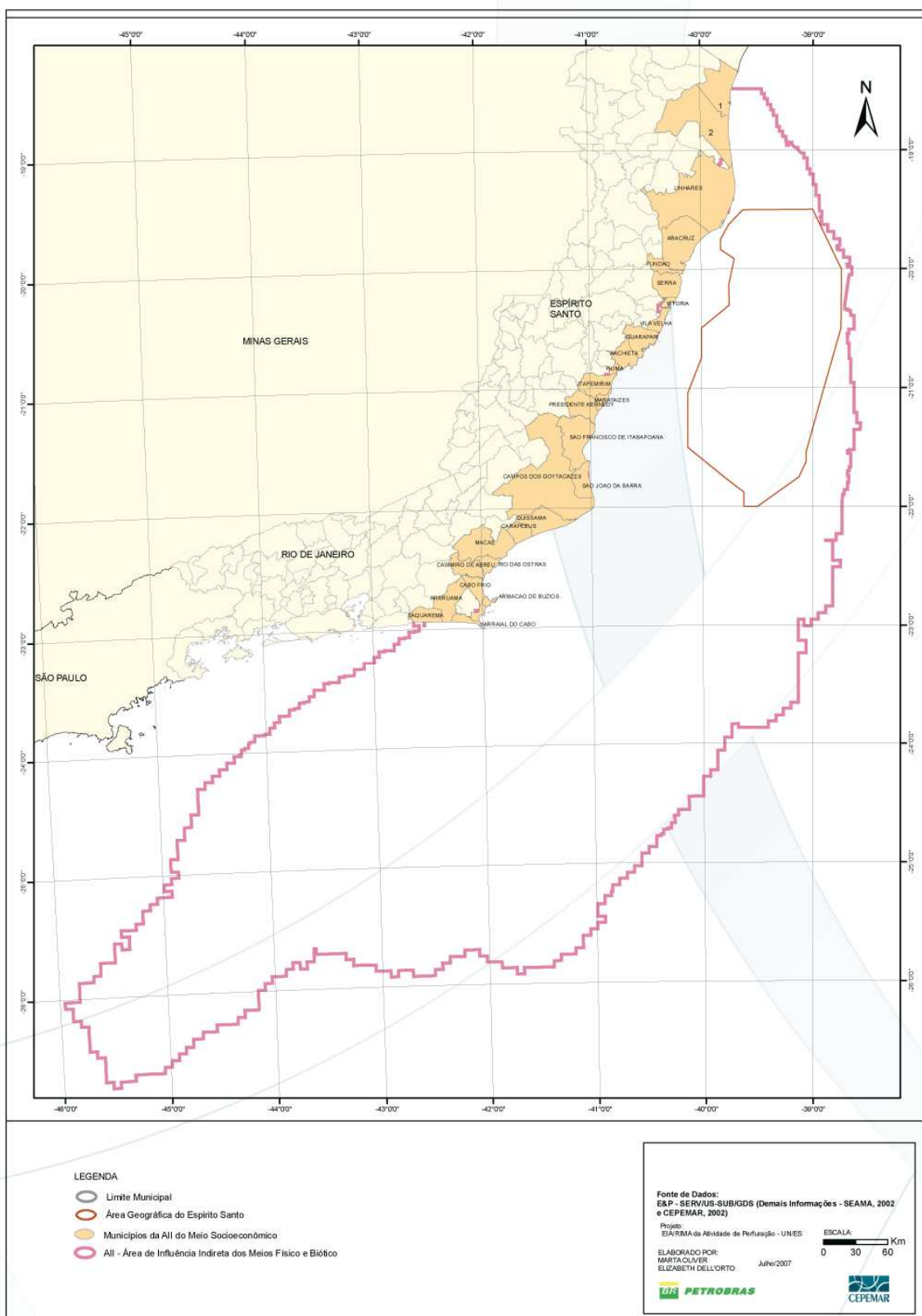
2. Area of Indirect Influence (All)

The principal criterion for the restriction of All for the physical, biotic and socioeconomic environments is the region that can be affected in case of accident involving oil spill. That area is defined from a study of the several scenarios referred to as Probabilistic Modeling. That study makes the simulation of the different probabilities of an oil spill and the area that can be affected.

The study of the Probabilistic Modeling accomplished to AGES considered the worst possible scenario, forecasting the overlaying of simulations of oil spills, at the same time, at 22 different locals.

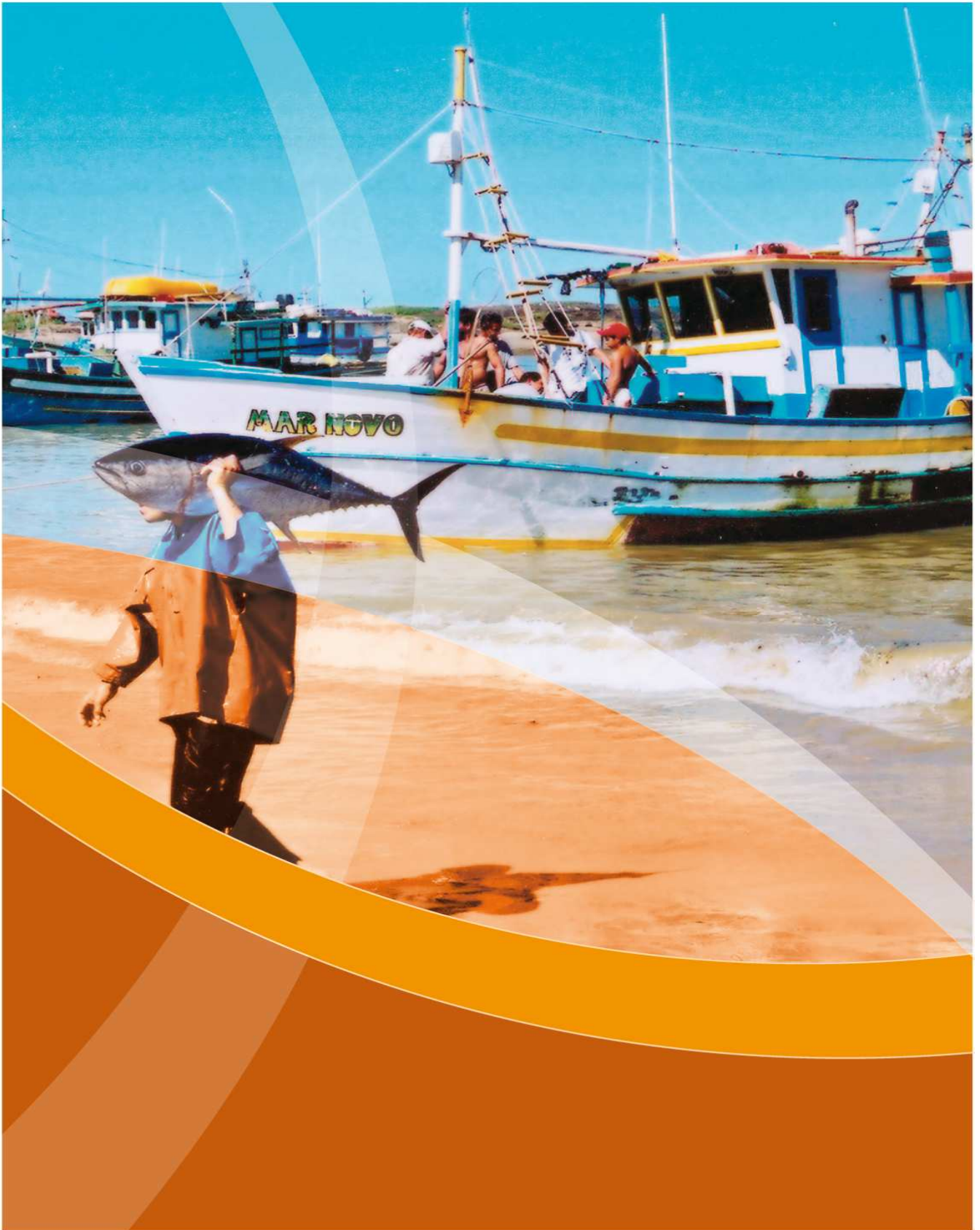
The result of that modeling showed that:

- The area to be affected comprises oceanic and coastal areas, between the municipal district of Conceição da Barra, in Espírito Santo, and Saquarema, in Rio de Janeiro. The whole area was considered as an Area of Indirect Influence for the physical and biotic environments.
- All the 27 coastal municipal districts that comprise that area can suffer the influence in the socioeconomic environment and were, therefore, included in All.



Environmental Diagnosis





Environmental Diagnosis

Characteristics of the Region

Aiming at identifying the current characteristics and point out the possible influences of the project in the area, the following studies were developed: Environmental diagnosis of the Area of Influence and Map of Environmental Sensitiveness.

Physical Environment –climate, characteristics of the water, soil types and rocky formations, etc.

Biotic Environment – coastal environment, species of vegetation and fauna, fishing resources, etc.

Social-Economic Environment – use and occupation of the soil, main groups of interest, economical activities, employment and income generation, infrastructure and access to highways, etc.

The diagnosis of the area of influence describes the current characteristics that can be affected by the enterprise, considering the **physical, biotic and socioeconomic environments**. From this diagnostics, it was prepared a summary with the main aspects addressed, referred to as Environmental Quality Summary, which is presented below.

The Map of Environmental Sensitivity identifies the most relevant environmental characteristics classifying the coastal and oceanic region in accordance with its sensitivity to the impacts. That environmental sensitivity, in the case of drilling activity, is related to the effects of a possible accident with oil spill. In other words, the Map consolidates the information of the Environmental Quality Summary, showing which areas can be more affected and which is the severity degree for the environment in case of an accident.

Thus, it is a study that helps in the development of prevention and emergency plans.

Summary of Environmental Quality

The studied area extends from Conceição da Barra, in Espírito Santo up to Saquarema, in Região dos Lagos, in the northern coast of Rio de Janeiro, covering oceanic, coastal and onshore areas. Due to its huge dimension, it presents different geological, ecological and socioeconomic characteristics and, thus, several sensitivity levels to the impacts.

In general, the environmental quality of the Areas of Direct and Indirect Influence of the enterprise can be summarized as follows:

- The oceanic ecosystem is quite preserved. The area is used as migratory route by several sea animals, among which the whales and turtles.
- The coastal ecosystems, in spite of being already affected by the man, still have a great ecological relevance, being inclusively a spawning area for threatened species of turtles.
- In relation to the economical aspect, the coastal range of the studied area presents, with prominence, fishing and tourism activities that generate employment and income. The sustainability of those activities is strongly associated to the preservation of the environmental resources.

To facilitate the understanding of the diagnosis, this Environmental Quality Summary will be divided into Coastal Area, Oceanic Area and Onshore Area.

COASTAL AREA

The Coastal Area presents several types of reliefs, soils, beaches and ecosystems, such as swamps and sandbanks (Restingas), with different sensitivity levels to impact. The influence of the enterprise in the local varies from biological to socioeconomic alterations.

Those ecosystems present different preservation levels, due to the growth of the population in the coastal areas of the area. However, there are, in this coast, several Preservation Units directed to the preservation of those environments and we can mention the Biological Reserve of Comboios, in Linhares, in Espírito Santo, and the National Park of Jurubatiba, in the municipal districts of Macaé, Quissamã and Carapebus, in Rio de Janeiro, among others.

The interaction of the sandbank ecosystem with the other ecosystems of the inclusion area is little representative, as that is characteristically terrestrial and more isolated from the sea communities, not relating itself directly with the sea animals and vegetables, nor with the estuaries and the mangroves.

The estuaries and mangroves, which are representative of transition ecosystems between the terrestrial and the sea atmosphere, present complex and inter dependent relations and are very important for the socioeconomic activities, such as fishing and crab search.

In order to better present the characteristics of that area, it will be divided in four sections, as follows: North Coast /ES, Central Coast /ES, South Coast/ES and North Coast/RJ.

Section 1–North Coast /ES: area between the border with the State of Bahia (municipal district of Conceição da Barra) up to Baía de Vitória, in the capital.

The North Coast of Espírito Santo covers the municipal districts of Conceição of Barra, São Mateus, Linhares, Aracruz, Fundão and Serra, which together are 229 km long, representing 57% of the coast of Espírito Santo. The main economical activities in this section are the tourism and the fishing.

In this section the coastal plains prevail, with ponds, sandbanks, dunes, flood plains, flooded areas and mangroves in the valleys and mouth of rivers. Those environments are rich in different species of animals and vegetables.



Dune Field

The main rivers present in this section are: rivers Itaúnas, São Mateus, Doce, Riacho, Piraquê-açu and Reis Magos.

In general, the mangroves prevail in all mouths of rivers to the sea, being most of them strongly degraded due to the growth of the population in the coastal areas.

In the municipal district of Conceição da Barra, close to the mouth of river Itaúnas, it can be noticed an extensive field of dunes and the beaches of the Villa de Itaúnas and Riacho Doce, both formed by medium and fine sands.

The well-known beach of Itaúnas, as well as the State Park of Itaúnas, strongly attract tourists from different points of the country. The headquarters of the municipal district of Conceição da Barra the Vila de Itaúnas present good tourist structure with hotel network, camping site, restaurants and taverns. The fishing and tourist activities are generating significant resources to the inhabitants of that municipal district, being further outstanding the production of alcohol, with two plants installed in its territory.

To the south, there is the coastal plain of river Doce, located in Linhares and in a portion of Aracruz coast, which is also formed by coastal sandy strings, that are 38 km wide, in the proximities of the mouth of the river to the sea.

The beaches between Povoação and Regência, in Linhares, present thick and medium sands, high and moderate slopes, banks and longitudinal gutters, which are favorable to the practice of surfing. In the tourist activity, the eco-tourism and the sports tourism are outstanding.

