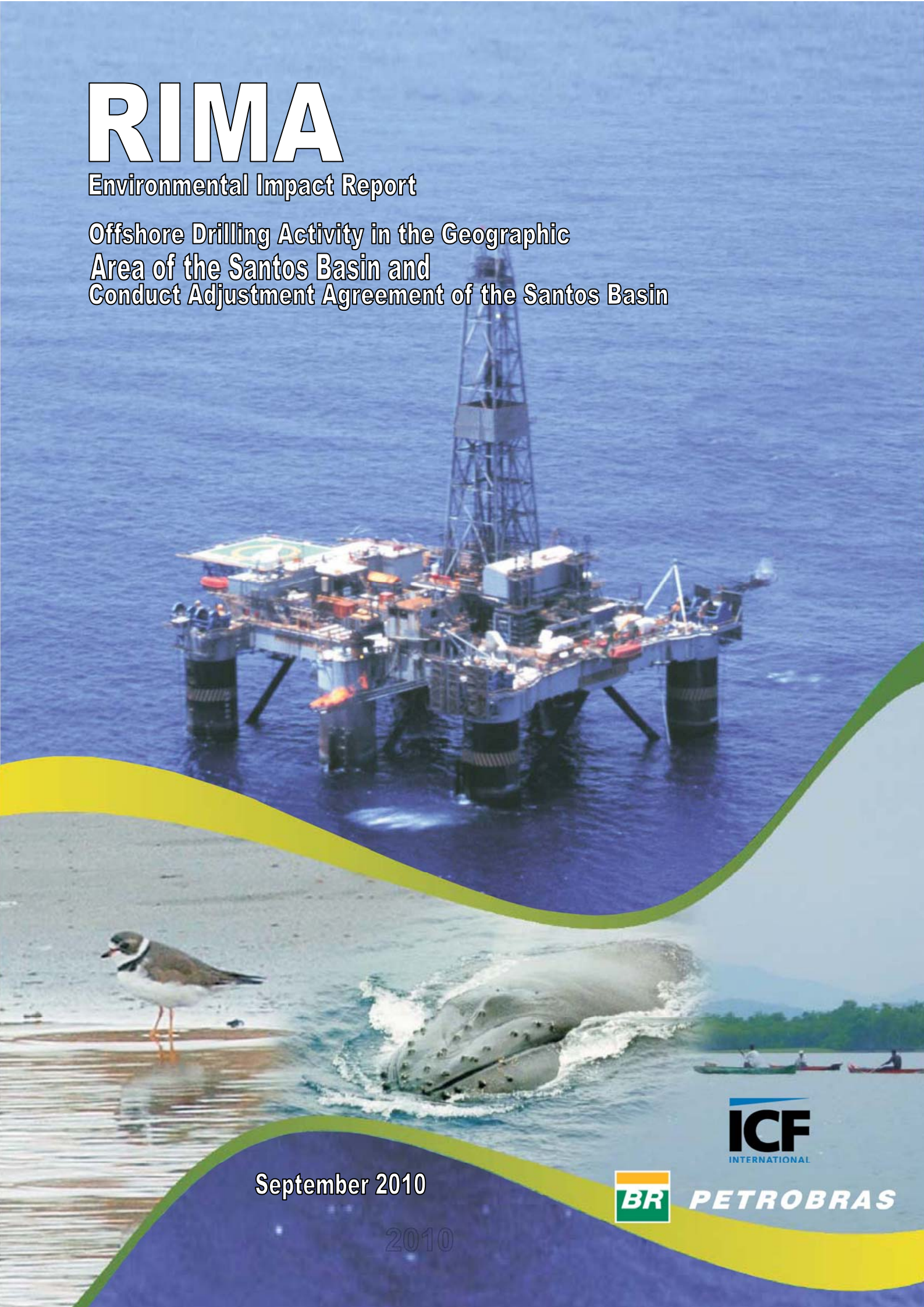
RIMA

Environmental Impact Report

Offshore Drilling Activity in the Geographic Area of the Santos Basin and Conduct Adjustment Agreement of the Santos Basin



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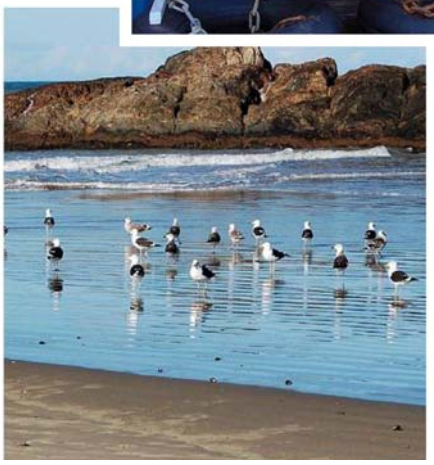

Presentation

This RIMA has among its objectives to inform about the history of the process of regularizing the Offshore Drilling Activity and the Production in the Merluza Field in the Santos Basin, through the Conduct Adjustment Agreement of the Santos Basin (BS-TAC) signed between the Brazilian Institute of Environment and Natural Resources (IBAMA) and PETROBRAS.

The main focus of this RIMA is to present the results of the Environmental Impact Study of the Offshore Drilling Activity in the Geographic Area of the Santos Basin (AGBS) prepared to continue the Offshore Drilling Activities in the Santos Basin.

Detailed technical information on these activities is found in the EIS, which was submitted by PETROBRAS and is under evaluation of the General Coordination of Oil and Gas (CGPEG) of the Brazilian Institute of Environment and Natural Resources (IBAMA).

ABOUT US

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About the Conduct Adjustment Agreement of the Santos Basin

The exploratory activities in the Santos Basin began in the 60's, but only from the 70's was drilled the first well, called 1-PRS-1. The high cost of exploitation of the Santos Basin, associated with the great success of the activities carried out in the Campos Basin, made efforts to new discoveries diminished for some time, as shown in **Table 1 - History of Discoveries in the Santos Basin.**

Table 1 - History of Discovery in the Santos Basin

End of the 60's	70's	80's	90's
Beginning of the exploratory activities in the Santos Basin.	**1970** – Drilling of the first well in the Santos Basin, Paraná Submarino No. 1 (South Pole)	**1988** – Discovery of the Tubarão Field (South Pole).	**1990** – Discovery of the Coral and Estrela do Mar Fields (South Pole).
	1979 – The Merluza Field was discovered (Merluza Pole).		**1992** – Discovery of the Caravela Field (South Pole).
			1999 – Discovery of the Tambuatá Field (Uruguá Pole).
Decade of 2000			
2000 to 2003	**2004 to 2006**	**2007 to 2008**	**2009 to 2010**
2003 - Discovery of the Uruguá Field (Uruguá Pole).	**2005** - Discovery of Tambaú Field (Uruguá Pole) and the first signs of the Pre-Salt Oil - Block BS-10 (Parati - Pre-Salt Pole)	**2007** - Discovery of oil reservoirs in the BM-S-9 (Carioca - Pre-Salt Pole) and BM-S-21 (Caramba - Pre-Salt Pole).	**2009** - Drilled the second well in the Carioca area in the Pre-Salt Pole. Beginning of the Long-Term Test (TLD) of Tupi – Pre-Salt Pole.
2003 - Discovery of Mexilhão Field (Mexilhão Pole).	**2006** - Discovery of oil in Block BM-S-11 (Tupi - Pre-Salt Pole), confirming the presence of oil in the pre-salt Santos Basin.	**2008** - Discovery of the reservoirs of natural and condensate gas in Block BM-S-24 (Jupiter - Pre-Salt Pole) and oil in Block BM-S-9 (Guará - Pre-Salt Pole).	**2010** -Beginning of the Long-Term Test of Tiro and Sidon - South Pole

Until the 90's, Brazil did not yet have a specific environmental legislation that controls the activity of exploration. It was only in 1993 that IBAMA, through Ordinance No. 101, established the procedures that should be observed for the licensing of exploration and production of oil and gas. Subsequently, in late 1994, was published Resolution No. 23/94.

In 1997 the Brazilian National Congress established several regulatory changes in the oil sector. The break of the state monopoly, the creation of the National Council of Energy Policy and the creation of the **National Oil Agency** were set.

ANP aims to promote the regulation, contracting and monitoring of the economic activities in the industry of oil, natural gas and biofuels.

In December 1998, IBAMA issued PETROBRAS a Preliminary Permit for the drilling activity in several blocks and exploration areas located in the Santos Basin. In 1999 Petrobras asked to renew this license, but its validity was questioned by IBAMA.

Considering the strategic importance and the relevant public interest in the supply of oil and natural gas in the country, the need to stabilize the environmental licensing of the oldest blocks and allow the continuation of drilling in the Santos Basin to obtain an Operating License for Drilling along the lines of Resolution No. 237/97, IBAMA and PETROBRAS signed in April 2007 a document called the Conduct Adjustment Agreement of the Santos Basin (TAC-BS).

The TAC of the Santos Basin (TAC-BS) has the following objectives:

1. Regulate the environmental licensing of wells drilled in the Santos Basin before signing the TAC-BS.

2. Define information and studies required for the environmental assessment of the area affected by the offshore drilling of wells drilled until the signature of the TAC-BS.

3. Establish guidelines to enable the drilling of wells within the AGBS until a new drilling license is issued, provided that duly authorized by IBAMA.

For the preparation of TAC-BS was limited an area, formed by a polygon of approximately 120,000 km², with 12 extremities, called Geographic Area of the Santos Basin (Figure 1), where the **fields** and the exploration blocks of PETROBRAS are present in the Basin Santos.

The fields are areas that have reservoirs of oil and gas with proven economic value.

The exploration blocks are defined and auctioned areas by the National Agency of Oil, Natural Gas and Biofuels (ANP), where there is the possibility of presence of oil and natural gas.

