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# Economic and Financial Feasibility Study of LLX Logística S.A.


- Market Study

- Consolidation of assumptions and validation of the business model

**RAM Engenharia**

- Port Açu Project

-Capex estimate for Port Açu


- Port Brasil Project

- Capex estimate for Port Brasil


- Port Sudeste Project

- Capex estimate for Port Sudeste


- Assumptions for the operating expenses for Port Açu iron ore

**Logiserv Consultoria**

- Operating expenses estimate for other loads of Port Açu, , Port Brasil and Port Sudeste.

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# GENERAL INDEX

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# 1 Foreword

This Feasibility study was developed at the request of LLX Logística S.A. (LLX or LLX Logística) with the sole purpose of meeting the legal and regulatory requirements of the Securities and Exchange Commission regarding the application for registration of a public company and the listing of shares issued by LLX Logística in Novo Mercado segment of BOVESPA

This Feasibility study was developed by Verax Consultoria e Projetos Ltda. (Verax) and was based on Verax's knowledge and understanding of the sectors and projects described herein, within the assumptions exposed herein and the limitations inherent to this type of analysis containing estimates and projections of macroeconomic, commercial and statistical data.

The study presents the results of a simulation of the demand for the port services to be offered by LLX Logística and includes an analysis of the potential profitability of the investment. It also presents, in a detailed manner, the results of several analyses supporting the establishment of potential volume targets to be met by the LLX Logística management.

As the study is based on independent analyses by Verax, future results might turn out to be different from those indicated by such analyses.

In order to understand this study properly one must bear in mind that the information herein, especially the projections, is subject to influence from several variables such as economic, regional, political and commercial factors that can change at any time, as well as various types of risks. These risks include but are not limited to the failure by LLX Logística to execute the business strategy described and to implement part or all of the projects described in this study within the defined schedule. These unforeseeable events and risks add a level of uncertainty to such information, which is based on assumptions that may not materialize in the future, either fully or partially.

Furthermore, the assumptions used for projecting LLX Logística's future results were based on our current understanding and capacity to forecast these assumptions and on the current market dynamics and values. Such assumptions may either not materialize or undergo changes during LLX Logística's operations. Even if they do materialize, several other factors that have not been considered, including those referred to herein, might play a determinant role in preventing LLX Logística from achieving the expected rates of return. Therefore, even if LLX Logística implements the projects in the manner and within the schedule described in this study, the costs, deadlines, service prices and other assumptions adopted by the company might turn out to be substantially different.

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Some of the factors that might have an impact on the assumptions regarding the future, and consequently on the projections made in this study, are:

- Brazil's economic, political and business scenario.
- LLX Logística's lack of operational track record which reduces the level of certainty regarding its capacity to develop its business plan with the anticipated costs and obtaining the forecast return.
- LLX Logística's capacity to implement its operational strategy and business plan, including its capacity to undertake loans when necessary and at reasonable terms.
- LLX Logística's level of debt and other equity obligations.
- Inflation, exchange rate volatility and interest rate fluctuations, amongst other macroeconomic variables.
- Changes in current and future laws and regulations, including those related to the environment and to the operation of private and mixed use terminals.
- Government interventions resulting in economic, tax, tariff or regulatory changes in Brazil.

LLX Logística's actual results may be hindered and consequently prove to be substantially different from the expectations described in our projections. Therefore, the projections cannot be seen as a guarantee of LLX Logística's future performance.

This Feasibility study does not contain all the information which may be important for making the decision regarding the investment, and are we not obliged to carry out any future alterations or updates to information, estimates or projections in this study, which may be subject to change. Potential investors should also carefully consider all available information relating to products and markets relevant to LLX Logistica´s activity.

As LLX Logística has no operational history, we have included macroeconomic, commercial and statistical information and estimates about the Brazilian economy, as well as other information about the markets in which the company will operate.

The information was obtained from various domestic and international public, autonomous and regulatory sources, such as the World Trade Organization (WTO), the Ministry of Agriculture (MAPA), the Ministry of Transport (MT), the Ministry of Mines and Energy (MME), the Brazilian Census Bureau (IBGE), the Brazilian Central Bank (BACEN), the National Commodities Corporation (Conab), the Energy Research Corporation (EPE), the National Oil, Natural Gas and Biofuel Regulatory Agency (ANP) and the port authorities in the states of São Paulo (CODESP), Rio de Janeiro (CODERJ) and Espírito Santo (CODESA), among many others.

We also consulted data published by reliable companies such as LLX Logística itself, MMX Mineração e Metálicos S.A. (MMX), MPX Energia S.A (MPX), Anglo

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American,, Petrobras, VALE and Companhia Siderúrgica Nacional (CSN), among others.

The methodology and terminology used by these sources were not always the same and data from different sources cannot be immediately compared. Furthermore, other similar studies might use different methodologies from ours and consequently produce results that are significantly different from our estimates which, as stated before, might be subject to the influence of economic, regional and commercial circumstances that could change at any moment.

We believe that the information herein was provided by reliable sources and as such due care was taken. Thus we assume that the macroeconomic, commercial and statistical data are correct and accurate, and they have not been checked in an independent manner.