In that municipal district there are two fishermen' associations and fishermen colonies, which have a poor infrastructure for the maintenance of the fishing, requiring refrigerating chambers and ice factories. The beach resorts such as Pontal do Ipiranga, Povoação and Regência have touristic supporting infrastructure and are covered by the State roads, which, from that local forward, are under bad conditions, floodable during rain season and have no sign. In this portion of the coast, there is the Indigenous Reverse of Comboio and the handmade and recreational fishing performed by the Indians and tourists, respectively.

Linhares is also outstanding for the development of the agricultural, agro industrial and furniture industry, being an exporter of fruits (mainly, papaya), juices and pieces of furniture.

More to the South, in the municipal district of Aracruz, we find beaches, as the one of Comboios and Barra do Riacho, with thick sands, and there is an increase in the slope, contrary to the beaches heading northward, with finer and less sloped sands.



Barra do Riacho

The great sandbank areas can be considered as highly sensitive, mainly in relation to the vegetation area closer to the tidal zones. It is noticed that that vegetation is responsible for the fixation of dunes and it serves as feeding and shelter for species of terrestrial animals.

The Biological Reserve of Comboios is located between the municipal district of Linhares and Aracruz, between Regência and Barra do Riacho. Besides having as objective the preservation of the sandbank, it is the headquarter of Project TAMAR (Sea Turtles) of IBAMA (Brazilian Institute of Environment). The Beach of Caimbas at the north of the mouth of Rio Doce also has a similar environmental relevance.

At this section of the coast, there are several species of sea turtles protected by Federal Law (Normative Instruction No. 5 of May 21, 2004). Among which we can mention “tartaruga cabeçuda”, “tartaruga de couro”, “tartaruga verde”,

“tartaruga oliva” and “tartaruga de pente”. Several of those species seek those beaches for spawning and shelter, being monitored by the team of Project TAMAR/IBAMA. Besides, several species of sea birds use the area as a reproduction area.



Collection of turtle eggs at Comboios Beach – ES (Source: Ecologus/AS, 2002)

Project TAMAR is also responsible for generating employment to the population of Regência, População and Itaúnas in the manufacture industry of the trademark or in the field activities.

Among the sea fish, we find two less common species in the area and that are also protected by the Federal Legislation, the jewfish and the saw-fish, that can suffer immediate and significant impacts from severe pollution and intensive transit.

Below the coastal plain of river Doce, there are the beaches of the Municipal Districts of Aracruz, Fundão and Serra, with irregular coast and narrow coastal plains. They are classified as being of low energy, and protected from the action of the waves by abrasion terraces (rocks and sediments at the beach line). On those rocks, there are a great number of bentonic animals and vegetables that are quite sensitive. The sands possess size of medium the fine. They also exist a lot of formations of sandbank vegetation in the beaches.

The banks of reefs move forward up to one kilometer into the sea from the beaches, and the greater the distance from the margin, the biggest are the fishes found, and this coast area is one of the richest fishing area in the State.



Abrasion terraces promoting the fastening of algae, Praia Mole, Serra

In this region, it is outstanding the mangroves of the mouths of rivers Piraquê-açu and Reis Magos. The ecological importance of the marine region close to the mouth of River Piraquê-açu created a proposal for the implantation of the first Sea Park of the State of Espírito Santo, which is also being discussed.

The fishing activity in the coast of Barra do Riacho and Barra do Sahy, in Aracruz, and Jacaraípe, in Serra, is organized in two fishermen associations and a colony, provided with minimum facilities required for the production. The fishermen already face problems with the oil activities and industrial fishing, which is performed by larger boats from other areas. The tourism is also an outstanding activity.

The presence of the mega enterprise Aracruz Celulose places the municipal district of Aracruz among the more attractive for investments in the State, due to the logistic infrastructure that it already has.

The area has facilitated access by highways BR 101 North, which is paved, and ES 010. The coast does not have airports, except for the aerodrome of the company Aracruz Celulose, which is of exclusive use of the company. The marine boarding is made by the terminal of PORTOCEL, which is specialized in the cellulose embarkation, or by river Piraquê-Açu, by medium and small vessels.

However, the coast is able to receive mobilization of personnel in case of accident or other event that requires the presence of a team and/or equipment.

Section 2–Central Court /ES: Region between Baía de Vitória and the mouth of river Itapemirim

This section covers the municipal districts of Vitória, Vila Velha, Guarapari, Anchieta and Piúma and it has 116 km of coast with a great variety of ecosystems, such as coastal mountains, areas close to river mouths, mangroves, beaches, sandbanks and lagoons. They are regions where the rocky formations meet the coastal line, forming an irregular coast, with many islands and flat mountains, as well as exposed and sheltered areas from the direct actions of waves (Figures 4-15 and 4-16). The wide urbanization and tourism vocation are outstanding. The section also has a great variety of flora and fauna.

In Bahia de Vitória, which comprises the mouth of rivers Santa Maria da Vitória (between the municipal districts of Serra and Cariacica), river Bubu (Cariacica), river Aribiri (Vila Velha), in addition to the channels Passagem and Lameirão, there is one of the most interesting concentration of mangroves of the Coast of Espírito Santo.

An ecological station and a municipal park are present within the limits of Lameirão Island. Although there is no protected fish species, there is a significant handmade fishing fleet that depends on the extraction of the fish of the coastal zone. The problems that most affect the ecosystems of the region are related to the chronic pollution of the discharge of urban effluents, to the disordered occupation of the coast line, especially the mangroves areas, and the port activities in the bays of Vitória and Espírito Santo.

Other important mangroves are present in this section, such as the ones of rivers Una, Perocão, Aldeia Velha and Jabuti, of the main Channel of the Bay of Guarapari and of river Benevente (in Anchieta, being one of the largest mangroves of Espírito Santo).

To the south of the capital, in the municipal district of Vila Velha, the coast is cut by sandstones and flat crystalline mountains, with degrees of exposure to the waves. Several preservation units have been identified, such as the Ecological Park Morro do Penedo, Environmental Protection Area of Ilha do Frade and Permanent Protection Area and Heritage of Coastal Islands, which were implemented to protect the richness and diversity of the island and rupestrian , implanted to protect the wealth and the diversity of the insular and rock art ecosystems.

It is further outstanding the State Park Paulo Cesar Vinha and APA (Environmental Protection Area) of Setiba, one of the last areas in the South coast of Espírito Santo, which also has sandbank vegetation and field of dunes, with a concentration of a rich biodiversity of fauna and flora.

Among the Preservation Units, there are the following ones: Ecological Park Morro do Penedo, Environmental Protection Area of Ilha do Frade and Permanent Protection Area and Heritage of the Coastal Islands.



View of a section of the State Part Paulo César Vinha, where it can be observed parts of sandy beach and rocky mountain, besides a coastal pond and a sandbank section parallel to the beach

The beaches of Vila Velha are intermediary, with moderate slope and composed by thick and medium siliclastic sands. This space of the coast, as well as the sands of Vitória, presents a residential and tourist area with several hotels and countless kiosks.

The sea area comprises several protected species of sea mammals (whales and dolphins), that feed themselves with small coastal fishes and squids, pursuing shoals of tainha fishes and sardines, being able to suffer the indirect impact of excessive fishing or pollution of the coast. The sea invertebrate animals are also found at the beaches of the coast of Espírito Santo. In this area, there is also a great variety of sea birds that use the islands located in the coast, mainly in front of the municipal districts of Vila Velha and Guarapari, for resting and reproduction purposes.



Types of very common sea birds in the area: (1) Atobá marrom, (2) Fragata, (3) andorinha do mar do bico amarelo and (4) andorinha do mar do bico vermelho

At these municipal districts, sea animals are bred for trading, such as mexilhão perna and mangrove oysters. The cultivations are developed predominantly in family scale, and the mariculturists are associated to the local associations of local water culturists.

In general, the beaches are one of the main ecosystems used by the population of Espírito Santo in this section of the coast and, due to this reason, they are usually occupied by kiosks, taverns and restaurants. There are several types of beaches protected and intercalated by rocks, with different size of sands (thick, medium and fine). Among the beaches with cliffs, Maimbá is outstanding and it is narrow and limited by live cliffs close to Maimbá lagoon, in Anchieta.

This section presents the greatest urban concentration of Espírito Santo, as well as a large economic activity, mainly the industrial and port ones. The tourism is also an important activity, and it has generated the construction of a hotel network and services, as well as the urbanization of the beaches. There is a high dynamism in the activities of the tertiary, which is typical of areas with a great urban expression.

The area of Greater Vitória was already quite affected by the urbanization process, inclusively with the embankment of swamp areas, substituted by constructions and concrete walls, blockhouses and locals for waste disposal, causing an acceleration in the natural trend of obstruction of the bay. The river Santa Maria da Vitória, together with the river Jucu, are responsible for the water supply of the whole population of the area of the Greater Vitória.

The presence of industrial plants, such as the seven pelleting plants of the Company Vale do Rio Doce (CVRD) and the steel plant of ArcelorMittal Tubarão, besides countless other enterprises located in the industrial areas, such as the ones pertaining to CIVIT I and II, and three important port terminals (Vitória, Tubarão and Praia Mole), which comprise the logistic complex of Espírito Santo, in an area of strong concentration and urban pressure, they generate expressive impacts that affect the environmental quality in this area.

With regard to the access, the area of Greater Vitória presents an easy road, maritime and aerial traffic. BR-101 provides access to Airport Eurico Salles and it crosses the capital. In Vila Velha there are paved coastal highways, in good maintenance conditions and with parking lots. The marine access is favored by quays, ramps and infrastructure of the industrial port facilities.

In the estuarine area (coastal area where the fresh water mixes with the salty water) there is an easy road access at the closest portion of the oceanic area, due to the intense human occupation. Quays, shipyards and ramps can be easily found. At the bottom of Baía de Vitória, where the mangroves are preserved – at the northwest margin, in the vicinities of the mouth of River Santa Maria - the access is only possible by small vessels by the time of tide inundation. There are small quays and ramps improvised by the local population.



View of region of Santa Cruz (estuary of River Piraque-açu with a big area of swamps in the background)

To the south of Greater Vitória, there are the municipal districts of Guarapari, Anchieta and Piuma, with a great tourist activity. The industrial and port enterprise of Samarco Mineração S/A is also outstanding, as well as the activities associated to the cultivation of mollusks in family scale, and the mariculturists are associated to the local water culturist associations.

Section 3–South Coast /ES: area comprised between the mouth of river Itapemirim up to the boundary with the State of Rio de Janeiro (mouth of river Itabapoana)

In this section of the coast there are the municipal districts of Itapemirim, Marataizes and President Kennedy, which have a coast about 56 km long.

The main rivers that flow into the coast are Itapemirim and Itabapoana, and the latter serves as a boundary between the States of Espírito Santo and Rio de Janeiro. In the mouth of those rivers, they are mangroves in good preservation conditions.

This section is comprised by narrow beaches preceded by live cliffs, such as the beach of Cações, in Presidente Kennedy and Matataízes, in Espírito Santo, and Ponta do Retiro, in Rio de Janeiro, and sandy beaches associated to coastal strings, such as beach of Neves, in Presidente Kennedy.



Cliffs of the Barreiras Formation, in the south coast of Marataízes, with limited sea and fluvial deposits in valleys carved in Barriers

This section is characterized by the little development of live organisms in the coastal plains and sandbanks, and greater development of fluvial valleys and plains formed by river mouths, such as the mouth of river Itabapoana, which presents a mangroves in good preservation conditions.

The central beach of Marataízes is submitted to a severe erosive process with interventions of hard structures, such as espigões and gabiões, impairing the tourist activities.



Borders built at Beach of Marataízes/ES

Even if the activities related to the municipal administration and to the trade of the municipalities were the largest income producers, they are also important for the tourist and fishing activities for the maintenance of the families that reside in this area, mainly in the coastal area.

Section 4– North Coast /RJ: area comprised between the northern portion of the State of Rio de Janeiro and the Municipal district of Araruama (RJ).

This coast covers the following coastal municipal districts of the north of Rio de Janeiro:

São Francisco de Itabapoana, São João da Barra, Campos dos Goytacazes, Quissamã, Carapebus, Macaé, Rio das Ostras, Casimiro de Abreu, Cabo Frio, Armação dos Búzios, Arraial do Cabo, Araruama and Saquarema.

The municipal districts included in this section have an international and national expression in tourism, influenced by the wealth and natural beauty they have, especially in the section Cabo Frio - Rio das Ostras.

In this section, the plain of the delta of river Paraíba do Sul is outstanding, and its drainage basin is quite large, covering part of the States of Rio de Janeiro, Minas Gerais and São Paulo. In the lower course of the river, there is the region of Baixada de Goytacazes, which is characterized by a wide plain, with extensive sandy formations. They also include lagoons with opening into the sea and fluvial outlets, such as Lagoon Carapebus and the mouth of river Paraíba do Sul.



Delta plain of river Paraíba do Sul –RJ

The area has a rich flora and the species that compose the vegetation of the beach and of the sandbank are protected by a strip of sand. The fauna is also quite varied, with presence of mollusks, crustaceans and birds.

The rocky hills also shelter a quite rich flora and sea fauna. In that area it was implanted, in 1997, the Maritime Extractive Reservoir of Arraial do Cabo, the objective of which is to protect handmade fishing. The great number of fishes at the location is attributed to the phenomenon referred to as resurgence, which is characterized by the raise of deep waters that bring many nutrients, increasing the availability of food for the sea animals.

The area between Macaé and Arraial do Cabo is characterized by rocky formations, which reach the valleys of rivers Macaé, São João, and, Also, the small valleys of rivers of Ostras and Una. Associated to the coastal strings, there are countless temporary and permanent swamps, besides several coastal ponds.