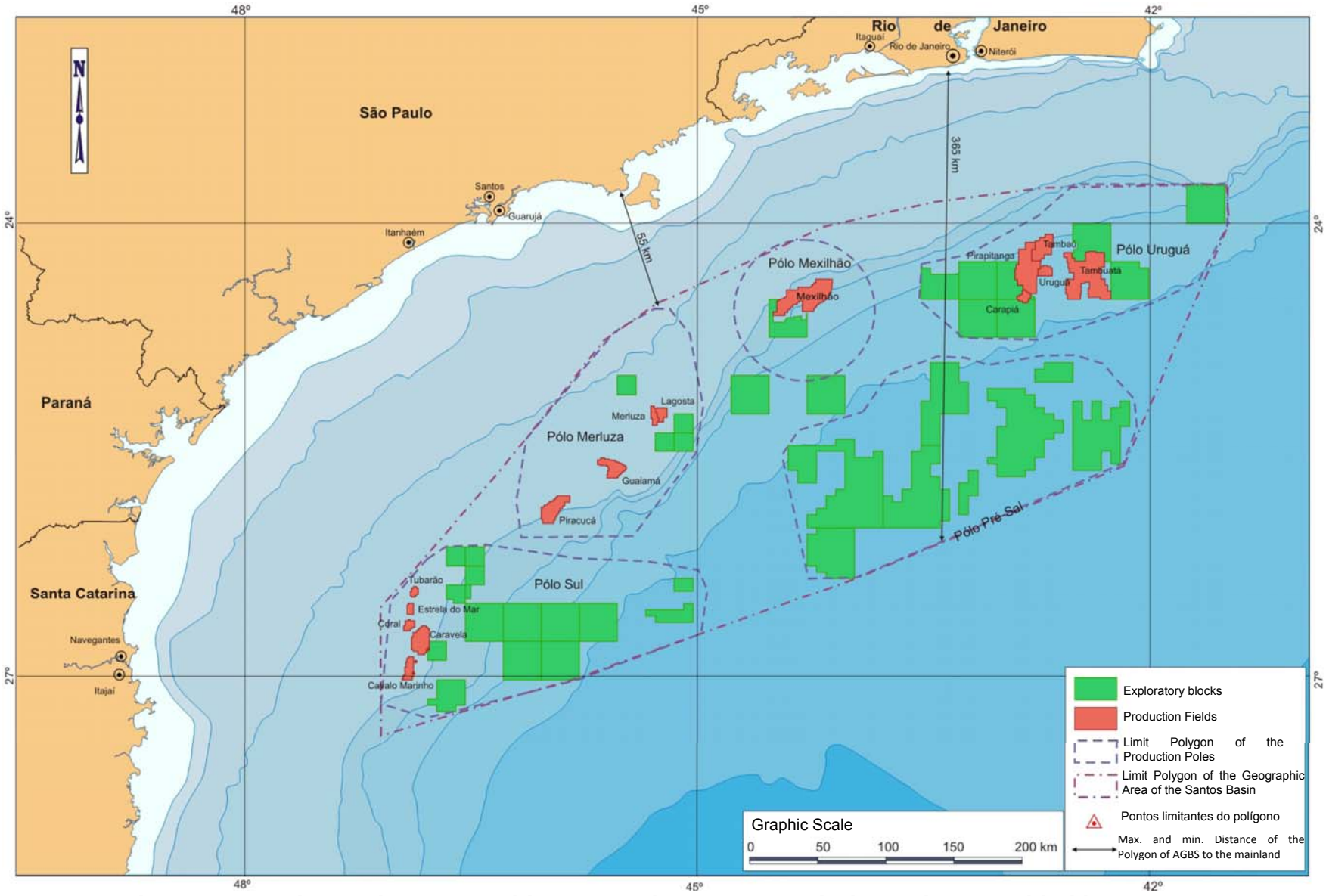


Figure 1: Location of the Geographic Area of the Santos Basin (AGBS) as provided in TAC-BS

Considering that the exploration of the activity for oil and natural gas shall meet the environmental legislation in relation to the environmental protection, IBAMA has demanded several actions of PETROBRAS for the signature of the TAC-BS, such as:

- Elaboration and implementation of the Assessment Project of the Environmental Impact of drilling activities carried out in the Santos Basin, to identify and assess the impacts caused by the activity.

- Elaboration and implementation of Regional Environmental Characterization Project of the Santos Basin to better understand the environmental characteristics and AGBS.

- Submission of monthly and quarterly reports of the drillings carried out during the term of the TAC-BS.

- Approval by IBAMA of Environmental Risk Analysis and Individual Emergency Plans for the drilling platforms and the Emergency Plan for Oil Spill of the Geographic Area of the Santos Basin (PEVO – BS Drilling).

- Conducting of exercises simulated to combat oil spills (as part of the Emergency Plan for Oil Spill in the Geographic Area of the Santos Basin).

- Presentation of Media Projects to inform the fishing communities of the municipalities in the area of influence on the drilling activity.

- Submission of Environmental Impact Study and Environmental Impact Report (EIS / RIMA) of the Drilling Activity in AGBS to obtain an Operating License for Drilling.

- Conducting a public hearing.

In TAC-BS was also included the regularization of Flow and Production Activity of the Merluza Field, since the validity of its Operation Permit was also questioned by IBAMA.

The Merluza Field was discovered in 1979 by the company PECTEN, a subsidiary of Shell, in partnership with PETROBRAS.

In 1989 the Merluza Platform was installed, and production started in 1993, being operated by PETROBRAS, under the authorization of an Operating License issued by the Department of Environment of the State of Sao Paulo in 1992.

In 2002, PETROBRAS requested the renewal of this Operating License to IBAMA based on the guidelines of Resolution CONAMA No. 237/97. IBAMA declared that the license issued by the Department of Environment of the State of São Paulo could not be renewed because it does not meet the current environmental legislation and the settlement should therefore be made in patterns of CONAMA Resolution No. 23/94. Thus, in 2005 PETROBRAS sent an Environmental Study (Environmental Assessment Report - RAA) to support the issuance of the Operating License.

Considering the strategic importance and relevance of public interest of natural gas supply in the country, the need to stabilize the environmental licensing and permit the continuation of the production and flowage activity in the Merluza Field to obtain an Operating License in the patterns of CONAMA No. 23/94, this process was also included in the TAC-BS and various requirements of IBAMA has been met by PETROBRAS.

The Merluza Field is located in the central portion of AGBS, about 180 km from the mainland toward the city of Santos, Sao Paulo in depth around 130 meters (**Figure 2**).

The activities performed in this field involve the production of natural gas and condensate from five wells connected to a fixed platform, and the flowage of these products through a pipeline installed on the seabed, connecting the platform to the city of Praia Grande, Sao Paulo. From this point, another duct is responsible for the flowage to its final destination, the Unit of Natural Gas (UGN), located in the Refinery of Presidente Bernardes (RPBC) in Cubatão, Sao Paulo.

It is called condensate the liquid part that is attached to the natural gas.

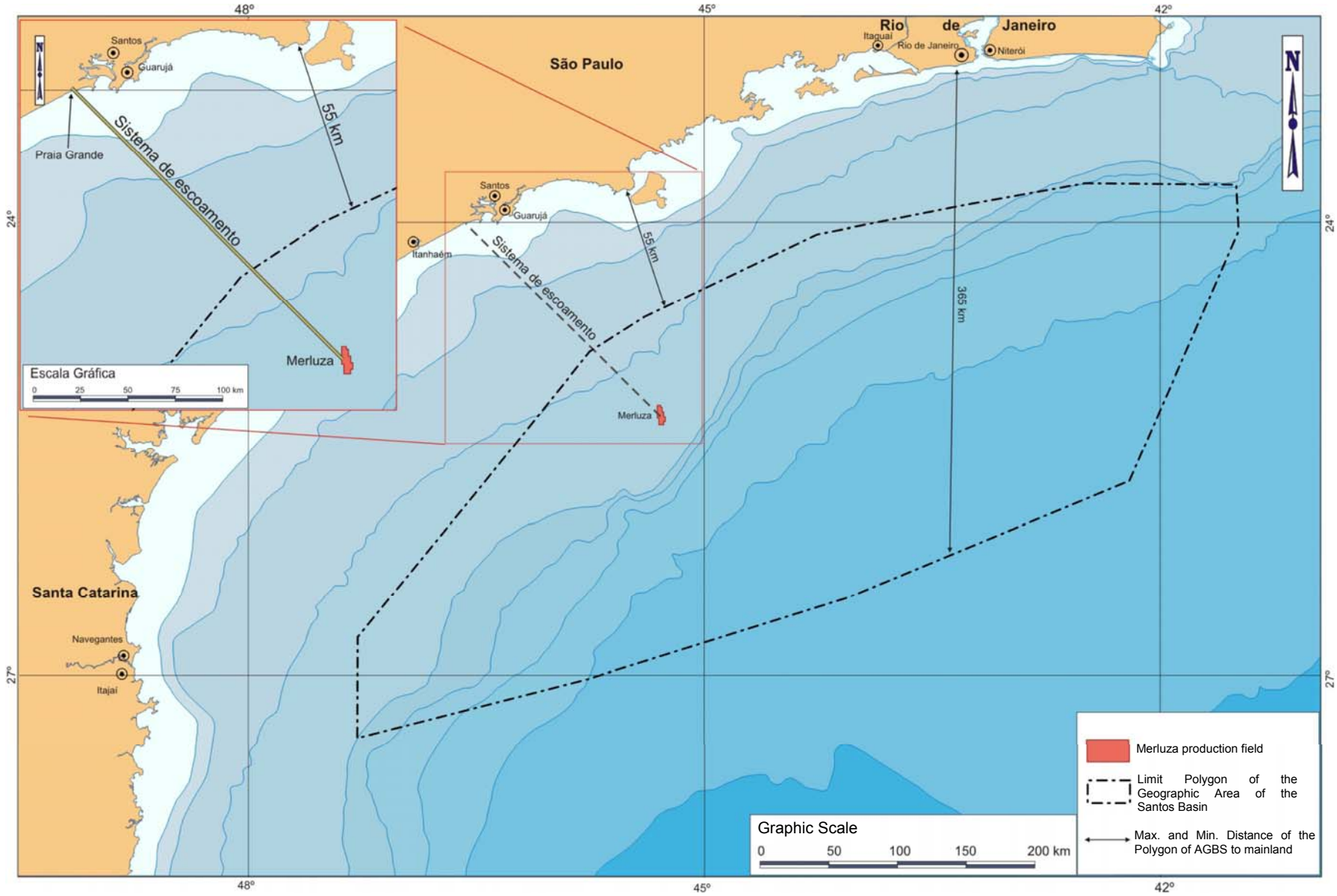
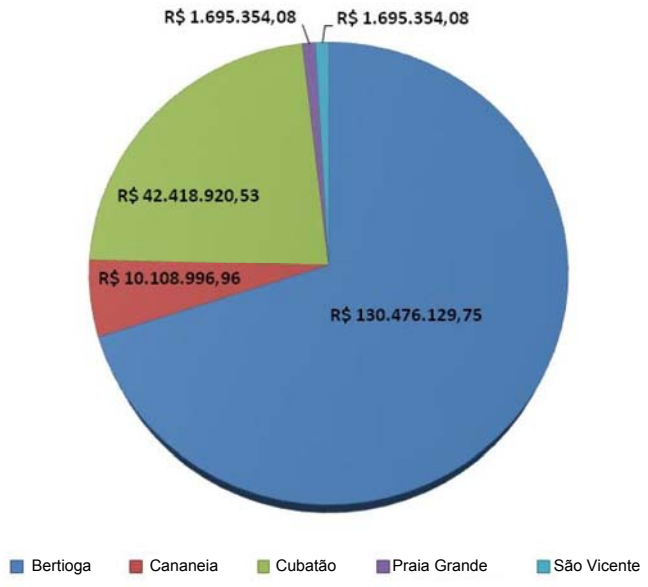


Figure 2: Location of the Merluza Field

The production activity represents a significant increase in natural gas production in the state of Sao Paulo, and currently the Merluza Field is responsible for the greatest part of the production of gas and condensate in the state. According to the ANP, in the month of August 2010, Merluza produced 2,779 m³ of condensate and about 13,613,332 m³ of gas. Moreover, the performance of the activity promotes an increase in the commercialization of local goods and services, which has as consequence major tax revenue. The production in the Merluza Field is mainly benefiting the communities of Bertioga, Cubatão, Cananéia, Praia Grande and São Vicente, presented in **Figure 1**, with receipt of ***royalties***.

Financial compensation by the use of scarce natural resources in the production activity.

Graphic 1 – Total of royalties accrued by municipality, from 1998 to 2009



The production activity in the Merluza Field presents environmental aspects that should be monitored throughout its implementation. To ensure the safety and appropriate environmental management, control and monitoring measures required by IBAMA have been developed and implemented, allowing the minimization of negative impacts.

In order to reduce the chances of an accident, whether by human error or equipment, a Risk Management Plan was designed, prepared from an Environmental Risk Assessment of the activity. It is noteworthy that the platform, as also the pipeline, is operationally protected by safety valves and monitoring systems in order to avoid accidents. In case of a possible accident involving a spill of condensate in the sea during the production activity, a plan of specific combat will be put into action, the Emergency Plan for Oil Spill of the Geographic Area of the Santos Basin - PEVO - BS Production.