The Pond of Imboassica has the greatest ecological commitment due to the discharges of direct sewage and disordered use of its margins by landfills and buildings.

At the beaches of Xexé, Maria da Rosa and Açú, covered with typical vegetation and sandbanks, there may be spawnings of sea turtles. A peculiar characteristic in this area refers to the presence of women collecting crabs (crab women, (caranguejeiras)).



Swamp and mangroves formation at Pond Açú close to Beach of Açú

The irregular coast is responsible for different levels of exposure to the waves and beach extensions. With regard to the beaches, it is noticed that between Macaé and Rio das Ostras the coast is comprised of long beaches separated by rocks. In the area of Armação dos Búzios and Cabo Frio, the coast is more irregular, comprised of calm bays, sandy beaches and rocky mountains. Beach of Però, in Cabo Frio, is currently one of the most preserved beaches, with sandbank formations covering the dunes.

The outflow area of river Paraíba do Sul is one of the most important of the State of Rio de Janeiro in terms of fishing productivity, favored by the great extensions of mangroves in the area. At São Tomé Beach there is the embarkation and disembarkation of fishing boats with tractors, with a strong presence of tourism and commercial activity.

The exploration of the fishing determines a zone of potential conflict of use. The handmade fishing is limited by the capacity of the vessels and there is a prevalence in the more coastal region, at depths ranging from 200 to 400 meters, while the industrial fishing operates independently and at highest depths (oceanic region), where the activity is associated to the collection of huge pelagic fishes and fishes attracted by the already existent platforms and by those that may exist during the drilling stage.

With regard to the issue of conflicts of use, an example is the break of the bonds of the fishing tradition starting with the loss of the “cultural domain” over the sea. The physical presence of platforms in the fishing area, exercising attraction on the fish with their lights and organic residues and the intense traffic of supply vessels represent factors of exogenous appropriation of the cultural space of the traditional fishing.

Along the municipal districts of Macaé, Quissamã and Carapebus there is one of the most important Preservation Units of the State: the National Park of Restinga de Jurubatiba. It is one of the most expressive areas of sandbanks of the State of Rio de Janeiro, considered an ecosystem with exclusive characteristics, because it is one of the spaces of the Brazilian coast that presents the largest diversity of natural resources, besides a rare beauty and a rich fauna.



Aerial view of Restinga de Jurubatiba; Macaé -RJ



View of the entrance of PARNA de Jurubatiba

In the lake region, it is outstanding the coastal section of Araruama Lagoon and Restinga de Massambaba, which are island-barriers system that isolates Araruama Lagoon from the sea.

At this section, it is outstanding the APA (Environmental Protection Area) of Massambaba, located between the municipal districts of Saquarema, Araruama and Arraial do Cabo, which was created to protect the sandbank ecosystems, mangroves, lagoon and swamp present at this location.

Other mangroves are also identified, such as in the Island of Carapeba, in Campos dos Goytacazes, which is composed of the landscapes of the flooded area, forest and apicum. Also at the Beach of Maria da Rosa, there is the mangrove of Açú Lagoon, which is quite visited by swimmers in the summer (Figure 4-33). In that mangrove that extends along the Açú Lagoon up to the Beach of Açú, it is noticed a white swamp and a red swamp, besides extensive berbigão banks and a great forest of button swamp.



Mangrove of the Island of Carapeba

Close to the mouth of River Macaé, there are other mangrove areas with highly degraded ecosystem close to the city due to deforestation, discharge of waste and hospital residues. At the mouth of river of Ostras, there is the mangrove of river of Ostras, which suffers several degradation processes due to the increase of the city.

At this space, it is also present rivers Ostras, Macaé and São João.

One of the peculiarities of the basin of the river São João is the existence of the Dam of Juturnaíba. The city of Barra de São João is located at its mouth, and it has a mangrove with species of red, white and black mangrove.

The high urban concentration in this section, especially in the Municipal Districts located in the coastal area, such as Macaé and Rio das Ostras, contribute to compromise the quality of the natural resources that exist in the area.

The area of indirect influence of the enterprise corresponding to the north coast of Rio de Janeiro is being characterized along its socioenvironmental history, on one hand, by the agricultural exploration through the agro industry and cattle-raising, and, on the other hand, by the sea and coast exploration, through fishing and commercial and port activities. More recently the oil industry has been included here.

The tourism is a significant economic development /growth factor for the municipal districts in issue.

Taken altogether and seen under a wide time and space scale, these transformation agents / factors produced the different effects marked in the social and environmental dynamics of the territories they generated.

The slow and secular evolution of the agriculture in the area, with its stagnation periods and the almost colonial socioeconomic structure that maintains it (or is kept by it), is recorded in the land order and in the local political organization. In close dependence with this picture, the commercial and port activities were only shaken in the last thirty years with the beginning of the exploration the Oceanic Basin of Campos. With the oil industry, in few years territories built within three centuries were irreversibly transformed.

Onshore, the fishermen disputed areas with the new activities that are being installed, including the tourism, while they are mixed to the recently-arrived populations in the growing urban peripheries.

At the sea, the coastal dispute with offshore supporting vessels and structures disassembles the territory of the ancestral domain of the sea in conflict with the new laws and regulations of use required by the oil industry.

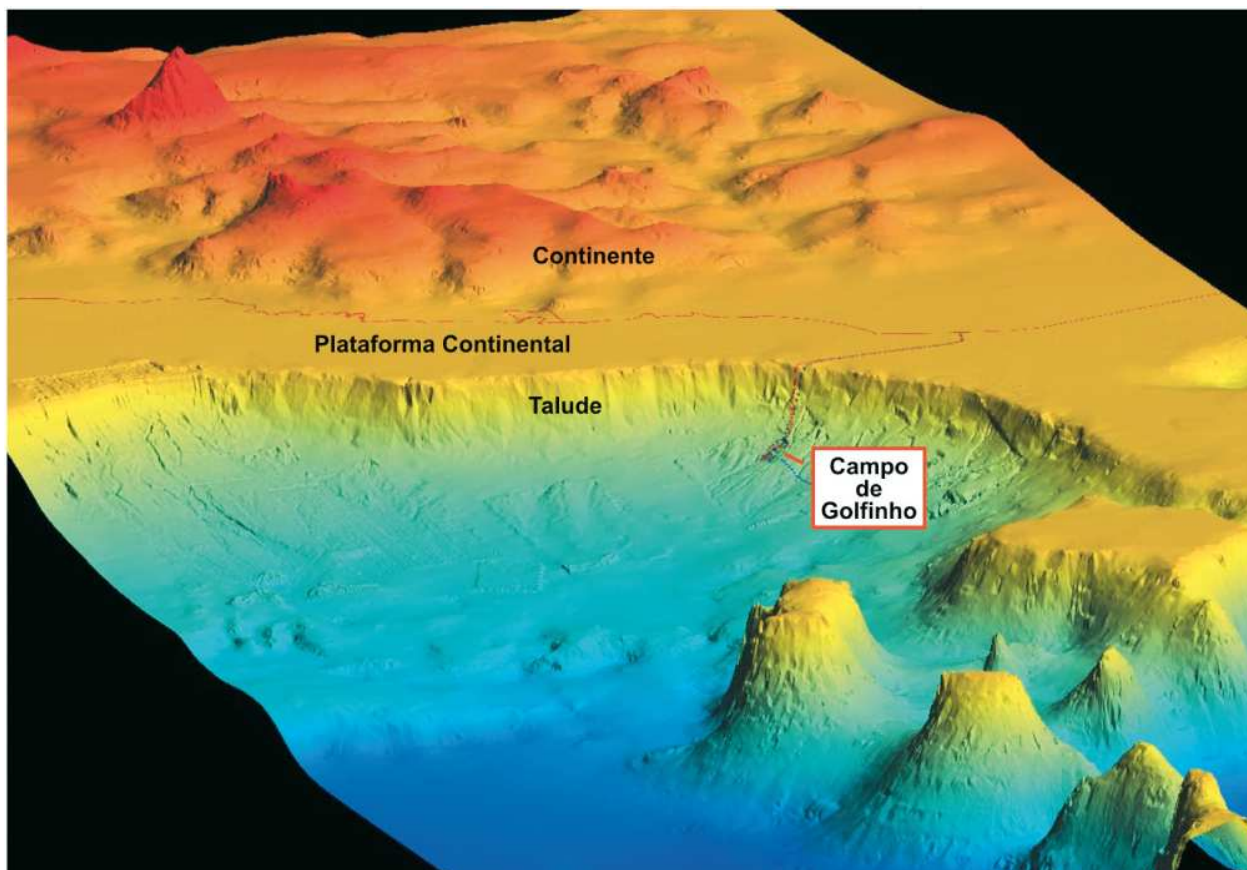
In the urban portion of the space, starting from the 80's, the local populations were led to a development process in which the required transformations were not followed by all their segments. From the socioeconomic and cultural point of view, what there is today in the area is the superposition of a traditional population and recent ones. This phenomenon is more accentuated in Macaé, Rio das Ostras, Casimiro de Abreu, Armação de Búzios, Campos dos Goytacazes and, at a smaller degree, in Cabo Frio, Arraial do Cabo and Araruama. From the point of view of the urban space, these recently-arrived people provides a fashionable growth towards certain directions provided with environmental amenities and, also, the creation of slums in extensive less valued areas.

Due to the receipt of the royalties from late 1980's on, several municipalities started the expansion and improvement works of the basic infrastructure conditions. In the same way, there has been investments in the Health and Education sections.

It is pointed out, therefore, that these municipal districts, considered as an area of indirect influence of the enterprise, are involved by a socioenvironmental and cultural transformation process of irreversible character, the developments of which are difficult to be forecasted, in face of the circumstance of non-renewable resource of oil and natural gas.

The city of Macaé is today a new development hub for the north area of Rio de Janeiro, presenting attractive characteristics for investments, as well as for the populations in the regional and state vicinities. In addition to Macaé, other municipal districts of the influence area have been trying positive changes, with the increase of the revenues and their investment in basic infrastructure, what already contributes to the development of economical activities that already exists of interest for the municipal population.

OCEANIC AREA

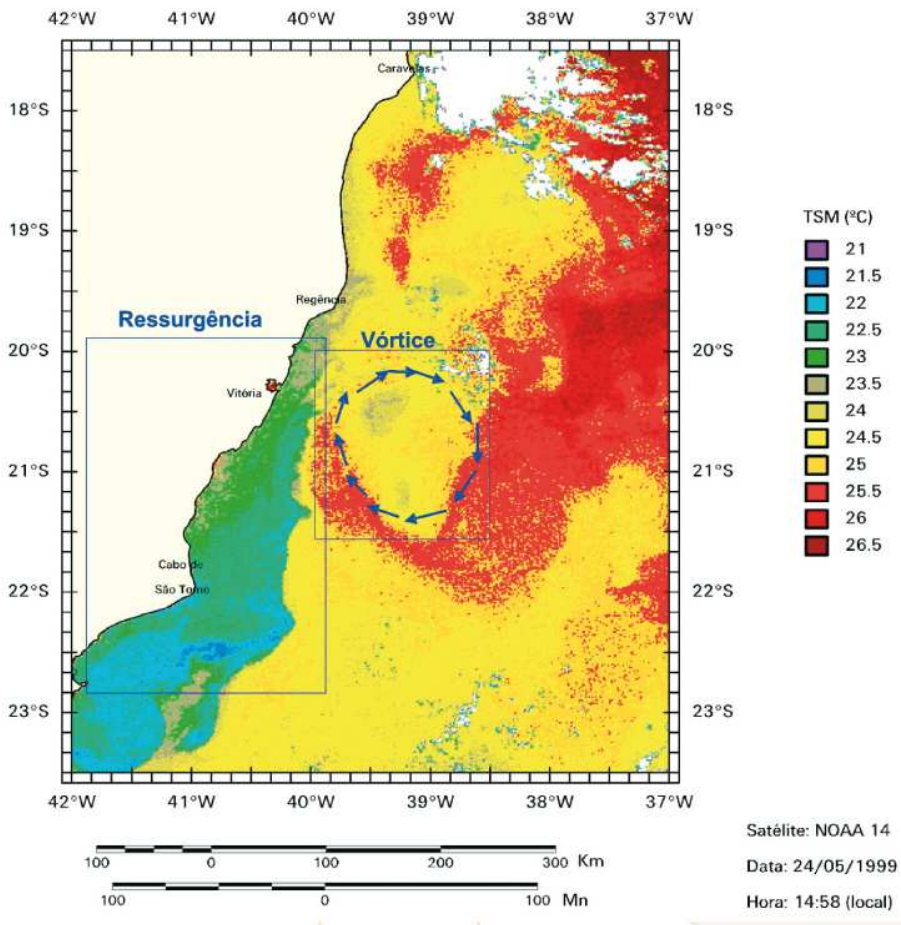


The Oceanic Area of the influence area includes Espírito Santo Basin and a part of Campos Basin, which are outstanding for the complexity of relief. That area shelters the Platform and the Continental Slope, extending from the area close to the Coast line up to a water depth of 2500 m.

The distribution of the superficial sediment is influenced by the variations of the sea level and by distribution of the sediments brought from the continent, through the main rivers (Doce, in Espírito Santo basin, and Paraíba do Sul, in Campos basin). Thus, in the areas close to the mouths of these rivers, it can be noticed mineral and muddy sediments. But in the platform, there are more sandy sediments of biological origin, including reefs.

In Espírito Santo basin, the reefs are present in Banco de Abrolhos, and along the platform. In that area, it is noticed a circulation pattern of the oceanic water mastered by Current of Brazil and the formation of vortexes (great whirls at the sea).

Carta de Temperatura da Superfície do Mar



Up to 200 meters of depth, the waters are saline and hot, with low concentration of nutrients and plankton.