The actions required by TAC-BS have been carried out by PETROBRAS and accompanied by CGPEG / IBAMA. The continuity of the Offshore Drilling Activity and the Production and Flowage in the Merluza Field in the Santos Basin, after the term of the TAC-BS will only be possible after the evaluation and approval of the Environmental Impact Study (EIS) of the Offshore Drilling Activity and the Environmental Assessment Report (RAA) of the Production and Flowage in the Merluza Field in the Santos Basin and the issuing of their licenses for the operation by CGPEG / IBAMA.

This RIMA is also one of the documents required in the process for issuing such licenses.

About the Definitive Licensing of the Geographic Area of the Santos Basin (AGBS)

Meeting AGBS

As explained in the previous section, for TAC-BS was delimited an area, formed by a polygon of approximately 120,000 km², called Geographic Area of the Santos Basin, but with the Pre-salt discoveries PETROBRAS recognized the need to increase by 25,000 km² the area east to the original polygon. Thus, the new area of the polygon of AGBS presented in the EIS / RIMA of Offshore Drilling with this addition now has approximately 145,000 km² of offshore area and extends from the municipality of Arraial do Cabo, in Rio de Janeiro, to Florianópolis, Santa Catarina (**Figure 3**).

The point of AGBS closest to the mainland is at a distance of about 50 km from the coast toward the state of Sao Paulo, while the farthest is located approximately 390 km toward the state of Rio de Janeiro. The water depth in AGBS varies from 75 to 2,700 meters.

The AGBS is divided into five poles. **Table 2** provides some information about each of the poles, which are shown in **Figure 3.**

Table 2 – General data of AGBS Poles

Pole Name	Location
Uruguá Pole (old Block BS-500)	At about 160 km off the coast of the State of Rio de Janeiro, with depths between 500 and 2,000 meters, where drillings occur at depths greater than 1000 meters.
Mussel Pole	At about 140 km off the coast of the State of São Paulo, with depths between 150 and 1,500 meters, where drillings occur at depths greater than 450 meters.
Merluza Pole	At about 180 km off the coast of the State of São Paulo, with depths between 80 and 1,000 meters, where drillings occur at depths greater than 100 meters.
Pre-Salt Pole	At about 250 miles off the coast of the states of Sao Paulo and Rio de Janeiro, with depths between 2,000-2,500 meters, where drillings occur at depths greater than 2200 meters.
South Pole	At about 180 km off the coast of the states of Sao Paulo, Parana and Santa Catarina, with depths between 120 and 2,000 meters, where drillings occur at depths greater than 200 meters.

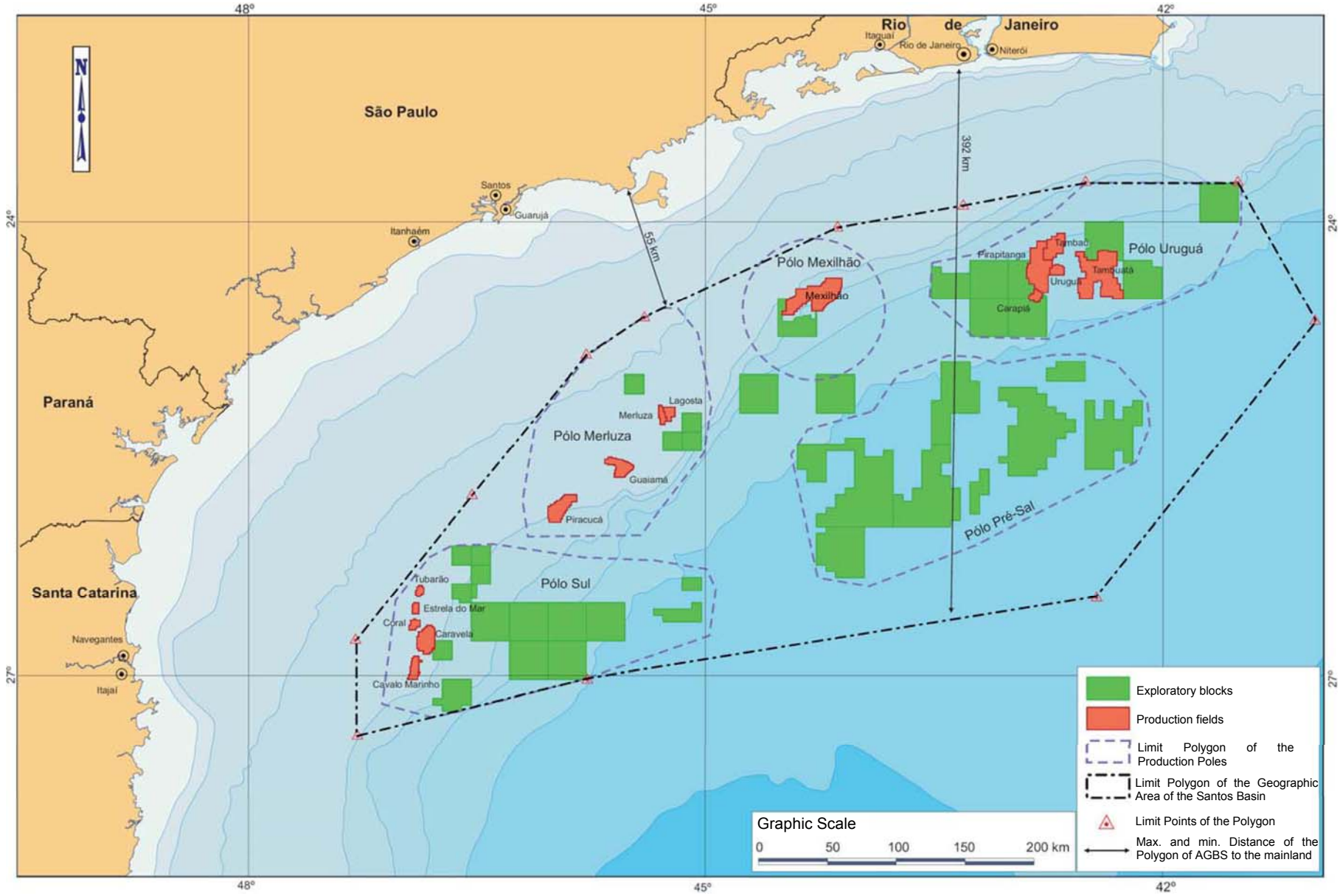


Figure 3: Location of the new Geographic Area of the Santos Basin (AGBS) proposed in the Drilling EIS / RIMA

The Drilling Activity

The activity consists of offshore drilling of wells in the Geographic Area of the Santos Basin (AGBS).

PETROBRAS has been drilling offshore wells in AGBS since 2007 under the TAC-BS, and this licensing process is requesting authorization from IBAMA to drill about 80 wells per year.

PETROBRAS is a national company that develops and owns advanced technology for oil exploration in deep waters.

This activity will continue contributing to the growth of oil and natural gas production in Brazil, an important factor for maintaining self-sufficiency in Brazilian industry.

Why drill in AGBS?

The continuity of drilling exploratory wells aims to discover new reservoirs of oil and natural gas. After assessing the extent of these findings, if feasible, wells will be drilled with the objective of developing the oil and gas production in the region.

1 - Technical Aspects

PETROBRAS has developed own technology that enables the performance the offshore drilling only in places with a greater chance of finding oil. This technology is internationally recognized for its efficiency and safety.

2 - Economic Aspects

This activity aims to identify new reservoirs to exploit them. Thus, it may cause increased production of oil and gas to meet the needs of Brazil, reducing dependence on imports.

This activity has contributed and will contribute even more to stimulate the strengthening of the oil and shipbuilding industries.

3 - Environmental Aspects

The oil operation is accompanied by environmental studies and projects, for example, the MAPEM. In AGBS, as required by the CGPEG / IBAMA, is being carried out by PETROBRAS the Environmental Monitoring Assessment Project of the Environmental Impacts of Drilling (PAI) as also the Regional Environmental Characterization Project of the Santos Basin (PCR-BS).

These projects contribute to better understanding of the ecosystems and natural resources of AGBS.

MAPEM: Project already completed, accomplished through an initiative of the Brazilian Oil Institute (IBP), in conjunction with the Foundation Federal University of Rio Grande do Sul (FURG), which sought the Environmental Monitoring in Exploratory Offshore Drilling Activities (MAPEM). In this project we evaluated the effects of gravels and fluids resulting discarded resulting from drilling, and determined the degree of environmental impact and recovery of these locations until one year after disposal.

The drilling platforms

For the drilling of wells in AGBS are used semisubmersible platforms (**Figure 4**) and probe vessels (**Figure 5**).

Figure 4: Example of semisubmersible platform.

Figure 5: Example of probe vessel.

The semisubmersible type platform rests on underwater floats and usually does not have their own engine displacement. To stay in position during drilling, this type of platform can use the anchoring system for attachment to the seabed or the *Dynamic Positioning System (Dynamic Positioning - DP)* - **Figure 6.**

System responsible for keeping the platform still in the surface without the use of anchors.

The probe vessel is designed for drilling of offshore wells in deep and ultra deep waters. It has great mobility due to displacement by engine itself, and operation capacity, by the use of Dynamic Positioning System, which remains fixed during drilling.

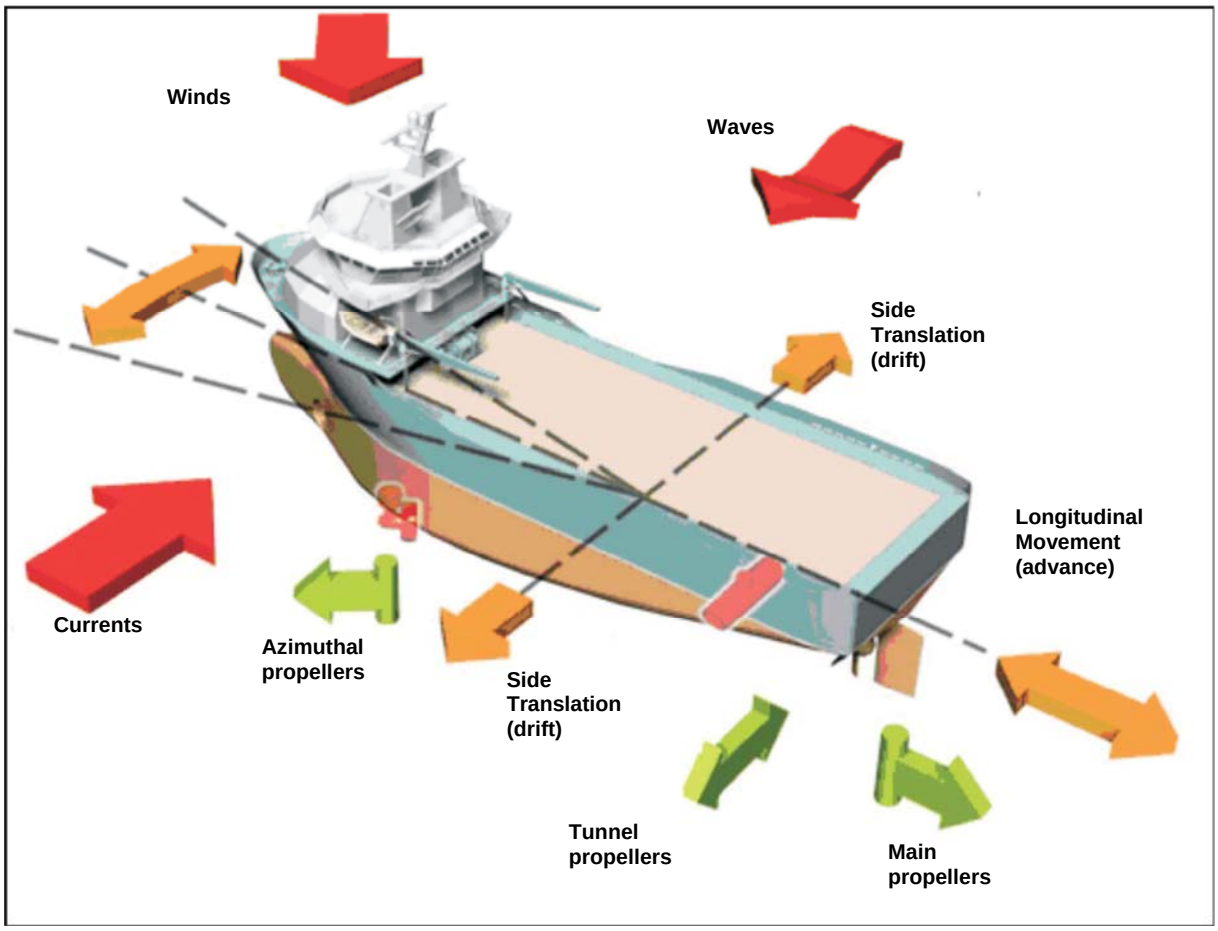


Figure 6: Scheme of operation of the dynamic positioning (DP).