Monitoring works around some drilling platforms show that the measured concentrations are at levels below what is established by CONAMA for Class 5 salt waters. That means that the waters are not polluted by heavy metals.

The distribution of nutrients – ammonia, nitrite, nitrate, phosphorous and silicate – in general, is presented in two ways: low concentration of nutrients at less deep areas, due to the presence of hot and salt waters of the Current of Brazil; and concentrations of nutrients in the cold waters at deeper areas.

In general, the Brazilian East Coast (in front of the coast of Espírito Santo and Rio de Janeiro) characterized by the low productivity of micro algae due to the presence of water poor in nutrients of the Current of Brazil (CB).

However, in the south portion the production is supported, at least partly, by three different sources of material: the flows of fresh water from rivers Doce and Paraíba do Sul, the rising of the bottom waters that are rich in nutrients, and the presence of the Vortex of Vitória, a great whirl that favors the pumping of bottom waters to the shallowest areas, increasing the amount of nutrients.

In the case of Campos basin, that pumping is caused by the existence of two curvature levels of the coast line, the island of Cabo Frio and São Tomé cable, which represent break points in the general direction northeast southeast of the Brazilian coast. Another reason is the variations of the weather along the year, which is wet and rainy in the summer and dry in the winter.



Chart showing the direction of the coast line along the Brazilian East Coast. It is noticed the inflection of the coast from Cape São Tomé on.

The community of micro algae of the area can be considered as typical of tropical oceanic areas. The zooplankton community – formed by small organisms and nestlings of larger organisms, as shrimp larvae, for instance–, presents a great number of species and low density, which is the result of the poverty of nutrients of the superficial waters.

The benthic community – formed by organisms that live in the sea bottom – presents variations related to the type of sediment and the depth where they

occur. At the extent the depth increases, the density, the biomass and the diversity of these organisms decrease. In the continental shelf there are extensive banks of calcareous algae, that shelter an enormous variety of algae and benthonic animals.

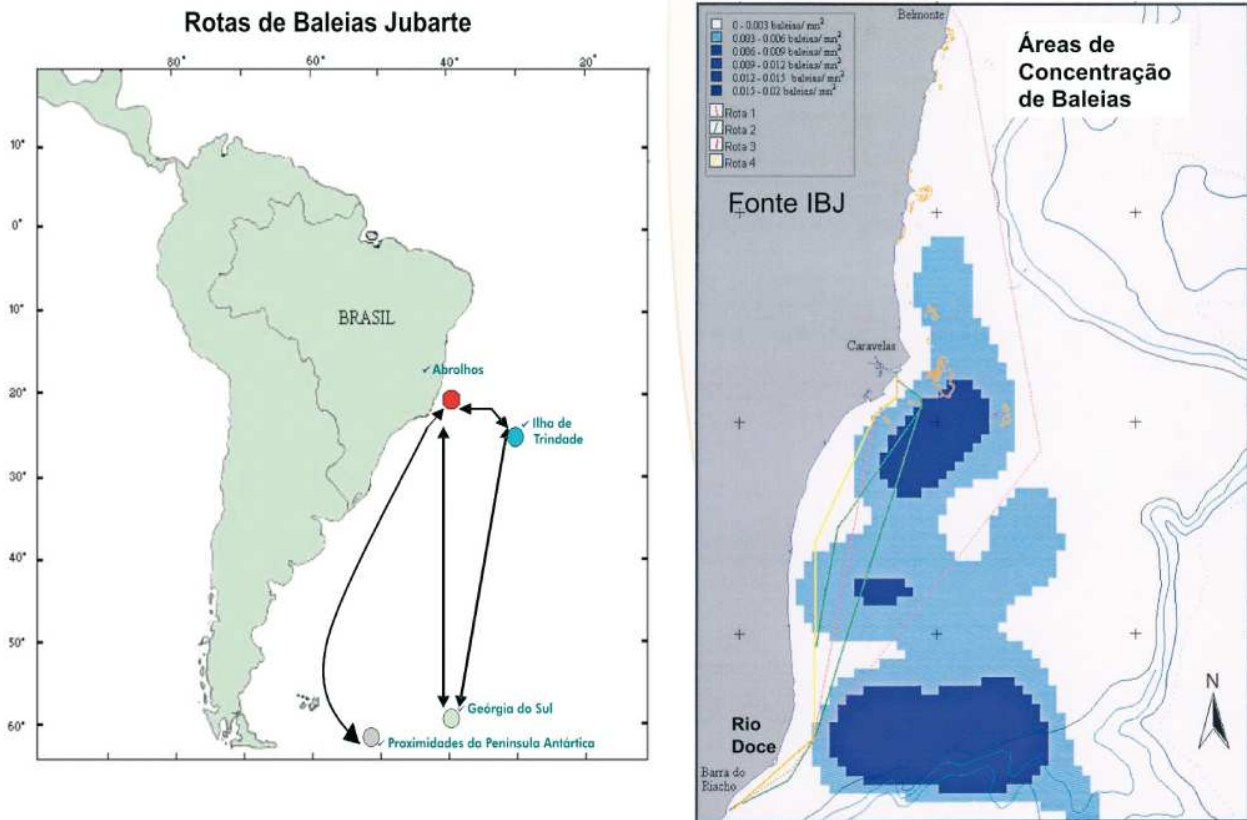
That community is better structured and present in the coastal system in the in-between-tides zones, influenced by materials, inclusively nutrients brought from the continental area. The environments close to river beds and subject to the salinity variations favor the development of mangroves, with wealth of species, diversity and biomass.

The section presents a great number of species of fishes typical of coastal tropical areas. Some of those species are threatened of extinction, as groups of sharks and stingrays, which, due to their low fecundity and high longevity, are very sensitive to the fishing activity.

The area is presently used by, at least, 23 species of whales and dolphins. Those animals of more oceanic habits and with a wide displacement area, divide the area exclusively with species of coastal habits of smaller distribution area. From the species registered in the area, two have exclusively coastal habits, do not make long movements and use the area along the whole year: the gray Amazon dolphin and the “franciscana”. Those species interact and are frequently threatened by human activities, as the fishing and the pollution of the coastal environments by spillage of pollutants.

The whales of the kind “franca do sul” and jubarte are present in the area, preferably in the winter and in the spring. They are species that deserve special attention since they had their populations in the area reduced by the hunt. In the coast of Espírito Santo, in front of River Doce, it was identified an important area of concentration of whales of jubarte type between July and November.

In the study area there are five species of marine turtles in the Brazilian coast, and it has been registered areas of spawning of big-headed turtle (north of Rio de Janeiro) and of the green turtle (mainly in the Island of Trindade, in the Espírito Santo), among others. The accidental capture in the fishing is main cause of death. Besides, it is not possible to discharge a possible negative influence of the oil activities due to the acoustic disturbance, oil leaks and increase of the traffic of vessels.



A risk for the turtles, the fishing is one of the main economical activities of the area and also the principal possible impact to the socioeconomic environment. However, in spite of the high diversity of fish found in the area, only a reduced number possesses economical importance as fish, because most of the coastal species has small load and little acceptance for the consuming market.

In that way, the handmade fishing activity, prevailing along the whole coast and oceanic area, is supplemented by crustaceans and mollusks. That activity is developed close to the coastal area, without heavy transit in the oceanic area.

The industrial fishing, accomplished mainly in Itaipava and Vitória, in the Espírito Santo, is extended from Banco da Vitória up to Abrolhos, being subject to impacts related to the reduction of the fishing area and the traffic of supply vessels to the oil platforms. The fishing activity in the north of the state of Rio de Janeiro is better structured, and the municipal district of Macaé is outstanding.

TERRITORIAL AREA

The area of influence of the enterprise is comprised of 27 municipal districts, 14 of them located in the State of Espírito Santo and 13 in the State of Rio de Janeiro. Considering the specificities of each municipal district analyzed, it has also been decided to subdivide them in four groups:

- Greater Vitória
- North Coast of Espírito Santo
- South Coast of Espírito Santo
- North Coast of Rio de Janeiro

Greater Vitória

The municipal districts of Greater Vitória concentrates a great part of inhabitants, represent most of State's GDP and most of the investments accomplished in the State. Thus, they present the largest financial capacity of the municipal public section, what reflects a greater participation in the Index of Municipal Development (IDM) of the Espírito Santo. The concentration of investments in those municipal districts is superior to the others, with few exceptions, especially in the field of the transport logistics and storage of products.

North Coast of Espírito Santo

The municipal districts located in the north coastal area of the state - Aracruz, Fundão, Linhares, São Mateus and Conceição da Barra present an expressive fishing and tourism activity in the coast, which generate resources for their inhabitants.

The economical activity of the municipal district of Conceição da Barra is focused in the production of alcohol, with two plants installed in its territory. In the municipal district of São Mateus the mineral extractive industry is outstanding. It is represented by the oil and natural gas production accomplished by Petrobras. Linhares has a great expressiveness in the agricultural and cattle-raising and industrial sectors, with a prominence in the export of fruits (mainly, papaya), juices and pieces of furniture. The municipal district concentrates activities of the tertiary and appears as the main regional hub of the north of the State. The agroindustrial

sector is the propelling spring of the development of Aracruz, accomplished by Aracruz Celulose, which radically changed the economical profile of the municipal district and places it in the ranking of the top companies of the state in terms of gross domestic product (GDP) and IDM. Fundão has the weakest productive performance and, consequently, smaller participation in GDP, in IDM and other socioeconomic indexes. Its economics is based on the agricultural activity, which is more concentrated inside its territory.

The expected scenario for the area is an increase of the comparative advantages as from the aggregation of new and growing investments in the oil and logistic activities, placing it as one of the most attractive for investments of the state. The growth of the urban occupation in the area can cause positive and negative aspects with regard to fishing. Among the positive aspects, there is the increase of fish consumption and, thus, the increase of the fishing activity improving the fishermen communities' purchasing power in the area. On the other hand, there is the possible over-fishing and dispersion of shoals, increasing the fishing effort and consequential increase of the price of the fish in the area.

South Coast of Espírito Santo

The municipal districts in the south coast of the state, especially Presidente Kennedy, Itapemirim, Marataizes and Piúma, present as base of their economies the agricultural and cattle-raising, tourism and fishing activities. The latter has a cultural dimension and represents a source of income for many families.

In the south end there is the prevalence of the traditional sugar cane activity, which is kept the former alcohol and sugar Plant "Paineiras", installed in Itapemirim. Anchieta holds an expressiveness in the tourism, in fishing and in the agricultural and cattle raising activity. However, the performance of its economy is strongly associated to the transformation industry by the presence of Samarco Mineração S.A, producer of "pellets" of iron ore. The company still develops port activities in Port of Ubu, a strong attraction for investments.

Guarapari, an icon of the tourism of the south of Espírito Saint, presents a strong contribution of the fishing and agricultural activities, as well as the civil construction industry and of the real estate activity.

In accordance with the analyzed data, it is noticed that those municipal districts present a small expressiveness in the generation of State GDP; per capita income (which varies from low to average, in comparison with the state average); besides presenting low IDM.

North Coast of Rio de Janeiro

In the north coast of Rio de Janeiro, the traditional activities are the sugar cane agro industry, fishing and tourism. The activity of oil and natural gas exploration, in Campos Basin, which has been incorporated recently, is also an expressive factor for the development.

The municipal districts of that area, like Campos, Cabo Frio and Macaé, have been growing at higher levels in comparison with the national average. The possibility of investments derived from businesses carried out by the oil industry, as well as from transactions generated by the payment of duties, especially of royalties, has leveraged the development of the area. So, many of those municipal districts have been manifesting the dependence of that resource to the municipal safes, which reaches, in some cases, 80% of the municipal revenue.











For the great majority of those municipal districts, the job market is warmer in the activities associated to the tourism. The public administration also appears as an important generating source of employments, as well as the industrial activity.

Environmental Sensitiveness Map

The sensitiveness map points out the more sensitive environments to a certain activity, allowing the planning and development of actions to protect these environments.

The following representation, which is internationally recognized, brings the scale established in the Basic Manual for Elaboration of Maps of Environmental Sensitiveness to Oil Spills in Petrobras System: Environmental and Estuarine Environments

Scheme of colors for the classification in increasing order of environmental coastal sensitiveness (Araújo et al., 2001)

1		Flat rocky mountains; cliffs in sedimentary rocks; flat artificial structures
2		Flat rocky terrace or substratum of medium slope, exposed
3		Dissipative beaches, of fine to medium-size sands, sheltered
4		Beaches of thick sand; intermediate beaches, of fine to medium size sands, exposed
5		Mixed beaches of cuttings and sand; abrasion platform; irregular surface or surface covered with vegetation
6		Beaches with cuttings; talus deposit; rock dumping; platform rec. conc. later. or bioc.
7		Plain of exposed sandy tide; exposed low tide terrace
8		Hillside of sheltered flat rock; hillside of non flat sheltered rock; rock dumping
9		Plain of sheltered sandy/ muddy tide; low tide sheltered muddy terrace terrace
10		Flooding lands, swamps, swamps, margins of rivers and ponds, marismas, mangroves

The coverage area of that study was divided in two maps to facilitate the presentation of more detailed information. However, the information presented in the two maps are identical, as well as the graphic representation.

The areas with spatial, non punctual coverage were limited in gray and the corresponding icon was placed on it. The geomorphologic information (about relief and its formation) were obtained through prior knowledge and surveys already accomplished on the coast line of Espírito Santo.

Study of the Environmental Sensitiveness of the Coastal Area

The description of the characteristics and the determination of the level of importance of the atmosphere due to the interference of a possible oil spill (which varies from 1 to 10) in the Coastal area will also follow the subdivision in four sections established for the Environmental Quality Summary.

Section 1–North Coast/ES: area comprised between the boundary with the State of Bahia (municipal district of Conceição da Barra) up to Baía de Vitória, in the capital.

In the coast of the boundary between the states of Bahia and Espírito Santo up to the city of Conceição da Barra, due to the presence of sandstones, terraces of abrasion and formation of barriers, the level of environmental sensitivity is quite high, at rating 6, that is intercalated with rating 3, at the beaches.

The coastal area between Conceição da Barra and Barra do Riacho presents an environmental sensitiveness regular to low (between 3 and 4). The margins of the rivers, floodable plains, sandbanks and lakes are areas that are potentially more sensitive due to the difficulty of cleaning and/or recovering the environment in case of accidents with oil spill. Its extensive sandbank areas are considered as highly sensitive, mainly when close to the tidal zone, since that vegetation serves as feeding and shelter for animals and helps the preservation of the dunes.

The section of the coast from Barra do Riacho up to the entrance of Baía de Vitória is rated as moderate to high level of sensitiveness to oil spill (6) as the abrasion terraces and the carbonates sands (with algae) help to retain oil. However, as they are sheltering locals for biological organisms, the level of environmental sensibility can be increased. In the valleys and mouths of rivers Reis Magos, in Nova Almeida, and Piraquê-Açu, in Santa Cruz the sensitiveness level is at the maximum (10) due to the establishment of the mangrove ecosystem and the presence of other animal and vegetable species.

Section 2–Central Coast /ES: Region between Baía de Vitória and the mouth of river Itapemirim

The coast between Baía de Vitória and the mouth of river Itapemirim presents different levels of environmental sensitiveness. The bay of Vitória receives the maximum classification of environmental sensitiveness (10) due to the diversity of the mangrove ecosystem. In the oceanic portion, there is the bay of Espírito Santo, which, in spite of being rated moderate to low (3 and 4), it has, in the back portion, the Municipal Ecological Reservoir Restinga de Cambric.

The beaches of that area have intermediate sensitiveness, at level 4, with moderate slope and thick to medium size sand. However, the intense fishing activity, organized in colonies, cooperatives and associations, increases the environmental vulnerabilities of the area, which has a great presence of tourists, hotels and kiosks.



Aerial view of the coast of Vila Velha

In the south portion of this section, the beaches present level of sensitiveness equal to 4, since they are comprised of medium sands, associated to front dunes. The central beach of Piúma, also among the rocky mountains, is of dissipative and fine sand type, with sensitiveness equal to 3 for being submitted to erosive processes with partial destruction of the coastal highway.

Guarapari, which presents several coastal ecosystems, provides different classifications with regard to the level of environmental sensitiveness, also influenced by the tourist vocation of the municipal district. It is outstanding the beaches of Santa Monica, which is dissipative with fine sands (3), Setiba and Setibão, sheltered by rocky flourishing, (4) do Morro, dissipative to intermediary (3), of Areia Preta, which is sheltered, reflective of thick and medium sands (4), Enseada Azul, low energy reflective, preceded by sandstones and sheltered by rocky mountains, and the beach of Meaípe, reflective, with decrease of energy of waves towards the north and formed by thick to medium silicibioclastic sands, with plenty particles of heavy minerals and rating level equal to 4.

In the beach arch, where it is located the lake of Maimbá and archeological sites there is a high level of ocean exposure (1), as well as environments with low to intermediary sensitiveness (3 to 5) that is typical of dissipative sheltered and reflected sands and, further, environments with a high sensitiveness level (10), mainly at the mouth of rivers, bays and mangroves.

The beaches of Ubu, Central and Iriri are protected and intercalated by rocky strings, with different types and dimensions of sands, granting a sensitiveness level between 3 and 4. In the beaches of Castelhanos and Parati, the presence of abrasion terraces of the Barreiras Formation in the front beach are responsible for a higher sensitiveness level.

At the center of Anchieta there is the outlet of river Benevente, which shelters in its bed one of largest mangroves of Espírito Santo, with about 1260 km². This presents the highest level of environmental sensibility - 10. To the south, in Piúma and Itapemirim, the local closer to the river bed and mangroves are outstanding, also with rating 10 of environmental sensitiveness.

Section 3– South Coast /ES: area comprised between the mouth of river Itapemirim up to the boundary with the State of Rio de Janeiro (mouth of river Itabapoana)

The presence of abrasion terraces in the coast between the mouth of river Itapemirim, in Espírito Santo up to the boundary with the State of Rio de Janeiro increases the environmental sensitiveness level of the section to class 5. In Marataízes, lagoons such as the Lake of Siri are areas of greater environmental sensitiveness.

Section 4– North Coast/RJ: area between the northern portion of the State of Rio de Janeiro and the Municipal district of Araruama (RJ).

The mangrove areas of the north coast of Rio de Janeiro, between Guaxindiba and Macaé, presents the higher sensitiveness level (10), both due to the richness of fauna and flora, and by the significance for the economic activities performed.

Also the coast of Macaé and region of lagoons, due to the importance of preservation of the environment for the tourism, and existence of fishing activity and sandy beaches (Figure 4-38), coastal mountains and mangroves, can be rated as presenting maximum environmental sensitiveness (10).

The image features a central aerial photograph of a city, overlaid with a semi-transparent green filter. The city's layout, including roads, buildings, and green spaces, is visible through the green tint. The word "Impacts" is centered in the image in a white, sans-serif font. The entire composition is framed by a light gray border at the top and bottom.

Impacts



Impacts

Introduction

A team of professionals of several areas—biology, economy, geography, sociology, among others—participated of the identification and evaluation works of the potential impacts referring to the enterprise in issue and the result is the analysis presented in this chapter. From the information on how the drills and the environmental diagnostics will be performed, the experts identified the main impacts that can occur during and after the development of that enterprise. Those impacts were classified according to the following criteria:

Category – Negative or Positive. They can be adverse or beneficial to the means.

Form of Incidence – Direct or Indirect. In general the indirect impacts are derived from the development of the direct impacts;

Area of coverage – it can be local (inside the area of direct influence), regional (in the area of indirect influence) or strategic (out of the influence areas);

Duration or Timeliness – it evaluates the time of duration of the impact and its consequences, being classified as Temporary (when it is possible to define the term of its occurrence) or Permanent (when the effects can extend besides a foreseeable term);

Degree of Reversibility – the impact is Reversible when it is possible to eliminate its consequences with punctual actions or the suspension of the activity, or Irreversible, when even with the suspension of the activity it is not possible to revert its consequences;

Term for the Manifestation – it considers the time so that the impact or its effects are shown. It can be Immediate (1 year or less); Medium Term (from 1 to 10 years) or Long Term (above 10 years);

Dimension – It measures the intensity with which the environmental characteristics can be altered, adopting a nominal scale of Weak (1 to 3), Medium (4 to 7), Strong (8 to 10) or Variable (when the intensity can change along an activity term);

Level of importance – after determining the size of the impact, which considers all other assessment features, the analysis is accomplished, associating the size of the impact with the sensitiveness of the ecosystem or social means affected, determined in the Environmental Diagnostics. The result follows the interaction criteria in accordance with the table presented below:

MAGNITUDE \ SENSITIVENESS	WEAK	MEDIUM	STRON
HIGH	Great	Great	Medium
MEDIUM	Great	Medium	Small
LOW	Medium	Small	Small

Source: HABTEC, 2005

Thus, a strong impact, occurring over an environmental factor of high or medium sensitiveness has a high level of importance. The crossing among between a strong magnitude and low sensitiveness, or vice-versa, indicates a medium level of importance for the impact. Finally, impacts of weak magnitude, that occurs over low or medium sensitiveness factors are considered as degree of small Importance.

Next, the main potential impacts of this enterprise. For a better understanding, we decided to subdivide the analysis into two parts, separating the impacts to the environment from the impacts to the socioeconomic environment.

After the description of each impact, it is pointed out the proposals of actions with the following objective: to reduce or to eliminate the effects of the negative impacts (mitigating measures); and to maximize the effects of the positive impacts (potentializing measures).

IMPACTS ON THE PHYSICAL AND BIOTIC ENVIRONMENTS

Impact 1

IMPACT: Variation of biodiversity derived from bioincrustation	
Phase	Environmental Aspect
Mobilization	Presence of the Drilling Unit at the local;
	Fastening the Drilling Unit on the maritime layer.
ACTIONS: No control or reduction action is required	

The subsea structures of the drilling unit (FPSO vessel or oil platform) will operate as locals available for fastening incrusting benthic organisms, that is, organisms (as algae and corals) that live on sea bottom and stuck themselves on any type of surface, such as rocks, ship hulls and structures built by the man. Those organisms are very common in all AGES and they can populate, within a short time, those facilities, being this an immediate impact. When the drilling unit moves around, those organisms will continue incrusting, renewing the populations and populating new subsea structures, such as the pipes and the string connected to the well.

The introduction of incrusting species in the environment can be considered positive, because, besides contributing for an increase of the diversity and biomass, in an atmosphere usually poor in nutrients, those communities represent food for the fishes of the area. However, with regard to the ecological alteration, this impact is classified as negative. This impact is considered temporary, because, when the unit leaves the local, it will take with it the whole assembled structure, including the community incrusting on the structure, also classifying it as of medium magnitude.

It is not advisable to interfere in the incrustation process, allowing, thus, that the development of those organisms increases the local diversity and attracts other populations of fish, mollusks (as octopi and squids) and crustaceans (e.g., shrimps and lobsters). Besides, as it will be for a short term, no control or reduction measure is required.

Impact 2

IMPACT: Attraction of Water Organisms and Birds	
Phase	Environmental Aspect
Mobilization	Presence of the Drilling Unit at the local;
ACTION: No control or reduction action is required	

The physical presence of an artificial three-dimensional structure, such as pipes and drilling units (FPSO vessels or oil platforms) encourages the development of a flora (algae) and fauna (animals) that attract other organisms to its vicinities, mainly for nourishing purposes. Thus, the units start to operate as artificial reefs, providing shelter, by shadowing and food, mainly to the pelagic species, that is, those that accomplish great displacements, and to species that live associated to the reefs of corals. Among the representatives of that fauna there are the squids and some species of big fishes, such as dourado, albacora-laje and albacora-branca fishes.



Those communities of fish living in the neighborhood of the drilling unit increases the productivity of the fishing activity in the area around it. However, as there is an exclusion area exists for the fishing activity, within 500 meters around the drilling units, it could become a Marine Preservation Area, preserving stocks of reproducers and recruits, contributing for the preservation of the species deemed threatened.

The increase of the presence of fishes and organisms living around the units may also attract coastal and oceanic marine birds in search of food. Besides, the structures of the drilling unit operate as a resting place for those animals. It is not expected, however, that the drilling unit has that function. On the contrary, the structures of the units offer more risks than shelter to those animals.

The effect of the unit on the biota (sea organisms) will be immediate, and its presence has a direct impact on the communities, because, acting as an “artificial reef”, it will allow the development of a diversity of sea organisms on its surface and in its vicinities. That function allows to consider this impact as positive and of medium magnitude to the oceanic environment. However, due to the fact that the studies point out the presence of tuna shoals in oil drilling areas, the magnitude of this impact can be enlarged.

This impact is considered as regional, temporary, due to the short duration of the activity, and reversible, because the attraction effect exercised by the unit it will be reverted upon the removal of the structures. It is recommended, therefore, to do not interfere in that process of attraction of new communities.

Impact 3

IMPACT: Possibility of introduction of exotic species.	
Phase	Environmental Aspect
Mobilization	Presence of the Drilling Unit at the local;
	Discharge of ballast water;
Drilling	Demand of transport of materials, equipment, inputs and personnel.
ACTION: Preventive	

The mobilization of the drilling units that will transit between the coastal and oceanic regions can submit those environments to a likely introduction of exotic species (not original from the local), that will be carried by the ballast water or incrustated on them. As reported in Impact 1, above, those subsea structures (hulls of ships, anchors and subsea equipment) provide a hard substratum for the incrustation of quite different bentic communities, which may be carried later.

Those species represent, nowadays, the second world cause of loss of biological diversity, because they alter the natural characteristics and the operation of ecological processes. Its introduction by the ballast water causes damages that are thoroughly recognized by the native communities and human health, demanding, inclusively, governmental programs for its management.



It is important to point out that the possibility of occurrence of this impact is remote and it is associated to accidental factors. However, it is assessed as negative and of direct incidence (in case of introduction as from the release of ballast water) and indirect (when there is dispersion of incrustated species). It can present a regional, permanent, irreversible and medium term coverage, varying in magnitude from weak to strong and it has a high level of importance, due to the environmental alteration derived from it.

Presently, the procedure that is being adopted in Brazil, as an inspection measure, is the demand, by ANVISA (National Agency of Health Surveillance), of the completion of the “Form of Information on Ballast Water.” That is an international effort and Brazil has been outstanding in the implementation of initiatives for the execution of those objectives.

With regard to the introduction of exotic species incrustated on the vessels, there is no specific legislation that regulates the matter. However, it is critical to follow-up the scientific progresses and the strategies that are being undertaken by national

and international organizations to identify new practical, safe and efficient technologies to minimize the possibility for its introduction. Nowadays, the most usual practice is the periodic cleaning of the hulls of vessels and use of anti-incrustation paints (copolymers) that ensures a protection for about 5-7 years.

Impact 4

IMPACT: Environmental contamination and interference in the biological community	
Phase	Environmental Aspect
Drilling	Generation and discharge of effluents and food residues; Deactivation Accidental Oil Spill into Sea.
Deactivation	
ACTIONS: Preventive, Corrective and Compensatory	

Generation and discharge of effluents and food residues

Inside the routine of the drilling activity of wells there will be the discharge into the sea of sewage, drainage and cleaning waters and water used for cooling engines and generators and organic residues mainly comprised of food remains, which can interfere in the quality of the water.