For the activity in AGBS is provided the use of 7 probe vessels and 24 drilling semisubmersible platforms, some of which are already operating in several areas explored by PETROBRAS in recent years.

How is the activity being performed

Installation of drilling platforms

The installation of the drilling platform involves its movement to the location to be drilled and the positioning process in place.

It should be noted that the platform must remain fixed in the same position throughout the process.

Well Drilling

The drilling of a well is performed by a drill (**Figure 7**) attached to the end of a column of tubes, called drilling column. The tubes are fitted one after the other to add up to the desired depth. **Figure 8** shows a simplified scheme of drilling a well.

Bits: are equipments used to facilitate penetration in different types of layers that make up the ground.

Figure 7: Examples of drilling bits.

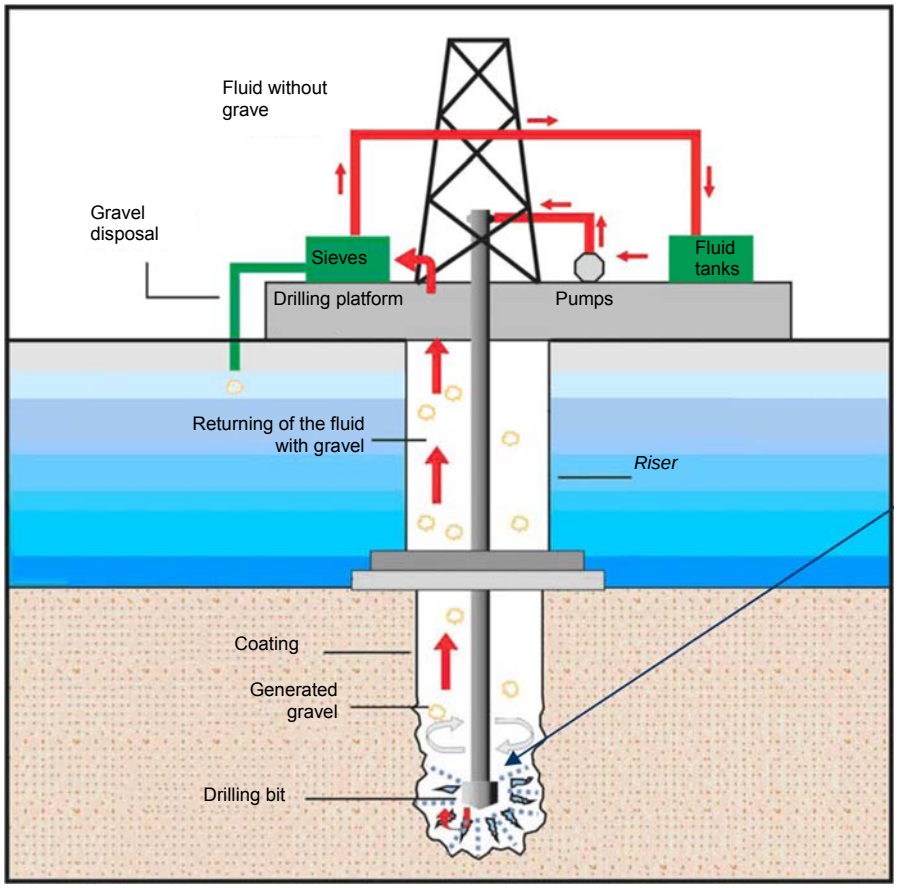


Figure 8: Simplified schema of drilling a well.

The rocks of the seafloor are crossed by the action of rotation and the weight applied to the bit located on the edge of the drill string.

To reduce the friction between the bit and the rock, cool it to clean the well by removing fragments of the crushed rock (gravels), are used the **drilling fluids**.

The drilling of wells occurs in several stages (name given to each step perforated), in which bits are used for different widths (the greater the depth smaller the width) and fluids of different types. At the end of each phase the well is lined with steel tubing to prevent its collapse.

The drilling fluid is a mixture of elements pumped through the drill string to the bottom, passing by the bit through holes.

For the drilling activity in AGBS are used fluids of two types:

- water-based fluids: are biodegradable and disperse readily in the sea;
- synthetic based fluids: present chemicals as main element.

As required by IBAMA, toxicity tests were performed on fluids that will be used in the drilling activity in AGBS. The results showed that they are not harmful to the environment and may be used in drilling.

In the initial phase, the drilling fluids used and the generated gravel do not return the surface, remaining in the vicinity of the well at the bottom of the sea. However, at later stages, fluids and gravels return to the surface through the **riser.**

Tube that connects the well to the platform.

On the platform, the mixture of fluid and gravel is treated through a system intended to clean the gravel. After the treatment, the gravel can be directly disposed of the sea and the fluid can be used again for drilling.

After being used several times the fluids lose the characteristics necessary to perform its function. It is no longer possible its reuse, the water-based drilling fluids can be directly cast into the sea, and the synthetic based fluids should be sent to the land, from which they follow for proper disposal.

It is noteworthy that all the procedures for disposal of drilling fluids are conducted in accordance with the conditions previously approved by IBAMA.

Security Systems

The safe operation is ensured by means of an apparatus installed at the well head which prevents any uncontrolled situation during drilling of causing leakage of oil and/or natural gas and accidents on the platform.

The following figure shows the scheme of a semisubmersible platform drilling a well with the safety valves (**Figure 9**) installed on the well head on the sea bottom.

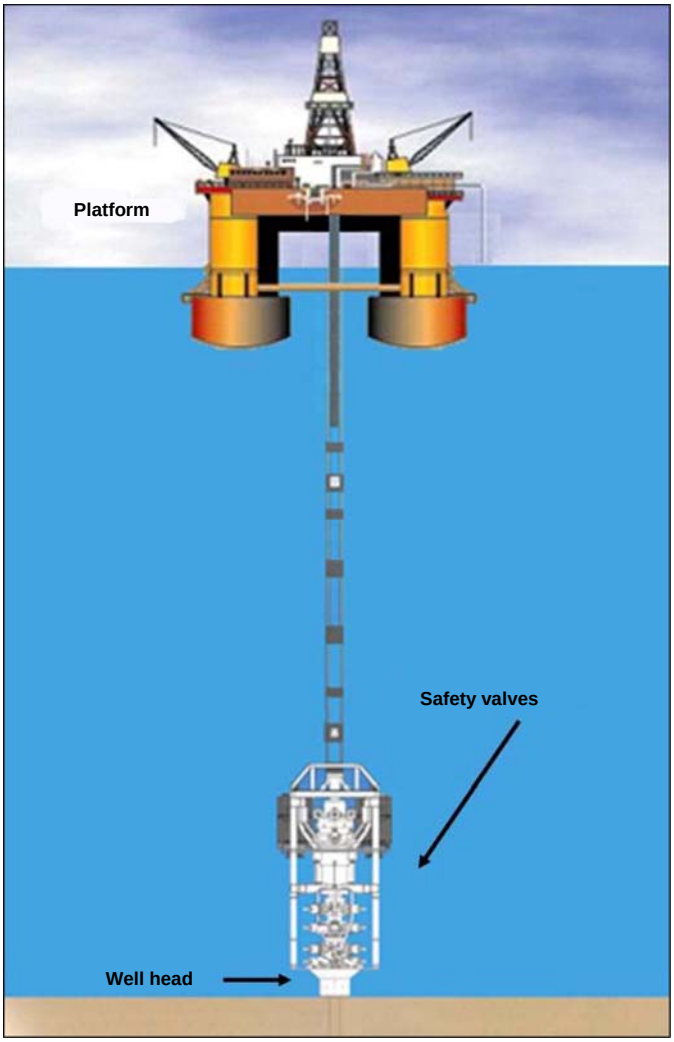


Figure 9: Scheme of platform in drilling activity.

End of the drilling activity

After the drilling the training test is carried out, which aims to evaluate the economic viability of the well.

If the test proves the formation of commercial viability of the well, it will be abandoned temporarily until a new licensing process for a future stage of production is conducted. In case the studies show that the well is not economically viable, it will be definitely abandoned.

The procedures for temporary and permanent abandonment consist of sealing the well with cement plugs to prevent the exit or entry of material drilled at the site. It is noteworthy that the abandonment of the wells is performed to meet the ANP Ordinance No. 25/2002 regulating the abandonment of wells drilled with the objective of exploring and producing oil and/or gas.

Infrastructure Support

The activities of supply and temporary storage of cargo in general (tubes, chemicals, miscellaneous equipment), and the embarkation and disembarkation of workers involved in the activity, are done in sea and air support bases.

Due to the sizes of AGBS, to reduce the access time between the bases and drilling platforms, the supporting infrastructure is concentrated in two sectors here called: Northern Part, which caters to the wells located in Uruguá Pole, Mussel Pole and Pre-salt Pole, and the Southern Part, for those located in the Merluza Pole and South Pole, as shown in **Table 3.**

Table 3: Location of the support infrastructures

Support Bases	Geographic Area of the Santos Basin	
	North Part (Uruguá Pole, Mussel Pole and Pre-Salt Pole)	South Part (Merluza Pole and South Pole)
Maritime	*Bric Brazilian Intermodal Complex S.A* (Rio de Janeiro)	Porto de Itajaí (Itajaí/SC)
Air	Jacarepaguá Airport (Rio de Janeiro)	Airport Dr. Antonio Ribeiro Nogueira Junior (Itanhaém/SP)
	Itaguaí (future port and heliport)	International Airport Ministro Victor Kondor (Navegantes/SC)
		Guaruiá (future airport)

Support vessels

The transport of cargo, fuel oil, water and drilling fluids from support bases to the platforms and vice versa is done by support vessels (**Figure 10**). It also responsible of these boats to bring to the earth the garbage produced by the platforms during the activity. These boats are still responsible for towing platforms that do not have engines, among the different wells.

Figura 10: Examples of support vessels.

What is the Area of Influence?

Area of Influence of the activity (Figure 11) is the one that may be affected directly or indirectly by the impacts, positive or negative, resulting from offshore drilling activity in AGBS, thus defined as:

- **Anchoring area of the drilling platforms** - This area was defined by considering the possible burial of animals and tilling the sediment on the seabed near the points where the anchors are released.

- **Area around the drilling platforms** - was considered a safe area of 500 meters from any point of the platforms. In this area is not allowed to navigate and, consequently, the fishing during all drilling activity, according to standard of the Brazilian Navy.

- **Effluent disposal area (drilling fluids, gravel, etc.)** - Set as the area where the deposited gravel is discarded at sea, varying with the depth at which the discharge occurs, the seafloor, and the conditions of weather and sea in the region where the platform is located.