In case there is any deficiency in the system of treatment of sewage residues from the units, there will be the possibility of introduction of bacteria and virus, which can pose risks to the human beings, without, however, representing a threat to the biota, especially because those microorganisms survive for a short term in sea waters. Besides, the discharge places are not bathing areas, and there is no direct contact with human beings.

The water used to cool the equipment of the production unit, such as engines and generators, is circulated in a closed system, what prevents its contamination. That water will be pumped directly from the sea and discharged back into it from the lifted points of the units.

The food remains will be triturated into parts smaller than 25 mm and thrown into the sea, according to the principles provided for in the current NORMAN's (Maritime Authority Standards, established by the Brazilian Navy) that refer to the sea pollution, facilitating the degradation by sea organisms.

The introduction of organic matter into the environment also represents a greater availability of food, what can provide an increase in the concentration of sea animals in the vicinities of the production units. Therefore, this becomes a positive impact due to the increase of nutrients and productivity. However, this impact is negative under the ecological point of view, as it alters the natural conditions. The coverage was considered as local, with direct and immediate effect. It is also considered a temporary and reversible impact, because the environment will come back to the previous conditions as soon as the activity is completed. It is not expected a cumulative effect for this impact so as to cause a significant alteration of the amount of organic matter in the environment and a disruption in the ecological structure of the ecosystem, being considered of weak intensity and low degree of importance.

In order to reduce or avoid possible negative effects, the sanitary effluents shall be treated and discharged in accordance with the limits established by IMO (International Maritime Organization), an international organization that regulates the several aspects related to navigation, including those related to safety, environment, technology and law), as well as the values defined by CONAMA Resolution No. 357/05 for saline waters (Chapter II, Section III). The oily waters picked up in the exposed areas and in the machinery areas of the production units shall be directed to a specific treatment system, in order to reduce the contents of oils and greases up to amounts inferior to the limits defined by CONAMA Resolution No. 357/05.

Supplementing those measures, there is the Pollution Control Project, which is presented in this report in the chapter Environmental Projects, which defines the control and monitoring mechanisms of the treatment systems available in each unit in order to ensure the compliance with the environmental standards.

Spill accidental of oil in the sea

In case there is an accidental spill of oil into the sea, the quality of the water will be affected, as well as the sediments of the area, altering the physicochemical and biological properties in accordance with the discharged volume. For this study, simulations were made in an attempt to reproduce the behavior of a possible oil spill. It was noticed that, in the summer, the area with probability of oil touch in the coast superior to 10% corresponds to the area between the municipal

districts of Linhares (ES) and Quissamã (RJ). During the winter, the area with probability of oil touch in the coast superior to 10% comprises the municipal districts of Conceição da Barra (ES) up to Araruama (RJ).



The oil spills into sea are quickly spread throughout the surface, as its content can not be easily dissolved in water, forming spots that impair the entry of sunshine. They are dissolved, partly, in the column of water, and may be degraded by bacteria. However, the main toxic components are strongly stable and persistent in the environment.

The potential impacts of this contamination in the sea atmosphere is centered, mainly, in the biological community that lives in the superficial waters, especially the plankton (organisms of animal and vegetable origin that are in the column of water and displace themselves in accordance with the currents), the displacement power of which is limited, being subject to the action of the currents, causing negative effects.

The contact of aquatic animals, such as fishes, whales, dolphins and turtles, with oil stains is unlikely, because the areas where the drilling units will be implanted are open and provided with characteristics that allow a wide escape area. However, the concern with the effect of the oil on whales and dolphins has been mobilizing the society and the scientific community.

Specifically in relation to turtles, the pollution of the waters by oil, waste and sewage can affect the feeding and displacement and harm the life cycle. The sea birds are also affected by the oil spill, and their feathers may become impregnated by the product, leading to the loss of flight ability, what, in its turn, can cause death by drowning.

The beaches, place of reproduction of turtles, are vulnerable environments. In spite of the eggs and nests are out of the reach of the tides and waves of storms, the oil spill can delay or even prevent the animal from reaching the beach, or, also, contaminate it during its climbing for spawning. The Beach of Comboios, an area where the "couro" turtles usually spawn, can be pointed out as a threatened region, as well as the National Park of Jurubatiba and APA (Environmental Protection Area) of Três Ilhas, in Setiba.

The mangroves, especially the ones of river Paraíba do Sul, Baía de Vitória, Aracruz (river Piraquê-Açu) and river Doce, are the most sensitive ecosystems and they have the greatest ecological importance. Once contaminated, the effects are expressed in all levels of the productive chain: affecting trees, roots, crabs and other species.

The magnitude of the effect of the environmental contamination due to accidental oil spill depends, as already mentioned before, of the spilled volume. Great amounts of oil cause the death of fish due to direct contact and frequent contacts can contaminate the fishes or other fishing resources.

The impacts are, in general, of little importance in the exposed coastal mountains. On the other hand, it can have more serious consequences when those coastal mountains are used for shelter. The physical effect of the cover of animals and algae by oil can cause the death and temporarily change the communities' structure.

Besides, the toxicity of the oil can cause other effects that are reflected in the wealth and in the diversity. In the area with probability of oil touch in the coast ranging from 70% to 100% there are the following Preservation Units (UC's): Ecological Reserve of the Island of Cabo Frio, Archipelago of Santana, in Macaé, Ilhas dos Franceses, in Piúma, Ilhas Rasas, Escalvada and Três Ilhas, in Guarapari, Islands in Praia da Costa, in Vila Velha; Santa Cruz and Barra do

Riacho, in Aracruz. However, it is important to remind that that critical scenario would occur in case no control measure was taken and, for that, there are several tools and strategies for fighting the oil spill into the sea that are foreseen and implemented by Petrobras, such as the Individual Emergency Plans and the Centers of Environmental Defense.

Irrespectively of the magnitude that this impact can have, it was rated as negative and temporary. With regard to the coverage area, if there is a spillage of worst scenario, it could affect the entire area of indirect influence of the physical and biotic environment, and, thus, it is rated as regional. It is reversible, even if in the long term, and it demands a costly task of recovery of the affected ecosystems.

This potential impact is rated in a conservative way as being of strong magnitude and with a high degree of importance. It must be emphasized, however, that the trend, by means of the technological development, is to reduce the amount of spills in the next years. Another relevant factor is that 72% of the events are small leakages (amounts below 9 tones, what is equal to about 11 m³). So, the probability of its occurrence is quite low and the expectancy is that, if it occurs, it will be of small importance.

Also, as it is an accidental hypothesis, this impact is indirect. In relation to its manifestation, it can be immediate, in the medium or long term.

Among the preventive mitigating measures, it is outstanding the application of the safety standards and trainings aiming at reducing the risks of accidents, so that people's integrity and stability are preserved as well as of the Production Units (UPs). Parallel to it, there shall be implemented the Risk Management Plans of all Ups, as provided for in the Risk Analysis of each unit.

The Ups shall have its Individual Emergency Plan continuously updated and supported by a continuous training of the institutions and human resources involved, comprising: the definition of the responsibilities of the institutions and people involved; the human resources, materials and financial resources available; a detailed set of technical and scientific information referring to the likely emergencies; the recommendations for a Plan of Action; the applicable

legislation; the identification and location of all institutions and people involved; and the references related to all resources able to be employed if required.

In addition, also in a preventive manner, there must be implemented a control and maintenance system of equipment and operations in order to ensure the continuous assessment of its operation and safety conditions. The company shall also make use of physical, chemical (in compliance with the guidelines of Resolution CONAMA No. 269/00) and/or biological methods to contain and recover the spilled volume or to promote its degradation.

In every emergency operation, there must be considered several priority criteria, such as safety of involved people, protection of environment, safety of equipment and protection of areas and goods with social and economical value.

Finally, as a compensatory measure, in case the preventive and corrective measures are not sufficient to avoid the spreading of oil, there must be taken compensatory measures for the eventual environmental damages caused to the affected ecosystems, besides the provision of priority to their immediate cleaning. Those compensations involve compensations and specific support to the fishing community possibly affected, besides the reimbursement of possible losses to the industry associated to tourism, among others.

Impact 5

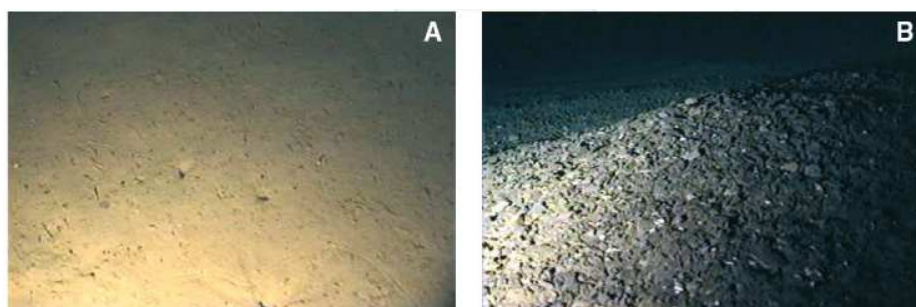
IMPACT: Environmental contamination and interference in the bentonic and pelagic communities	
Phase	Environmental Aspect
Drilling	Discharge of fluid and cuttings with drilling fluid stuck on them.
ACTION: Preventive	

In the drilling activity of the wells of AGES there will be used water based and synthetic fluids. After their use, the water based fluids are discharged into the sea and the synthetic fluids are sent for use in other rigs or onshore, where they are processed to be reused in other rigs. The process generates, also, a volume of cuttings with fluid. It is foreseen three types of discharge:

- discharge of water based fluid;
- discharge of cuttings with water based fluid stuck on them;
- discharge of cuttings with synthetic based fluids stuck on them.

Interference in the Benthonic Community

The deposition of cuttings on sea bottom can cause impacts on the benthonic organisms in three different ways: physical impact, caused by the discharge of cuttings, causing the burial and asphyxia of species; chemical impact, due to the fluid and other compositions stuck to the cuttings; and biochemical impacts, referring to the decrease of oxygen on the sediment due to biodegradation of the fluid.



Images of the oceanic bottom in the monitoring area of the drilling activity. A) the bottom presents homogeneous disturbed sedimentation, without material associated to the drilling ; and B) the bottom close to the discharge point of cuttings (50m) showing alterations in the morphology and original texture. (Source: MAPEM, 2004)

The results of the monitoring of MAPEM Project (Environmental Monitoring in Exploratory Maritime Drilling Activities), performed in 2004, showed that the communities of benthonic organisms present a significant decrease of the specific wealth and density immediately after drilling. In spite of that, the components of the benthonic fauna showed a weak relationship with the analyzed chemical parameters analyzed, such as the concentration of oil, gas and metals. Those results suggest that the effects of the drilling activity on that fauna are primarily related to the physical alterations in the deep ocean.

Still, the chemical effects seem to reflect just in a secondary way on the fauna, possibly during the biodegradation of hydrocarbons. Finally, it can be pointed out that one year after drilling, the density and the wealth of the micro fauna already showed values similar to the ones of the pre-impact term.

In a study performed by EPA (U.S. Environmental Protection Agency) (a US federal body equal to IBAMA), in 1999, it has been noticed that the alterations in the bentonic communities derived from the release of cuttings with water based fluid have been assigned more often to physical alterations in sediments and effects associated to the structure of the drilling unit than to the toxic effects (chemical).

The cuttings discharged into the sea environment tends to form dispersion plumes comprised by the particles suspended in water, the characteristics of which will depend on wave conditions, wind, streams, As a result, there is the reduction of the quality of the food available, affecting the metabolic rate of the filtration and breathing of the marine organisms. Depending on the tenor of the suspended material generated by the discharge, there may occur the chase out and even death of some species of fishes and organisms.

The discharge of residues causes a direct and negative impact as it alters the physical and chemical, and biological and toxicological condition of the sediment. The coverage of the impact can be deemed local, being restricted to the vicinities of the well. However, it is important to remember that this enterprise refers to a set of drills over an extensive geographic area (AGES), what determines a potential character of accumulation of this impact.

The duration of the impact was deemed permanent due to the persistence of the physical alterations in the sea bottom and contamination of the discharge batteries, for an indeterminate term. As to the reversibility, the impact was deemed irreversible, due to the substantial modifications in the bentonic habitat that may, or may not, return to the pre-impact conditions. The term for manifestation was deemed immediate. The intensity is medium due to the located effect. The importance of the impact due to the potential of the areas that are quite sensitive to be affected was deemed great.

In order to minimize this impact, Petrobras will use a cutting drier upon using non-water based fluids. The discharge of water based fluids is accomplished only with a content of oil equal or inferior to 1% and after a prior verification. In order to follow-up possible alterations promoted in the sea environment, and, from then on, propose corrective measures, it is presented an Environmental Monitoring Project (see chapter Environmental Projects).

Pelagic Community

The pelagic community is formed by organisms that live in the column of water of oceans, both in deeper and coastal regions. In coastal regions, in spite of a greater adjustment of organisms, the impact of the discharge of the cutting may be more significant. At this environment, the variation range of the concentration of suspended sediment varies from few to several mg/L, with higher values noticed close to sea bottom.

The increase of water turbidity generates unfavorable conditions for the accomplishment of photosynthesis by the phyto-plankton organisms (vegetables that make part of plankton), as it changes the passage of light to the inferior layers. The plankton (organisms of animal and vegetable origin, that meet in the column of water and displace themselves in accordance with the currents) also suffers variation pursuant to the current. Upon the dispersion of plumes, these organisms can not displace in a proper way.

Many sea organisms remain all their life cycle as members of the plankton. Due to this reason, changes to this community cause alterations in all productive levels of the marine ecosystem, as they alter the space and feeding of the bodies. However, the plankton community tends to quickly restore the original conditions as the environment returns to the natural status due to local circulation.

For the organisms of the zooplankton (animals that make part of plankton), there are two possible impacts: the indirect impact, due to decrease in the concentration of phyto-plankton, generating less offer of food, due to its position in the food chain; and the direct impact on filtering organisms, which may eventually have its filtering apparatus impaired.

In the case of aquatic animals, as fishes, whales, dolphins and turtles, the discharge of cuttings and remaining fluids used in drilling into the sea can change its concentration local, as the increase of the water turbidity can cause its withdrawing from these areas. However, the degree of toxicity of the fluids used probably will not cause significant effects, considering the escape capacity of these bodies from environmentally disturbed locals.

In the study developed by MAPEM Project in 2004 it was shown that the low concentrations of the elements researched in sea water (hydrocarbons, metals, nutrients, etc.) show that it is not significantly contaminated by the drilling activities, what minimizes the risk to the biological community.

This impact is deemed negative with a direct incidence, as it causes alterations in the quality of water and starts alterations in the pelagic community.

It was further assessed as being of immediate, temporary and reversible term, considering that, upon the stoppage of the discharge, the environment will recover its original conditions. Its coverage is local and, despite a cumulative impact, as its effects are felt throughout the food chain and interfere in the characteristics of the marine physical environment and water quality jointly with the other impacts over the pelagic community. It was classified as of low magnitude and medium degree of importance.

Also in this case, the main minimization measure adopted by Petrobras will be the use of a cutting drier when it uses a non-water based fluid. The discharge of water based fluids is accomplished just when the oil content is equal or inferior to 1%. Analyses of possible alterations and measures in relation to this impact are better presented in the Environmental Monitoring Project in the chapter Environmental Projects of this RIMA.

Impact 6

IMPACT: Alteration of air quality	
Phase	Environmental Aspect
Drilling	Emission of gases into Atmosphere
ACTION: Preventive	

The emission of gases into atmosphere will occur from the operation of drilling rigs in AGES, which have propelling and power systems of their own. In Campos Basin, an area 30% smaller than AGES and similar to it with regard to meteorological dispersion characteristics, 26 drill rigs were used. In AGES, just 13 rigs will be used, and just 8 of them will be equal to the ones used in Campos Basin. The other five will have similar characteristics.

Based on the estimative of fuel consumption, there has been applied the emission factors published in April, 1993, by USEPA (United States Environmental Protection Agency) and it was calculated the emissions of nitrogen oxides (NO_x), carbon monoxide (CO), sulphuric oxide (SO_x), carbon dioxide (CO₂), total hydrocarbons (HCT) and total particulate material (MPT).

Each platform was deemed a punctual emitting source. It was noticed that the average and maximum concentrations of the analyzed pollutants are below the limits established in law (CONAMA Resolution No. 03/1990). Among all species of pollutants discharged into the sea, the nitrogen oxides, considered as nitrogen dioxide (NO₂), are those than can cause the greatest impact on air quality. However, even for this specific case, the emissions will be around half (53%) the maximum limit allowed by law. In case of HCT, in spite there is no limit established in Brazilian law, the calculated concentrations can be deemed relatively low.

By means of studies and comparative analyses, the impact of gas emissions on air quality was deemed negative, direct, local, temporary, short term and reversible, It was also assessed as of low magnitude and small degree of importance, mainly due to the reduced population concentration in the affected areas and the great capacity of dispersion in atmosphere.

The proposed mitigating action is the preventive maintenance and the proper operation of equipment with potential to generate atmospheric emissions already provided for in the Atmospheric Emission Management Project, which was presented in the chapter Environmental Projects. This project may subsidize, in the future, an improvement in the management procedures of atmospheric emissions, assuming, as guidelines, the maintenance routines of engines and the use of diesel oil with low content of sulphur, in compliance with the regulations of the National Oil Agency (ANP).

Impacts on the socioeconomic environment

Impact 1

IMPACT: Generation of expectancies in Population	
Phase	Environmental Aspect
Drilling	Disclosure of Forecast for Drilling in Media.
ACTIONS: Mitigating, Corrective and Potentializing	

From the moment the local press discloses the forecast for drilling wells in the Geographic area of Espírito Santo, the populations starts to have expectancies on the project, mainly the inhabitants of the coverage area. The main expectancy is the possibility of creation of new employment positions, either by the project itself, or by the opportunities of new business. The public income is also impacted positively by the increase of employment, income and duties. These perspectives are positive, making population be favorable to the accomplishment of the activity.

In order to potentialize these expectancies, Petrobras will encourage the broadcasting of clear and accurate information on the benefits in the increase of employment, revenue of duties and expansion of business. Thus, local population, government and businessmen may prepare themselves better to make use of these opportunities.

The disclosure of the project also creates negative expectancies and contrary positions, mainly due to the concern as to the possible environmental impacts. The fishing community fears the reduction of its fishing area with the expansion of the exploratory activities, due to the adoption of a safety area of 500 meters around each well.

In order to minimize this negative character, it is initially proposed the application of a specific Social Communication Program to clarify the fishing community of the region on the reach of the restrictions. At the same time, there shall be accomplished a wider Social Communication Program to answer the inquiries of the non-governmental organizations (NGOs) that act in the environment protection area, explaining the actions that will be taken to avoid and reduce the negative environmental impacts.

This impact is immediate and continuous, as it begins just after the decision to disclose the enterprise and is extended after the completion of the drilling activity. Its coverage is strategic, exceeds the limits of the region, producing expectancies in all the country. It also refers to a cumulative impact and of great importance, as, while Brazil conquers the self-sufficiency in oil production, the subject tends to get a greater visibility in press and discussions of society.

Impact 2

IMPACT: Movement of Economy	
Phase	Aspect
Drilling	Increase of demand for inputs, services and labor: attraction of new business, generation of duties, increase of jobs.
ACTIONS: Potentializing	

The forecast of the accomplishment of 30 drills during the first year of activities in AGES shall attract enterprises to Espírito Santo. Both local companies, and companies from neighbor states, that aim at serving or already serve this market, will be encouraged to invest in the region, by offering services or materials required to supply the demands of the drilling activity.

This impact is positive, of strong magnitude and immediate. The attraction of new investments will make the area of influence sensitive and will cause the coming of other types of business and services to the State. This impact may also be considered strategic as it exceeds the Area of Indirect Influence (All) and involves companies located in the extensive national territory, being even able to affect major decisions by the multinational companies.

In order to strengthen the positive character of the areas of influence of the enterprise, Petrobras will inform to businessmen, by institutions such as FINDES/SENAI (Federação das Indústrias do Espírito Santo/ Serviço Nacional de Aprendizagem Industrial) and SEBRAE (Serviço Brasileiro de Apoio às Micro e Pequenas Empresas), about the potential hirings for the provision of materials and services that will meet the needs of the project.

At the same time, the development of this enterprise will generate duties of several modalities, among which the Services Tax (ISS) and the State Tax on Circulation of Goods and Services (Value-Added Tax) (ICMS). There shall also be an increase in the collection of the Imports Tax (II) related to the import of products and equipment. It is a positive factor as it increases the volume of sources for the public administration and economy. It has Federal, State and Local coverage and occurs immediately and simultaneously to the accomplishment of business.

In order to potentialize the positive effects, it is proposed the purchase of materials and the hiring of services in the municipal districts of the area of direct influence of the enterprise whenever possible. Otherwise, it is suggested the provision of preference to suppliers that are within the area of indirect influence and /or installed in the Country.

Impact 3

IMPACT: Generation and Maintenance of Employment	
Phase	Environmental Aspect
Drilling	Labor Demand
ACTIONS: Potentializing	

The enterprise may contribute for the generation and maintenance of employments in the region. The total number of professionals required to drill each well is 291, being 3 for the administrative area and 288 for drilling itself. Each unit requires, in average, 16 floormen and 12 operation assistants per shift, categories with a higher number of vacancies.

There shall also be created indirect jobs to supply the demand for products and services of the companies hired by the enterprise. Thus, there will be a movimentation of the economy in the municipal districts of Vitória, Vila Velha and Serra, where the supporting logistic of the activities forecasted (port, airport, headquarters of UN-ES) will be installed, as well as the logistic companies supporting the enterprise.

The impact associated to the generation of employment is direct, positive and of medium magnitude, being immediate, and occurs even before the start of the drilling activities. Its coverage is strategic as, due to the specialization requirement in some activities, professionals of other States will be hired. It is important to emphasize that Petrobras' preference, upon hiring, will be of the labor within the area of direct influence of the enterprise. When this is not possible, the hiring will be in the area of indirect influence and, in case it is not possible, in the country. The potentialization of this impact will occur at the extent the entrepreneur increases its demands and the volume of business. The labor training delivered directly by Petrobras or by other companies will also cause a qualitative improvement of the local labor, so it will increase the possibility of employment in this enterprise and in future investments, either within the region or out of it.

Impact 4

IMPACT: Generation of Conflict with Fishing Activity	
Phase	Environmental Aspect
Mobilization of the Drilling Unit	Creation of Safety Area
ACTIONS: Mitigating, Preventive	

The creation of the safety area around the drilling units, which is expected by law and required to provide further safety to the forecasted activities, restricts fishing in these locations, resulting in a conflict between the activities that are accomplished simultaneously: fishing and drilling. The conflict is worsened as the oil activities expand themselves - either the production or drilling activities-, increasing the number of areas where fishing is forbidden - both the hand fishing and the ocean fishing, as the safety radius reaches 500 meters around each unit.

This impact of medium magnitude is negative, but temporary and reversible, as it may come to an end if the drilling or production activities are completed in the area. It is local, restricted to a zone around each drilling unit.

It is an impact with a high level of importance, due to the high sensitiveness of the fishing industry. Besides, it is accumulated with the impact "Generation of

Expectancy in Population”, with regard to the fishermen’s expectancy on the enterprise, as it will affect the development of its routine activities.



In this sense, one of the measures suggested aiming at the decrease of the impacts (mitigating measures) refers to the Social Communication Project specific for the fishermen community - both to manual and industrial fishermen. As a supplementary measure, directed to this impact, it is recommended the creation of a permanent communication channel with fishermen associations and colonies. This would allow to inform, in advance, about the location of each drilling platform, as well as the geographic coordinates of the no fishing area. Thus, the risk of conflict by the use of the same space is reduced, and, at the same time, it is possible to plan the fishing area and the modality to be used in advance.

Impact 5

IMPACT: Interference over the road and maritime transportation infrastructures	
Phase	Environmental Aspect
Drilling	Demand of Transportation of Materials, Equipment, Inputs and Personnel.
MEASURES: Mitigating, preventive	

The need to transport inputs, materials, equipment and personnel to the drilling platforms, as well as the remittance of the generated residues for final disposal

onshore will lead to an increase of all modalities of transportation. This will affect these structures and may disturb its operations.

In the case of road transportation ways, the impact can be greater due to the current deficiency of this system. The increase in the number of vehicles will cause an increase of the risk of road accidents. This impact was rated as negative, temporary, reversible, direct and immediate. With regard to its coverage, it shall be more significant near the supporting port terminal, Companhia Portuária de Vila Velha (CPVV), located in Vila Velha. This characterizes the impact as local. Considering the high sensitiveness of the road system, the impact was rated as of medium degree of importance.

Petrobras will demand from its contractors the systematic servicing of vehicles and training of drivers in order to ensure the safety and avoid possible accidents and disturbances in the roads. The public government will be responsible for performing the improvement works in the roads that access the region of Companhia Portuária de Vila Velha (CPVV), besides regularly providing their maintenance and a proper signaling, especially in locals where there is a greater flow of vehicles and in the accesses that are used more often by the cargo vehicles.

In relation to maritime carriage, there will be two main impacts:

- The first one will be generated by the greater demand for port services, which will contribute to improve the industry, causing an increase in volume of financial, material and human resources. It is, thus, a positive impact. However, the intensification of the oil exploration activities in the region shall encourage the implantation of new business in the industry, enlarging the existent capacity of the current infrastructure.
- The second one will be generated by the increase of the transit of supply vessels directed to carry materials, equipment, inputs and personnel to the drilling units and the seismic survey vessels. This fact can cause conflicts with fishermen communities. As a supplementary mitigating measure for this impact, it is recommended the creation of a permanent communication channel with the fishermen associations and colonies identified in the environmental diagnostics of this study, aiming to inform the likely routes to be followed from the terminal of the supporting port (CPVV) to the drilling platforms, so as to minimize the risk of accidents between the supply vessels and the fishing vessels.

Impact 6

IMPACT: Movement of the air carriage areas, oil industry, naval industry, shipping and port services	
Phase	Environmental Aspect
Drilling	Demand for Carriage of Materials, Equipment, Inputs and Personnel.
ACTIONS: Potentializing.	

The accomplishment of drilling activities in maritime areas positively affects the air carriage areas, the naval industry, the shipping and port services, increasing its development through the investment of financial resources with them.

In the air carriage industry, there will be an increase of demand for personnel transportation to the drilling units, what will lead to an increase of the presence of airplanes and helicopters in airport Eurico Salles, located in Vitória/ES, which is being expanded. Next to this airport, there is a terminal of helicopters that is being used by Petrobras.

In the case of the naval industry, the lease of vessels / specific units for this type of activity, the drilling platforms, will produce large revenues, about USD 145 thousand/day, what totalizes an average of BRL 4.35 million per drilled well (estimating the term for drilling each well as 30 days). This allows the accomplishment of new investments in the industry, both in improvement of existent equipment and acquisition of new equipment.