Studies show that for a well located at the average depth of 70 meters where the gravel discharge occurs only during the initial phase of drilling, it tends to be deposited at a distance of about 20-30 meters from the well. As for wells at depths of around 1400 meters, where the platforms discard much of gravel generated, studies show that the gravel tends to be deposited at distances of up to 800 meters from the well.

- **Area formed by the municipalities that can be influenced by shipping routes of the vessels** - Defined by the municipality of Niterói and Rio de Janeiro, by having vessels that use the output of Guanabara Bay, of Itaguaí in Sepetiba Bay, and Navegantes and Itajaí, for using the Itajai-Açu River.

- **Area formed by the cities where the structures supporting the activity are located**, according to the table below.

State	Municipality	Structures
Rio de Janeiro	Rio de Janeiro	Port and airport
	Itaguaí	Future heliport and port
São Paulo	Santos	Future logistic base
	Guarujá	Future airport
	Itanhaém	Airport
Santa Catarina	Itajaí	Port
	Navegantes	Airport

- **Area formed by the municipalities that may be socially or economically impacted by the mere presence of the activity** - Defined by the municipality of Niterói, Itaguaí and Rio de Janeiro (RJ), Santos, Guarujá and Itanhaém (SP), Navegantes and Itajaí (SC) due to increased tax revenue, migration and/or generation of expectations.

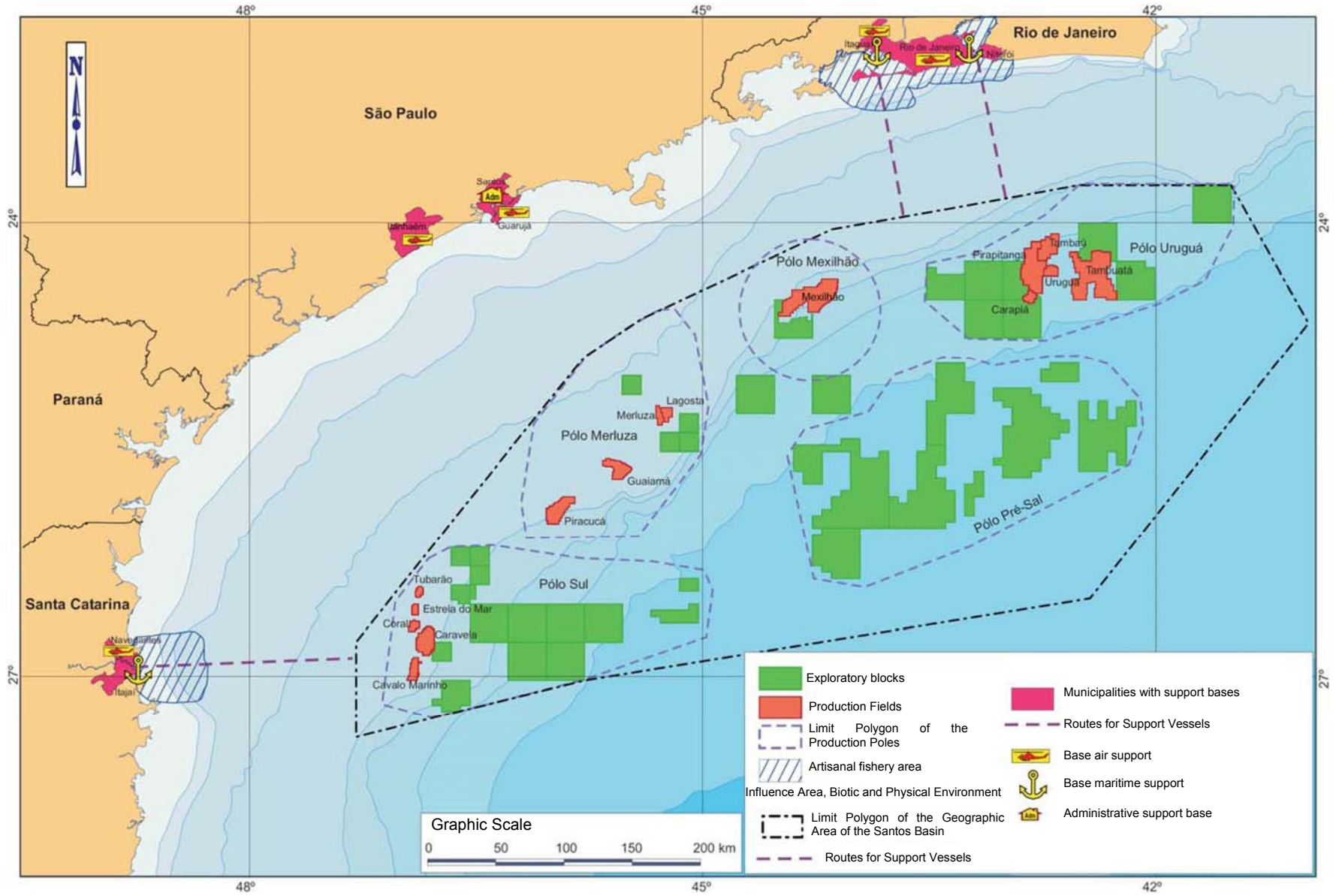


Figure 11: Area of Influence of the Drilling Activity in the Geographic Area in the Santos Basin

How is the Environment in the Area of Influence

In this item are presented the characteristics of the physical, biological and socioeconomic environments found in the area of influence. To know the environment of the region of activity and its surroundings is important to allow a criteria analysis of the impacts that may be caused by the drilling activity. Therefore, we study the conditions existing before the activity. This measure helps to identify weaknesses of the ecosystem and socio-economic activities developed by local communities. This study serves as a basis for assessing the impacts of the activity, allowing the consideration of the most sensitive areas with special attention. The following is a brief description of the main socio-environmental characteristics of the Area of Influence of the drilling activity in AGBS.

Physical environment: climate, characteristics of water, rocky formations, etc.
Biological environment: plants and animals, fisheries, conservation units, etc.
Socioeconomic environment: land use and occupation, generation of employment and income, fishing characterization of the fishing area.

Physical Environment

This item presents the main environmental factors that characterize the physical environment of AGBS, covering aspects of climate, topography, winds, currents and sea conditions.

The South and Southeast Brazilian regions are characterized by the dry winter and the hot and rainy summer. In the warmest months (January, February and March) the temperature can reach 28ºC and the coldest (July), 13ºC. The rains occur more often in December (Santa Catarina) and January (Rio de Janeiro and Sao Paulo), while in June (Santa Catarina) and August (Rio de Janeiro and Sao Paulo) are considered the months when it rains less.

In relation to the winds, in the Geographic Area of the Santos Basin there is predominance of northeast winds in the summer, and east winds in winter.

The relief in the coastal region is characterized by the presence of the mountains of Serra do Mar, mainly in Rio de Janeiro and the northern part of the state of Sao Paulo, and flatter and lower areas, especially in the stretch between the south of Sao Paulo and Santa Catarina.

The marine relief is formed by the continental shelf and continental slope. The continental shelf is the portion of the submarine relief that begins near the coastline and

moves toward the sea with a gentle slope to sink suddenly in the region of continental slope, which is characterized by very steep and has depths exceeding 1,000 meters. In the Santos Basin, the Continental Shelf has a maximum width of about 230 km, opposite the city of Santos, and a minimum of 50 km, opposite the city of Cabo Frio, with maximum depth of 200 meters.

With respect to ocean circulation, it is emphasized that the AGBS is under the influence of the Brazil Current (**Figure 12**), the main ocean currents that occurs on the Brazilian coast. This is a hot and saline current from northeast to southwest direction at low speeds (less than 1 m/s).

The seawater temperature ranging from 24ºC, the surface, the 8-9ºC, about 600 feet deep, and 4ºC, the 1000 meters. An important factor, which occurs mainly in the coastal cities of Cabo Frio and Arraial do Cabo (RJ), during the spring and summer, is the phenomenon of upwelling (Figure 13). This phenomenon is characterized by the rise of cold water, loaded with nutrients to the surface, favoring the development of marine flora (plants) and fauna (animals).

Figure 12: Brazilian Current.

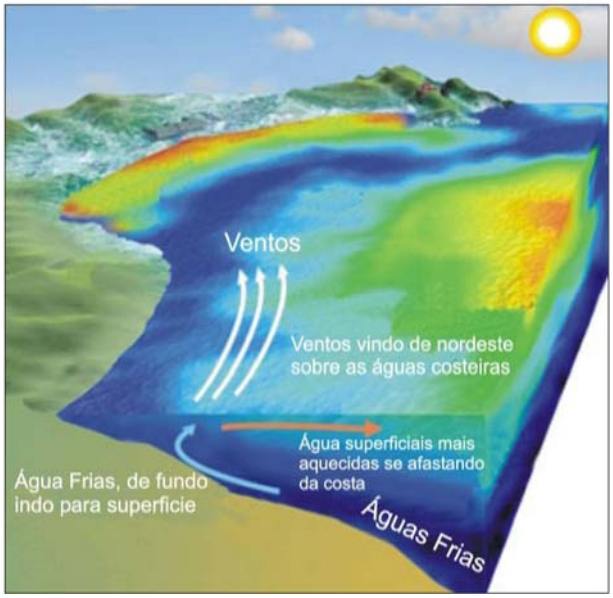


Figure 13: Phenomenon of Upwelling.

Biological Environment

Fishes

In AGBS appear several species of fishes, some of which are threatened with extinction, as some sharks and rays, including the cation-angel, the sand tiger shark dogfish (**Figure 14**), the whale shark, the old-mouth dogfish, the hammerhead and manta-ray (**Figure 15**).

Figure 14: sand tiger shark dogfish

Many other fishes are important fishery resources in the region, such as tuna (**Figure 16**), bonito, mackerel (**Figure 17**), gold fish (**Figure 18**), sauries and anchoítas. It is noteworthy that the main fishing resources of the region are sardines, namorado, potato-fish, hake, grouper, and the pink cusk goete.

Figure 15: Manta ray

Figure 16: Tuna

Figure 17: Mackerel

Figure 18: Gold fish

Marine Mammals

As for marine mammals (whales and dolphins), there are records of 43 species in AGBS, among them the dwarf minke whale, the blue whale, the southern right whale, the humpback whale (**Figure 19**), the sperm whale, porpoise or franciscan and the bottlenose dolphin (**Figure 20**). The southern right whales and humpback whales occur in the region from July to November, when they realize their migratory cycles.

Figure 19: Humpack whale

Figure 20: Bottlenose whale

Turtles

Also noteworthy is the occurrence of sea turtles along the entire coast of the area of influence, and nesting sites of loggerhead turtles (**Figure 21**), on the northern coast of the state of Rio de Janeiro.

Figure 21: Loggerhead turtle

Seabirds

In coastal ecosystems of AGBS there are many seabirds such as gulls (Figure 22), boobies (Figure 23) and frigate birds, which nest on offshore islands, as well as migratory species such as snowy plovers and sandpipers. The migration of these species for this region is derived from the northern hemisphere, between September and May, and the extreme south, between May and August (the coldest months in these regions).

Figure 22: Gulls

Figura 23: Boobies

Main ecosystems of AGBS

Among the main ecosystems that make up the AGBS are rocky shores, sandy beaches, estuaries and mangroves, which are summarized below.

Rocky shores

Rocky coast is a coastal environment, formed by rocks subject to wave action, tides, currents and winds. It represents an environment of transition between terrestrial and marine ecosystems and they are considered one of the most important ecosystems, for harboring numerous species of recognized ecological and economical value, such as mussels, oysters, shellfish, algae and fishes.

In the area of influence of the drilling activity in the Geographic Area of the Santos Basin, the rocky shores occur in bays and coves as well as in numerous islands and islets separated by sandy beaches and river mouths. As an example stand out on the coast of Rio de Janeiro, the Guanabara Bay (Figure 24) and in the region of Santos (SP), the Santos Slab (Figure 25).

Figure 24: Rocky coast in Guanabara Bay, RJ

Figure 25: Rocky coast in Santos Slab, SP.

Sandy beaches

The sandy beaches form one of the largest Brazilian coastal environments, especially in the states of Rio de Janeiro (Figure 26), Sao Paulo (Figure 27) and Santa Catarina. They represent important areas for recreation, besides sheltering many species of economic value, such as crustaceans and mollusks, used as food or as bait for fishing.

Figure 26: Beach of José Bonifácio - Paquetá, Baía de Guanabara, RJ

Figure 27: Beach of José Menino - Santos, SP.

Estuaries

Present in the states of Rio de Janeiro, Santa Catarina (Figure 28) and Sao Paulo, estuaries are environments that feature a mixture of salt water from the sea, with freshwater originating mainly from the rivers. They are considered areas of shelter and reproduction of key species for the marine food chain, and breeding sites for important species such as oysters and crabs.

Figure 28: Estuary area in Santa Catarina.

Several kinds of shrimps and fishes spend the early part of their lives in estuaries. There are examples of this ecosystem: rivers estuaries, bays and coastal marine wetlands.

Sandbanks

The sandanks are sandy and saline environments, near the sea, composed of a diverse vegetation, forming another important ecosystem in this region AGBS (Figure 29).

Figure 29: Marambaia Sandbank, RJ.

Mangroves

The mangroves (**Figure 30**) represent one of the most productive ecosystems existing. They consist of a variety of coastal communities, with a predominance of plant species transitional between terrestrial and marine environments, tree or shrub that can grow in soils with high salt content in the margins of estuaries, lagoons and inlets.

Figure 30: Itanhaém Mangrove, São Paulo.

Conservation Units (CUs)

Conservation Units (CUs) are areas whose protection is guaranteed by law in order to conserve natural resources and biodiversity existing in its interior. The CUs are divided into two categories: Integral Protection Units and Units of Sustainable Use. The Integral Protection Units are intended to preserve nature, admitting only environmental education and recreation, and scientific research. As for the Units of Sustainable Use, they are intended to integrate environmental conservation and sustainable use of natural elements present in the units.

We identified 48 Conservation Units, being 31 in sustainable use, 05 in integral use and 12 classified in other categories such as: Tumbled Natural Area, Ecological Reserve, etc

Among the Conservation Units identified can be mentioned: the State Park of Ilha Grande and the Ecological Station of Guanabara, in Rio de Janeiro (RJ); the Marine State Park of Santos Slab in Santos, the Area of Relevant Ecological Interest of Queimada Pequena and Queimada Grande islands, in Itanhaém (SP); the Municipal Natural Park of the Atalaia, in Itajaí (SC); among others.

Socioeconomic Environment

The area of influence of the activity for the socioeconomic environment includes a total of eight counties, three located in the state of Rio de Janeiro - Niterói, Itaguaí and Rio de Janeiro, three in Sao Paulo - Santos, Guarujá and Itanhaém, and two in Santa Catarina - Navegantes and Itajaí.

Population

According to the latest Census (IBGE/2000), the resident population in the municipalities of the Area of Influence sum of 7,340,959 inhabitants, with approximately 80% of the city of Rio de Janeiro. According to IBGE, the population estimates in 2009, this number reached 7,813,626 inhabitants, the municipality of Rio de Janeiro still responsible for around 80% of the total.

The **population density** occurring in the area of influence is very uneven. Rio de Janeiro and Niteroi stand out with the greatest number of inhabitants per km², with 5234 and 3716 hab/km², respectively, as the city of Itanhaém recorded only 146 hab/km², followed by Itaguaí with 388 inhabitants/km².

Population density is the ratio between the number of persons residing in a place and the area of that place.

Regarding the distribution of urban and rural population in all municipalities in the area of influence is predominant in urban areas. Data from the latest census of the IBGE (2000) show that the Rio de Janeiro, Niterói and Santos, members of the Metropolitan Region and/or major shopping centers and services at the state level, have only urban populations.

Tourism

The municipalities of the Area of Influence of AGBS present, in addition to natural attractions, the potential for historical and cultural tourism, for harboring several copies of the heritage of the colonial period, as strong and old houses, and museums and cultural centers of the Empire time, among others.

Santos is located in the largest port in Latin America. The city has 7 km of beach and an extensive urban garden on its edge (Figure 31), and historic buildings, museums and cultural centers. Tourism, beyond the port and trade are the main responsible for the economic dynamics of the municipality.

Figure 31: Coast Garden of Santos.

The tourist activity is also intense in the city of Rio de Janeiro, which natural, historic and cultural resources are known worldwide (**Figure 32**). The Rio de Janeiro is the main destination for international tourism in the country, in addition, the **business tourism** in the city also has been established as a major tourist arrangements.

Figure 32: View of the Guanabara Bay (RJ).

Business tourism: toward executives and companies moving toward big business and economic centers to conduct their commercial, industrial and professional. There is a current trend in tourist towns use as a meeting place for conventions and personnel training.

The city of Niterói, besides offering various tourist attractions, including museums, beaches, forts, forts and historic buildings, has sought to develop integrated with tours of the city of Rio de Janeiro in order to absorb the additional tourists this city.

The Green Coast Region, which is situated Itaguaí, has natural beauty and history places. Besides trails and tours in the Atlantic, the region has a vocation for cultural, ecological, recreational tourism and water sports.

Home to the largest fishing port in the country, the city of Itajaí, in Santa Catarina, is gaining prominence among the leading cities of Santa Catarina in the practice of nautical activities. Besides beaches and forests, it has the only pier exclusively touristic in Brazil, receiving several cruises in the summer season (**Figure 33**).

Figure 33: Pier view of Itajaí with a cruise ship docked

Navegantes is a municipality located on the left bank of the Itajaí-Açu River on the north coast of Santa Catarina. It has a long stretch of beaches extending from the neighboring city of Penha to the city of Itajaí. In Navegantes is also located an important airport (**Figure 34**), which serves the flow of tourists and businessmen traveling to the region of Vale do Itajaí.

Figure 34: Airport of Navegantes (SC).

Fishery

The fishing industry in Brazil is characterized by catching fish using large boats, generally well equipped, featuring the most modern techniques for fishing (seine nets potent and drag) and location of schools. According to information from the Special Secretariat of Aquaculture and Fisheries (SEAP), now the Ministry of Fisheries and Aquaculture (MPA) in 2006, the estuarine and marine fishing fleet which operated in the Brazilian coast, both in coastal and oceanic fish catch was estimated at around 30,000 vessels.

Among the species traditionally fished in the Southeast region, we highlight those living near the seabed such as grouper, snapper and bream, prawns and true sardines. In the South, there are the whiting, croakers, sardines true, beautiful belly-striped and shrimp. According to IBAMA, the states of Rio de Janeiro and Santa Catarina were in 2006, highlight position in production and marketing of fish in Brazil, being among the largest domestic producers.

The region of AGBS is occupied by an intense fishing activity, represented by the ocean industrial fleet, located in the main fishing ports of the southeastern and southern Brazil, some located in the municipalities in the area of influence of the activity, such as Itajaí and Navegantes, in Santa Catherine Santos, in Sao Paulo and Rio de Janeiro and Niterói, in the state of Rio de Janeiro.

This fleet is characterized by a high mobility, autonomy and diversity of resources which have targeted a wide spatial and temporal distribution, making it necessary to use different fishing gear and equipment. This dynamic leads to the existence, in the area of influence, fishing vessels operating throughout the year between depths of 150 to 600 meters for the fishing of demersal resources (living on the ocean floor) and even above this depth to the resources pelagic (living in the water column).

Coluna d'água: Representa a porção De água presente Entre o fundo do Mar e a superfície.

The fishing industry in the area of influence is mainly carried out by four fleets: trawl fleet, represents the portion of tuna pole and live bait, the longline fleet and the fleet or line of water present driftnet (Figure 35 and Figure 36). The remaining fleets are represented by the coastal fisheries that operate along the coast between depths of 10 to 50 meters. These fleets belong to seine fisheries for sardines and other small pelagic fish, pots for octopus, shrimp trawling, pair trawling, mesh bottom and coastal area, among others.

Figure 35 and Figure 36: Vessels that use the driftnet fleets.

The drilling activities of AGBS are held between the depths 150-2500 m, and its shortest distance from the coast is 55 km, being the greatest distance, 392 km, traveled from the coast of the municipality of Rio de Janeiro. The activity of fishing is carried out to a depth of 60 meters and does not occur, thus no interference between the fishing and drilling activities carried out in AGBS.

According to surveys conducted with the fishing settlements in the municipalities of Rio de Janeiro and Niterói, the main species caught by fishermen are sole, mullet, croaker, sea bass, anchovy, hake, barracuda, shark, stingray, xerelete, eye dog, swordfish, beautiful mountain and crabmeat. According to the report of the SEAP/IBAMA/PROZEE, the municipality of Niterói has on gill net fishing of the main fishery, with great diversity of types of nets (nets of anchor, back, and mesh and hunting caceio). In the prevailing ocean gill nets for bluefish, croaker and mullet.

Concentrating its activities mainly in the fishing industry, the port of Itajai/Navegantes annually receives more than 800 vessels coming not only from Santa Catarina, but also from other states.

The fisheries have an important historical, social and economic role in Navegantes (Figure 37) and Itajaí (Figure 38), because of the cultural aspects of the coastal area, and the shrimp trawling its main expression. Regarding fitting equipment with higher production, the most significant in the capture of fish during the period January to June 2007 were double the drag, followed by seine nets, fixed nets (simple cloth) and hand line.

Figure 37: Fishermen in Navegantes (SC.)

Figure 38: Fishery location Saco da Fazenda, in the county of Itajaí (SC).

How the Activity impacts the Environment

Environmental impact is any change (positive or negative) of the environment caused by human activities that directly or indirectly affect: 1) the health, safety and welfare of the population; 2) the social and economic activities; 3) the living environment; 4) the characteristics of the environment.

The environmental impacts of the drilling activity in AGBS were identified and evaluated considering the installation of platforms, drilling of wells and decommissioning activity. From the environmental study conducted environmental characteristics were identified that are or may be affected by the activity.

The Environmental Impact Analysis performed for the Offshore Drilling Activity in the Geographic Area of the Santos Basin showed that the negative effects generated by the activities can be eliminated or reduced. For actions that are being adopted for environmental control and security measures, carried out mainly through environmental projects, which are part of the requirements of IBAMA for licensing activity. These environmental projects are described in Item **Actions of Environmental Protection** this RIMA. The proposed control measures aimed at conserving the environment through the adoption of strategies that reduce the effects of the negative impacts and intensify the positive impacts.

Some of these actions consist of requirements set forth in the Conduct Adjustment Agreement (TAC-BS) and are already implemented or under implementation. Those that are not yet being implemented will be the subject of the permitting process of AGBS under evaluation CGPEG / IBAMA.

Each impact was analyzed according to certain criteria set out below.