The drill of new equipment aiming at the oil exploration and production contributes for strength of the oil industry and potentializes its expansion and development. This generates a positive impact, of strong magnitude, considering the high resources employed. It is strategic, because it extends beyond its areas of influence and immediate occurrence. In order to potentialize these positive effects, it is suggested the support to the development of new technologies directed to optimize the construction and production of equipment for oil exploration and production. It is also proposed to provide priority to the hiring of national companies for the supply of equipment and services.

With regard to the shipping and port services, the increase of demand for maritime transportation encourage the growth of these industries, a fact that is intensified by the simultaneous occurrence of other investments in the oil exploration and production areas, both in AGES and in other regions of the country. The current perspectives, associated to the current price of the oil barrel and cost of rental of the drilling units and supply vessels, justify the classification of this impact as being of strong magnitude. However, as it is a natural non-renewable resource, the impact is temporary.

As from the increase of the oil exploration and production activity, for which the forecasted drills contribute, these industries tend to be more dynamic due to the resources employed in it and also by the perspective of expansion of the business it generates. It is further associated the expansion of the global commerce by the maritime transportation, determining the accumulation of this impact. The impact was rated as direct and indirect, strategic, reversible, applicable in the medium and long term. Considering the high sensitiveness of these industries, which are unstable in relation to market floats and high reverberation in terms of generation of employment, this impact is defined as with a great level of importance.

The main measure to be adopted to increase this impact is to ensure, for all these sectors, a proper level of investment in infrastructure and participation in opened bids for hiring of services and products that may appear due to this enterprise.

Impact 7

IMPACT: Increase of risk of accidents	
Phase	Environmental Aspect
Mobilization of the Drilling Unit	Demand for Carriage of Materials, Equipment, Inputs and Personnel.
ACTIONS: Mitigating, preventive	

Both the air transportation of the workers that will participate of the operations required to the drilling activity and the maritime transportation of materials, equipment and inputs accomplished by supply boats from the CPVV port terminal, as well as the road transportation of these materials up to the terminal pose potential risks of accidents.

It must be further included here the possibility of involving, in the possible maritime accidents, the fishermen's vessels, being able to affect both professionals and the fishing equipment. However, it is pointed out that upon the use of safety measures to each of the activities that involve the transportation of personnel and materials, the risk of accidents may be reduced.

It is a negative impact, reversible, rated as temporary, as its term is defined by the end of the drilling process. It was also qualified as a medium magnitude impact and its probability of occurrence must also be reduced due to the preventive measures taken by entrepreneur. Upon the application of accident prevention programs, the company decreases the sensitiveness of the area where this impact is manifested. This low sensitiveness, associated to the medium magnitude of the impact, determines that its level of importance is low.

As it is an impact derived from accidents, it may, or may not, manifest itself, and, it was preventively defined as of immediate applicability. The coverage area will be local, as the supporting airport is located in the AID, as well as the transportation routes.

Petrobras already develops actions focused on employer's safety, in compliance with the rules of the Labor Ministry, and, inclusively includes in its scope training and qualification activities. Besides, also as a preventive measure, it is proposed the Employee's Training Project, which addresses both the environmental issues, and those referring to employer's safety.

In order to decrease the risks of accidents, inclusively the maritime ones, the company shall apply and demand the application by its suppliers of the proper safety standards to each activity to be performed, mainly the precepts and regulations valid for the maritime transit. This is a primary measure for the preservation of lives and material goods. This attitude also contributes for the creation of a good work environment, providing safety and trust to the operators and avoiding the stress of the members of the several teams involved with the production and support activities to the enterprise.

In this sense, if required, the company shall develop training with vessels' operators, in order to reduce the risks of accidents along the routes that can affect the material goods of fishermen that performs the traditional fishing.

The Social Communication Project is also a mitigating measure of this impact, as it contributes for the proper disclosure of information on the enterprise to the associations of fishermen and shipping areas. Information referring to the increase of activities in the area and resulting increase of the maritime transit, leading to the decrease of conflicts and probability of risk of accidents of several types. It must be also highlighted that the Risk Management Plans of the drilling units will contribute with preventive measures for the operational and workers' safety.

Impact 8

IMPACT: Loss for fishing and water culture and tourism activity.	
Phase	Environmental Aspect
Mobilization of the Drilling Unit	Accidental Oil Spill into the Sea
ACTIONS: Mitigating, preventive, corrective and compensatory.	

The oil drilling and production activity in a maritime area causes an increase of possibility of oil spill into the sea. This type of accident may occur due to the loss of control in one or more wells, causing environmental damages that may cause losses for the fishing, water culture (cultivation of aquatic animals such as oysters, sururu, fish, shrimp, etc) and tourism activities.

In order to assess this impact, several simulations of oil spill were considered, totalizing 22 points of AGES.

In accordance with these simulations, a leakage due to total control of one sole well, for a 30-day term, could cause a negative impact for the activity, as it immediately affects its area of performance. The loss to be caused will be greater if the affected areas are more extensive. This impact was rated as being of strong magnitude, considering the high degree of sensitiveness of this

activity.

In addition, the impact is cumulative, both in relation to other aspects of the enterprise (creation of safety area and maritime transportation), as to other stages of the oil activity (seismic and production) and, also, to the other activities developed in the coastal region. This impact is deemed reversible and temporary. However, the reversibility would occur in the long term and upon an expensive cleaning task of the affected areas.

This impact is an indirect occurrence of the enterprise, as it will only occur accidentally. As this possibility exists, the term for its manifestation is immediate, as from the start of the drilling activity and it extends up to the end of the activities. Its coverage may be either local or regional, as it may affect just the areas of direct influence of the project or reach its area of indirect influence, depending on the spilt volume and natural conditions within the term. Due to the high sensitiveness level of the fishing activity for several communities located in the area of influence of the enterprise, this impact was deemed of great importance.

The occurrence of the spill of a significant amount of oil, with possibility of touching the coast, it may cause losses for the tourism activity in the entire coast of AGES. The region has locals of remarkable natural beauty, a fact that has encouraged investment in tourism in several municipal districts. Some areas are also source of marine researches and cultivation of oysters and shellfishes.

The assessment of the impact in tourism was also made based on drills of oil spill, which showed the probability of oil touch in the coast, what can compromise the activity, mainly if the accident occurs in high season term (summer).

The main consequence is the pollution of the beaches by oil, characterizing the impact as negative of strong magnitude. Despite the high cleaning cost of the affect areas, long term for its accomplishment, and negative reputability it can create for the beach resort affected, the impact was deemed reversible, temporary and immediate. It is also deemed of direct occurrence as it refers to an accident, and it may be rated as local or regional, depending on the beach resort to be affected.

Due to the high significance of tourism in region, this activity presents a high sensitiveness, what characterizes this impact as highly important.

The mitigating preventive measure for this impact, both with regard to fishing and tourism, is the adoption of safety standards. In order to reduce the risks of accidents, the company will request the application of the safety standards proper to each activity to be performed, further creating a proper work environment, as provided for in the Risk Management Plan referring to each drilling unit that will operate in AGES.

In case of an accident, it must be immediately reported to the coordinator of the Individual Emergency Plan (PEI) of the unit, and, if the spillage is not contained in the Production Unit (platform), the PEI of UN-ES shall be enabled, aiming at the effective fight of the oil spill in order to avoid the losses to fishing and water culture.

When there are losses, the fishermen affected by it shall be reimbursed in cash during the entire term of the suspension of the activity. Due to this, it is essential the enrollment of all professionals that works in the region. It is also forecasted the reimbursement of possible losses caused to companies of the tourism area.

Impact 9

IMPACT: Pressure over the port infrastructure, road system and marine transit.	
Phase	Environmental Aspect
Mobilization of the Drilling Unit	Accidental Oil Spill into the Sea
MEASURES: Mitigating preventive	

If there is an accident with oil spill, there will be a further pressure on the infrastructures of transportation used to provide support to the leakage control actions. This includes ports, road system and marine transit. It is a negative impact that may cause problems in the use of these infrastructures. It is reversible, as the road status, marine transit and port operation will become regular after the contention of the oil spill.

This pressure over the transportation infrastructures will be variable in accordance with the volume of oil spilt. However, considering the satisfactory infrastructure that already exists in the areas of influence, the impact was rated as of small magnitude.

Its coverage may be local or regional, depending on the area affected by the spill and the region to be selected to centralize the support operations. This impact is rated as indirect because its cause is attached to eventual accidents and not to the activity being developed. The degree of importance was rated as small.

In order to decrease the effects of this impact, it is suggested that Petrobras keeps permanent contact with the managers of these infrastructures, warning about actions that will be performed in case of an eventual oil spill, so that they are included in the operation program. Another measure would be the inclusion of guidelines of attitudes for all agents involved with the air, road and maritime transportation activities, which must be included into the emergency servicing.



Environmental Projects



Environmental Projects

In order to supplement the control actions and reduce the impacts associated to the drilling activities in AGES, there has been prepared specific environmental projects that will be developed as an integral part of the enterprise. Detailed information about each project is available in the Environmental Impact Assessment (EIA). Next, an outline of these projects.

1. Environmental Monitoring Project

Being developed from the general guidelines defined by IBAMA, the Environmental Monitoring Project (PMA) has the following objectives:

- characterize the environmental conditions around the control points and in AGES, both before and after drilling;
- contribute for the understanding of possible effects of the drilling activities in the marine environment; and
- assess the behavior of the environment, after the end of the activity in the control points.

Environmental Projects

The PMA will be developed in two fronts:

- Specific Monitoring Project (PMAE) – that will monitor the sediment (sea bottom) around the control points, both before and after drilling. This work will allow the identification of technical and scientific elements to follow-up eventual impacts foreseen in EIA/RIMA. The analysis of this data will serve as a basis for future decisions in relation to the environmental management of the enterprise.
- Regional Environmental Monitoring Project (PMAR) – focused on the monitoring of the water and sediment conditions of all AGES, assessing the impacts caused by the drilling that was performed. Its development will be made from information found in the Environmental Characterization Project of the Geographic Area of Espírito Santo (PCR-ES) that will be also developed by Petrobras.

2. Pollution Control Project

The general objective of the Pollution Control Project is to keep the environmental quality of AGES by reducing, controlling and managing the atmospheric emissions, liquid effluents and solid residues generated by the drilling units.

The Project will be developed by specific actions in order to:

- ensure the proper operation of equipment that produce atmospheric emissions and, thus, reduce these emissions;
- provide a proper treatment to the liquid effluents produced, before their discharge into the sea;
- Determine the proper disposal of solid residues produced and the effective control over its management, in compliance with the environmental law.

3. Employees' Training Project

The main objective of this Project is to sensitize and make employees aware on the issues related to the preservation of the environment, in addition to contribute for the reinforcement of the knowledge about the environmental resources. The

target public of the project is all professionals involved in the activities, including Petrobras and contractors' employees.

In order to reach the general objective established in this Project, the following specific objectives have been determined:

- transmit to the involved professionals, by short courses, knowledge on the enterprise, local environmental characteristics, applicable law and main impacts and mitigating measures to be adopted during the activities;
- train onboard workers in the procedures required during the activity in order to avoid and reduce the negative impacts and increase the positive impacts.
- Make the professionals aware, by basic notions of environmental education, of the importance of preserving the environment and its contribution in this process, both in the performance of its tasks in the work environment, as in their day-by-day life.

4. Social Communication Project

By this Project, several actions will be taken aiming at informing and explaining the population living in the municipal districts of the area of influence about the enterprise and its environmental and social consequences.

In accordance with a guideline of IBAMA, the Social Communication Project will be accomplished in an integrated manner with other Petrobras' enterprises in development in this region, allowing that the actions reach the objectives to which they are intended more effectively.

5. Environmental Education Project

The Environmental Education Project qualifies the social players that are members of groups of interests that were impacted, aiming at allowing their effective participation in the management of environmental resources of the areas covered by the activity.

Just as it occurs in the Social Communication Project, this project will be performed in an integrated manner with other Petrobras' projects that are being developed in this region.

Final Considerations

The Maritime Drilling Project in the Geographic Area of Espírito Santo is an enterprise that will allow to continue the exploration of oil and gas in the region, with a significance importance for the increase of the Brazilian production and of this area as a hub of development of the oil activity.

The crossing of data found in the environmental diagnostics of the area of influence of the enterprise with the environmental aspects associated to the activities forecasted to its development, allowed the identification of the negative and positive impacts on the maritime environment.

The negative impacts refer mainly to the possibility of interference in the biological community by the lights, sounds, discharge of cuttings with fluid stuck on it, discharge of ballast water, re-suspension of sediment and environmental contamination by oil spill. These interferences initially are considered of low to medium magnitude. However, the scenario of a huge spill (in spite of being quite unlikely) could represent an impact of strong magnitude.

It must also be emphasized, among the negative aspects, the possibility of conflicts with the fishing activity, due to the common use of the area upon the development of these activities.

For all negative impacts of the enterprise measures were presented aiming at reducing or avoiding them, in addition to the Environmental Monitoring and Control Projects, pollution control, training of employees and communication with society.

The enterprise will also have positive impacts, mainly in the operation of the local and regional economy by the purchase of materials and hiring of services, fostering of naval and oil industry. In order to increase these impacts, there shall be provided priority to the hiring of partners in the municipal districts of the area of direct influence of the enterprise. When this is not possible, there shall be procured suppliers located in the areas of indirect influence or, in the last instance, in the country.

The purchase of products and the hiring of services increase the payment of taxes of distinct kind (ICMS, ISS, IPI, among others), what causes an increase in the Federal, State and Local collection, depending on the type of tax created. The set formed by the offering of employment and collection of taxes will favor the dynamics of the income in the area of influence of the enterprise.

Finally, there must be emphasized as an important strategic justification for the implementation of this project, the fact that it allows the discovery and development of new oil and gas fields, which are so important for the economy of the country and maintenance of the self-sustainability of Brazil in relation to the production of this type of energy.