Positive	When the impact results in an improvement of environmental, social or economic quality
Negative	When the impact results in loss of quality
Local	Impact the effect only occurs near or at the site of action
Regional	Impact effect of which occurs beyond the immediate vicinity of the site of action
Extra-regional	Impact of which the effect has collective interest or occurs in national level
Permanent	When results into final changes in the environment and/or that remain after the completion of activities
Temporary	Which is interrupted when the action that caused it ends
Reversible	When environmental conditions return to normal after the completion of activities
Irreversible	When the environmental conditions do not return to normal after the completion of activities
Magnitude	The extent to which an impact affect the environment. It can be classified as: *Low, medium high*
Importance	In accordance with the degree of interference on the environment. It can be classified as: *minor, medium, major*

The following describes briefly the possible effects of the activity related to, for example, air quality, water, sediment, wildlife, fisheries, among others, as well as their proposals for its reduction and, where that is the case, environmental projects linked to these proposals. It is noteworthy that there are impacts that are operational (or real), own activity, and those that may occur in the event of an accident, the so-called accidental impact (or potential).

The OPERATIONAL IMPACTS, in most cases, will be temporary and reversible, i.e. it is expected that, after the striking action, environmental conditions return to normal.

OPERATIONAL IMPACTS

Water Quality

The impacts on water quality are generated mainly from the disposal of ground food, water used in cleaning, and treated sewage, which can change, locally and temporarily, the water quality around the drilling rig. However, ocean currents, waves and the wind tend to spread quickly this material, reducing their concentrations to the extent of its departure from the drilling area. These entries lead to the increased availability of food for many marine organisms that may be attracted to the next platform.

Additionally, the disposal of drilling fluid adhering to the gravel can also cause changes in water characteristics, which may have different behaviors depending on water depth and speed of ocean currents. However, as mentioned in the previous paragraph, it is considered that the ocean currents, waves and wind action will rapidly disperse the material, making their concentrations gradually smaller as they move away from the point of disposal.

It is noteworthy that all the rest of food, oily water and sewage released into the sea shall be treated prior to disposal, meeting the environmental standards of the International Maritime Organization and the Brazilian Environmental Legislation, and that the drilling fluids were tested for toxicity, and will only be authorized for use after approval by IBAMA.

Any changes in water quality related to the development of drilling activity were classified as negative impacts, regional, temporary, reversible, high magnitude, and of major importance.

ACTIONS TAKEN

- Using the system of separation of synthetic base fluid adhered to the gravel.
- Treatment of waste food and health under the Pollution Control Project (PCP).
- Training of workers involved in activities through the Environmental Education Project for Workers (PEAT).
- Implementation of actions foreseen in the Environmental Monitoring Project.

OPERATIONAL IMPACTS

Air Quality

The impacts on air quality can be caused from emissions (gases released from the generators of the platforms, as well as diesel engines of support boats). These impacts, however, are negligible due to the temporary nature of the drilling operation, the strong local winds and the activity is located in the open sea. Thus, it is expected that, maintaining the proper operating condition of the equipment are not generated concentrations of harmful emissions to the environment.

Thus, this impact was classified as negative, temporary and regional, as the change in air quality will reach the entire area of drilling activity. Furthermore, it was regarded as reversible, since the activities completed, the changes caused in the air quality will be reversed, high magnitude, and of great importance.

ACTIONS TAKEN

- Preventative maintenance and proper operation of equipment with potential to generate air emissions under Pollution Control Project (PCP).

Sediment quality

Disposal of gravel stuck with fluid can cause changes in the quality of the sediment from the seabed, where shall be deposited. Thus, the impact on the quality of the pellet was considered negative, regional, temporary, reversible and of high magnitude and of major importance.

During the step of installing platforms that do not have dynamic positioning system, in the anchoring moment occurs the generation of re-suspension of the bottom sediments. This effect is also observed during removal of these structures during deactivation of the platforms. The re-suspended sediment was soon scattered by the action of ocean currents, returning to settle on the seabed. Thus, the impact generated on the sediment was classified as negative, regional, temporary, reversible, low magnitude and of minor importance.

ACTIONS TAKEN

- Implementation of actions foreseen in the Environmental Monitoring Project.

OPERATIONAL IMPACTS

Fauna and Flora of the sea

The platform can bring in ballast water and attached to the hull, species that do not belong to the fauna (animals) and flora (plants) of the drilling locations of the wells. These species can establish themselves in the drill site and threaten the existence of native species.

The vast majority of marine species carried in ballast water do not survive the trip because of the cycle of filling and discharge of ballast water, and the internal conditions of the tanks, which are not suitable for the survival of these organisms. Even for those who continue to live after the journey and are thrown overboard, the chances of survival in new environmental conditions are not favorable. Thus, the probability of impact can be considered very low. It is noteworthy that many of the platforms intended for performance in AGBS are already carrying out activities in Brazilian waters, thus reducing the possibility of introducing new species. Thus, the impact on flora and fauna of the seabed was classified as negative, extra-regional, permanent, irreversible, high magnitude, and of great importance.

The installation of the revolving platforms because of deep-sea sediments and may impact the benthic communities (species of animals and algae that live fixed to a surface). This impact was classified as negative, regional, temporary, reversible, of average magnitude and average importance.

In addition to the impacts mentioned above, the disposal of rubble generated during drilling can affect the flora and fauna of the sea, by landfill or by altering the characteristics of the sediments.

The discharge of cuttings at sea also has a split, because a small part of the drilling fluid remains adhered to the gravel, even after the separation process that is performed on the platform. The benthic communities are especially sensitive to exposure to toxic components of drilling fluid adhering to the gravel dropped. This impact was considered negative, regional, temporary and reversible. Considering the amount of drilling on AGBS, this impact was assessed as a high magnitude and importance.

The removal of the anchors of the platforms can also cause the turning of the sediments of the seafloor, impacting the benthic communities. This impact was classified as negative, regional, permanent, irreversible, of average magnitude and importance.

ACTIONS TAKEN

- Adoption of the rules of the International Maritime Organization (IMO) regarding the ballast water to prevent the introduction of new species.
- Usage of drilling fluids authorized by IBAMA.
- Usage of the separation system of synthetic based fluids attached to the gravel (with maximum fluid removal of synthetic-based cuttings adhere to).

OPERATIONAL IMPACTS

Micro-organisms in the water column

T The platforms can be introduced in AGBS new species of microorganisms brought from other places, through ballast water, which may threaten the micro-organisms of the plankton community (organisms that live freely in the water column, and have little capacity locomotion, are transported by the oceans through ocean currents) on the ground. The chance of this happening is very small in terms of international standards for shipping. However, if it occurs, this impact will be negative, extra-regional, permanent, irreversible, high magnitude, and of great importance

The disposal of crushed food and treated sewage generated on board the platform, are sources of organic material that can also bring changes in the plankton community. This impact is characterized as negative, regional, temporary, reversible, high magnitude, and of medium importance.

The changes in the characteristics of the water caused by the disposal of gravel stuck with fluid may affect planktonic species. Thus, this impact is classified as negative, regional, temporary, reversible, average magnitude, and of great importance.

ACTIONS TAKEN

- Usage of the separation system of synthetic based fluid adhered to the gravel.
- Treatment of waste food and health under the Pollution Control Project (PCP).
- Adoption of the rules of the International Maritime Organization (IMO) regarding the ballast water to prevent the introduction of new species.

OPERATIONAL IMPACTS

Marine Mammals

During the operation of drilling platforms and support vessels, there is constant generation of noise and light. These impacts may affect the behavior of some marine mammals (especially whales and dolphins) that tend to move away from the noise source or closer to the light source. The noise generated mainly during the anchoring of rigs can cause leakage or escape of animals that are nearby. Although noise levels can be perceived and even interfere with behavior or communication, it is considered that they were not strong enough to cause physical harm to these animals. This impact was classified as negative, regional, temporary, reversible, average magnitude, and of major importance.

ACTIONS TAKEN

- Guidance to the crews of vessels in support of the presence of these animals in the region (referred to in Environmental Education Project for Workers - PEAT).
- Positioning of lighting to the interior of the platforms and support vessels and decreased light whenever possible.

Fishes

The disposal of crushed food and treated sewage, sources of organic material, increase the availability of food for fish, which are also attracted by the platform to protect themselves against predators. This impact is classified as negative, regional, temporary, reversible, high magnitude, and of major importance.

The anchoring of platforms and deposition of gravel dropped phases of drilling can scare fish by the suspension of sediments. However, these sediments settle quickly. Furthermore, the turning of the sea foods which may release are in the sediment, which can attract some species of fish. It is noteworthy that some of the rigs to be used in this activity have a dynamic positioning system, which eliminates the anchor. Thus, this impact is classified as negative, regional, temporary, reversible, high magnitude, and of major importance.

ACTIONS TAKEN

- It is envisaged the adoption of measures for possible impacts on fish are off and reverse course.

OPERATIONAL IMPACTS

Fisheries

The main impact on fisheries is related to the definition of a safety area of 500 meters around the platform during drilling activities. This area is not allowed the movement of vessels that are not related to drilling activities, including fishing vessels, as provided by rule of the Navy of Brazil (NORMAN No. 08/2003).Because of AGBS be a region away from the coast, the fishing activity is not affected by the sandbox.

With regard to industrial fishing, this interference is minimal since the area of safety is small compared with the total area of operation of fishing vessels. Another impact is related to the displacement of the support boats between drilling sites and ports used by the activity. Such drives can cause accidental damage to fishing equipment, especially in gill nets, traps signal buoys or boats.

This impact is negative, high magnitude, and regional importance, since it may affect the fishing fleets of the various municipalities located within the catchment area defined for the activity. At the end of the drilling area to fishing restricted security will be released and thus the impact is classified as temporary and reversible.

ACTIONS TAKEN

- Information about the risks of fishing activities in the security area (foreseen in the Media Project - PCS).
- Guidance to the crew of supporting existence on fishing in the region (referred to in Environmental Education Project for Workers - PEAT).
- Report to the Maritime Administration, for release by the service of a Notice to Mariners, the locations of safe areas and the reasons for the restriction of the use.

OPERATIONAL IMPACTS

Manpower

It is estimated that in the drilling activity in the AGBS are involved an average of 260 people on board per drilling platform and 12 support vessel. As the activity requires highly skilled workers, most of them already work on the platforms that operate in AGBS.

Therefore, the impact of the generation of new jobs, by tendering, should be minimal in the region. The presence of activity can stimulate the opening of new service stations in the food, rent, lodging, transportation and purchase of goods and services. This impact was considered as positive, regional, temporary, reversible, low magnitude and of minor importance.

ACTIONS TAKEN

- Clarification of the actual offers of jobs, through the Media Project - PCS, with the purpose of avoiding expectations in the community about the activity.
- Preference for hiring qualified local manpower.

Services Sector

Activities related to the oil industry typically bring as a consequence an increase in the marketing of local goods and services by firms and their service providers. The sectors of hospitality, food, leisure, transportation, utilities, among others, would benefit most. The increased demand for these services will cause an increase in tax receipts. This will occur through the generation of tax revenue collection, such as the ISS (Service Tax), ICMS (Tax on Goods and Services), income tax and social contributions (PIS / PASEP / PIS), which should occur immediately at the start of activities, which constitutes a positive impact of social and economic. This impact is classified as local, temporary, reversible, low magnitude and of minor importance.

During the activity can also be expected interference with the regional traffic (land, sea and air) due to the transport of supplies, equipment, and waste workers. This impact was considered negative, regional, temporary, reversible, low magnitude and of minor importance.

ACTIONS TAKEN

- Purchase products and contracting services in the municipalities of the area of influence of the activity, resulting in the payment of taxes at various levels of coverage.
- Preference for the use of local infrastructure.

The assessment of impacts of the activity considered not only the operational impacts, but also the ACCIDENTAL IMPACTS of the activity resulting from the simulation of an accident or spill of diesel oil. These impacts are classified generally as high magnitude, importance, and in some cases, irreversible and extra-regional, considering the possible event of accidental oil spills.

ACCIDENTAL IMPACTS

Diesel Oil Leak

During the drilling activity may occur accidental spills of diesel oil platforms or boats, may alter the water quality and contaminate the marine fauna. To avoid such accidents, the Company adopts preventive measures. In case of accident, there are procedures to respond to minimize its consequences.

Oil Leak

The most serious accident during the drilling activity would be the oil spill by the loss of well control. In this situation, as well as in other cases of oil spill will affect water quality and sediment in the region, altering the physical, chemical and biological weapons, as the volume spilled.

Also there would be interference in the local fauna, especially in the plankton community, fish, turtles and mammals and seabirds.

Another consequence would be the oil contamination of coastal environments, such as mangroves, beaches and rocky shores, as well as the associated fauna and flora.

The mangroves are very sensitive ecosystems and have major ecological importance. Once contaminated, the effects are expressed at all levels of the production chain, reaching trees, fish larvae, crabs, among other species.

As for the rocky shore, the lining of the animals and algae oil can cause death and temporarily alter the structure of this ecosystem.

In case of contamination of the beach, beyond the damage to fauna and flora, will be the loss of tourism activities, leisure and commerce.

The fishing activity may also be affected by the oil spill due to mortality, contamination and devaluation of the fish (fish and shellfish).

ACTIONS TAKEN

- Service program of inspection and maintenance of test equipment and security systems.
- Implementation of operating procedures of the activity and the Risk Management Plan.
- Recruitment of skilled manpower.
- Activation of the Emergency Plan for Oil Spill in the Geographic Area of the Santos Basin.
- Conduct drills to attend to leaks.

The Environmental Risks of the Activity

The Environmental Risk Analysis aims to raise and analyze the risks that may cause environmental impacts in the event of an accident during the drilling activity, leading to release of any product that may cause pollution to the environment.

For this analysis, one should know the operation of equipment used to perform drilling liner, identifying situations where its use may cause some kind of accident. It is also important to know the history or frequency of accidents of this type of activity has occurred in the world.

From the Environmental Risk Analysis, is established the Risk Management Plan, which lists all the actions to be taken in daily activity to decrease the chances of occurrence of an accident, human error or equipment. For each platform was performed an Environmental Risk Analysis and Risk Management Plan, as was foreseen in the TAC-BS.

It should be noted that the activity has an Emergency Plan for Oil Spill Area Geographic Santos Basin, in addition to Individual Emergency Plans for Oil Pollution Incidents of each drilling platform, where are described all available resources and procedures to be followed in such cases as required by TAC-BS.

Environmental Protection Actions

IBAMA requires that, based on environmental impact assessment, environmental projects are developed to ensure that the environmental quality of the catchment area of activity is maintained. The following are projects that are already being implemented, such as the Pollution Control Project (PCP), the Individual Emergency Plans and the projects to be executed for this activity, such as the Environmental Monitoring Project (MAP) Project Social Communication (PCS), the Workers' Education Project (PEAT), and Environmental Education Project (PEA).

Environmental Monitoring Project (PMA)

The main objective of the Environmental Monitoring Project (PMA) is to monitor and evaluate possible environmental changes caused by drilling in the Area of Influence AGBS, according to the predicted impacts in the EIS.

The PMA is divided into two projects:

- **Drilling Specific Environmental Monitoring Project (PMAEper)**: aims to characterize the sediment (Figure 39) and communities of marine organisms in the region around some wells drilled in AGBS (control points) to subsequently evaluate the effects of drilling on the seabed, and the bodies living at the bottom.

- **Regional Environmental Monitoring Project (PMAR):** as the basis for the preparation of PMAR, is developing the Draft Regional Characterization of the Santos Basin (BS-PCR), which aims at a deeper knowledge of social and environmental characteristics of coastal areas and ocean in the Santos Basin.

Figure 39: Example of equipment used to collect samples of sediment.

According to information obtained in the Draft Regional Environmental Characterization of the Santos Basin (BS-PCR), the PMAR can identify and assess the potential impacts of drilling on water quality, seabed and the bodies of AGBS.

Pollution Control Project (PCP)

The Pollution Control Project aims to control and reduce environmental impacts caused by the generation of wastes, effluents and gases, caused by drilling in the Geographic Area of the Santos Basin.

It involves the control of solid waste, liquid effluents and air emissions for the control and reduction of their generation. Fixed procedures that reduce pollution, including that caused by the release of wastes and effluents at sea authorized by law. Increases, the maximum recycling of waste landed and referral to appropriate treatment of non-recyclables in accordance with environmental legislation.

The contents of the PCP serves the IBAMA established in the Technical Note 08/2008 and other applicable laws, in respect of:

- **Liquid effluents management**: the mapping and control the release of effluents generated and thrown into the sea or transported to destinations environmentally appropriate, such as sewage, oily water and drilling fluid.

- **Solid waste management**: aims to ensure the control of the entire life cycle of solid waste (food scraps, empty containers, scrap metal, waste contaminated with oil, etc.., From generation to final disposal - **Figure 40**), looking further develop processes that reduce the generation and / or prevent and avoid impacts of drilling in a transparent and environmentally mean.

Figure 40: Selective collection action foreseen in the Pollution Control Project.

- **Air emissions management**: aims at establishing the inventory of emissions (carbon dioxide, methane and sulfur dioxide) and the control of emissions sources (engines, flares, turbines), aiming at the implementation of measures to reduce the release of pollutants in the air

Media Project (PCS)

The project goal is to inform the public about the development of offshore drilling activity AGBS of the characteristics and impacts generated by the activity, as well as environmental projects to be executed.

To this end, the dissemination of informational meetings (**Figure 41**) and dialogues with the community will be made by sending invitation letters to the Municipalities, Departments of Environment and other institutions of municipalities in the region, as well as local radio and through car audio, posters and / or tracks. In order to keep the company updated in relation to activities undertaken by Petrobras, will also be distributed every four months, a newsletter about the activity.

Figure 41: Informative meetings will be performed to inform the population about the activity.

The specific objectives of the Media Project are:

- Provide the community with the activities of the UO-BS;
- Present the environmental, economic and social activities and its measures to maximize the positive and minimizing negative impacts;
- Promoting an interaction between communities and PETROBRAS, enabling answering questions and receiving comments and suggestions of groups that have interference in the activity.

Environmental Education Project (PEA)

This project is inserted into the Environmental Education Program Santos Basin (PEA-BS) and will meet the Technical Note CGPEG / DILIC / IBAMA No. 01/10, which establishes guidelines for development, implementation and dissemination of PEAs developed regionally, in the process of environmental licensing of maritime enterprises of exploration and production of oil and gas.

The main objective of this program is to promote integration and coordination of actions of environmental education (EA) for the entire area of operations of the AGBS in order to stimulate the participation of social groups affected by exploration and production of oil in the region of AGBS. The broad scope proposed by PEA-BS, is a way to seek greater consistency with the reality of local communities in the implementation of environmental education projects.

These are some of the actions planned for the PEA-BS:

- Identify and raise the demands of social groups affected by the activity, from the problems, conflicts and capacities identified by these groups in relation to their environment;

- Conduct the inventory and evaluation of EA projects already implemented and running in the Area of Influence of Geographic Area of the Santos Basin, as well as other actions related to public policies related to socio-environmental area;

- Define the social groups to be prioritized as the subject of educational action, from the results of the above actions.

Environmental Education Project for Workers (PEAT)

The Environmental Education Project for Workers aims to raise awareness among workers involved in the drilling activity on the main environmental and social impacts of AGBS about the activity. It also presents the legal standards applicable to the activity, and notions for the preservation of the environment (**Figure 42**). The PEAT gives workers the ability to generate trading experiences, creating a positive social interaction.

Figure 42: Training of Workers.

Throughout the process are analyzed the participants' suggestions for improvements in methodology, and topics of interest, aiming to improve the course and meet all expectations of the participants.

The implementation of PEAT follows the recommendations of IBAMA, always looking for the educational use of bold, fun and participatory with action, both individually and collectively, thus ensuring the

participatory nature and liberating this learning process.

Thus, the specific objectives of PEAT are:

- raise awareness among employees about the environmental and social impacts associated with drilling activities;
- provide information on environmental projects designed to minimize the potential impacts of operation;
- spread among the workers on the concepts of waste management and environmental legislation;
- provide knowledge to workers in procedures for containment of spills and emergency response;
- report on the fishing activities undertaken in the area of the drilling activity.

The project's ultimate goal is to generate knowledge that multiplies among employees so that they start to monitor their own actions, minimizing the environmental interference.

Individual Emergency Plans

Each of the 31 platforms that operate in the Drilling Activity in the Geographic Area of the Santos Basin has an Individual Emergency Plan (PEI) with response actions for incidents of oil spills elaborated considering the requirements of Resolution No. 398/08.

In the case of oil spills (**Figure 43**) that exceed the limits of the platforms, the actions to be taken are described in the Emergency Plan for Oil Spill in the Geographic Area of the Santos Basin - PEVO - BS Drilling, a document attached to the PEI platforms.

Figure 43: Simulation of oil spill accident in the sea..

The PEVO - BS Drilling provides procedures to be adopted to respond to incidents of oil spills outside the boundaries of the premises (at sea or on land). It also defines responsibilities and tasks of the teams responsible for response operations and procedures to be followed in every situation.

These procedures are:

- cessation of the drilling activities;
- reporting the spill to competent authorities;
- containment and collection of oil;
- protection of vulnerable areas;
- monitoring of oil slick;
- cleaning of the affected areas;
- collection and disposal of waste generated.

The PEVO - BS Drilling also lists the equipment to be used during the response procedures, such as containment booms, oil collectors, chemical dispersants arranged in support vessels.

PETROBRAS has eight support vessels to the emergency oil spill and a dedicated steering distributed along the Geographic Area of the Santos Basin, in order to ensure the service anywhere in the AGBS up to 6 hours.

If the resources of the vessels are not sufficient, the company can count on the equipment of the **Environmental Protection Centers (CADs).**

Environmental Protection Centers (CDAs) are bases located along the shoreline where PETROBRAS has equipment and trained personnel, ready to act immediately in case of an emergency oil spill.

Final Considerations

This Environmental Impact Report presented in summary form, the considerations regarding the Conduct Adjustment Agreement (TAC-BS) for the regularization of the drilling and production activities in AGBS in Merluza Field, signed between IBAMA and PETROBRAS.

And still the information from the Environmental Impact Study designed to provide basis for the environmental licensing process of the AGBS.

The environmental impacts of the activity in normal operation conditions, as indicated in the evaluation of impacts, can be minimized if the necessary precautions are taken for environmental preservation. For this, the activities must comply with Brazilian and international safety and environmental protection legislation and standards, to continue and implement environmental projects proposed and meet the conditions of the Environmental License, which will be issued by IBAMA.

Overall, the impacts were assessed as local, temporary and reversible and should not be impairment of environmental quality in the region due to the possibility of restoring the original condition after the deactivation of the activity.

Most significant environmental impacts would only be caused by accidents involving oil spills, which would lead to contaminated water, marine fauna and flora, and coastal ecosystems. To reduce the environmental consequences of an accidental oil spill, PETROBRAS, through the Emergency Plan for Oil Spill in the Area Geographic of the Santos Basin (PEVO-Drilling) is ready to perform the necessary response actions.

The Offshore Drilling Activity in the Geographic Area of the Santos Basin (AGBS) and the Activity of Production and Flowage of Natural Gas and Condensate in the Merluza Field contribute to the consolidation of the Brazilian market of natural gas and to maintain its self-sufficiency in the oil supply in the country.

From the technical review and approval of the environmental studies presented, the Offshore Drilling Activity in AGBS which today is carried out under the Conduct Adjustment Agreement of the Santos Basin (BS-TAC) will be performed under authorization of the Operating License to be issued by IBAMA.

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