The Feasibility study can be seen as an exercise of defining a base scenario which is associated to a demand scenario positioned between an average and an optimistic outlook for the future demand scenario for each service. It is a reasonable assumption scenario within an outlook of sustainable economic growth and economic stability in Brazil, as indicated by the current situation. The analyses suppose that: (i) the set of three ports of LLX Logística plus the MMX Minas-Rio system ore pipelines will be implemented by the scheduled dates; (ii) the port terminals will use modern and high productivity technology in all their operations (unloading, warehousing, handling, shipment or arrivals); and (iii) the terminals will be administered by a highly capable team with significant experience in port operations.

The information relating to OPEX and CAPEX was taken from studies conducted by specialized engineering and consultancy companies which LLX Logística made available to Verax for this Feasibility study. The studies were conducted by qualified companies with renowned expertise in port engineering, such as Sandwell, Planave and RAM Engenharia. In the case of OPEX, specialized consultancy firms such as Logiserv and Natrontec were hired. For the simulation exercise we checked the prices of services equivalent to those charged by similar existing service providers. The prices presented are only an indication of average prices currently charged by competitors **and therefore must not, in any way, be considered as future price expectations. However, as future prices are unknown and uncertain, we have adopted the aforementioned prices for the business specifications and profitability simulations.**

Enclosed are the CVs of the main individuals and businesses that took part in this study.

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# 2 Introduction and background of the projects

The sharp increase in global trade has been partly due to an improvement in port operations around the world. For example, the introduction of containers in the 1960s and of handling equipment has reduced ships' berthing times over thirty-fold.

The private sector started to provide services in Brazilian port terminals following the introduction of Law 8.630, of February 25, 1993 (Law 8.630/93), known as the Port Modernization Act. The efficiency of the ports increased significantly and for a few years the existing infrastructure was able to cope with the rise in flows. However, over the past few years, expansion of this port infrastructure has become imperative, resulting in the creation of new terminals, albeit still at a slow pace.

This increase in volume, together with the growth of the cities surrounding the main ports, has aggravated the already critical situation caused by shortcomings in the infrastructure and access. Today, Brazil's global maritime import and export operations present a low rate of efficiency and high costs when compared, with a few exceptions, to average operations in developed countries.

The vast majority of Brazil's port terminals currently operate with volumes over their optimum operating point, thus generating efficiency losses for the ports themselves and reducing the country's economic competitiveness on the international market.

Therefore, LLX Logística's business plans are timely and in line with Brazil's logistics needs. The depleted capacity of the Brazilian highway, railway and port networks in general, together with the accelerated growth in agricultural commodity and mineral exports have created ripe conditions for new large-scale investments in the country. In the economic context of large volumes being handled and current efficiency levels, investments in the transport infrastructure have proven very profitable for the private sector.

Some of Brazil's economic qualities have recently gained value with the fast increase in Chinese demand for supplies and food. Iron ore exports have grown by over 8% a year in the past seven years. Soybean and sugar exports are expected to rise in volume by an average 3% a year over the next ten years, while ethanol exports are expected to triple in the same period. Meanwhile, as domestic agricultural production begins to increase to meet rising global demand, this should prompt an 8% rise in Brazil's fertilizer imports.

Currently, agricultural bulk distribution tends to be directed towards the Santos and Paranaguá ports, while minerals from Minas Gerais are usually exported via Rio de Janeiro and Espírito Santo states. LLX's projects foresee the implementation of three ports strategically located in the aforementioned regions, with a proposal to create a complete logistics system rather than just an investment portfolio.

A properly planned port comes into this scenario with significant advantages. LLX Logística's ports would be built in areas with more space and with easier access. Unlike the old ports, these areas would be planned for the entire logistic supply chain , thus ensuring significant efficiency gains. The deep draft to meet the requirements of large

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vessels plus the implementation of the planned high-capacity handling equipment represent significant advantages to the proposal.

Historically the implementation and operation of port infrastructures have not been considered profitable activities, hence the need for public investment in the majority of countries with a coastline. Nowadays, the scenario has changed. Ports have become sufficiently profitable to justify heavy investments in infrastructure, such as protection piers, large dredging operations, berths and long-access bridges. This new scenario has led to a surge in port privatizations around the world.

The LLX Logística terminals are to be installed in planned areas with orderly internal growth. They have been forecast to operate within international efficiency standards and in general have better access than the existing ports in the regions where they are to be built. By offering a more adequate infrastructure, the LLX Logística ports will have potential competitive advantages over their competitors. One of these advantages is that the ports will be built outside the area covered by public port authority legislation, thus enabling greater speed in both the construction and the operations of the ports.

Although a far-reaching and well-coordinated plan for a logistics infra-structure is highly pertinent, the LLX Logística project is bold and ambitious. The two largest ports, Açu and Brasil, will be multiuse terminals that will offer a variety of services with various different operational characteristics, such as:

- The types and geometry of the vessels.
- Necessary cargo handling equipment.
- Retro port area space and facilities.
- Operational means.
- Management and control means.

On the one hand, these aspects present difficulties that must be overcome by means of a carefully drawn-up basic project and through tight operating planning carried out by experienced professionals. On the other hand, the wide variety of services provided by the same port will enable the joint use of expensive assets, thus affording the investment a strong element of synergy.

The evaluation by Verax summarized in this Feasibility study is aimed at each specific line of business and **does not assess whether or not the combination of different activities is appropriate**. Even though a financial model can simulate a possible reality for each product, this tool is not capable of projecting the operational viability of the whole set of products, and therefore cannot ensure the success of the project.

It is extremely important to emphasize that during the business profitability simulation, the price assumptions used for the base scenario are coherent with the average prices adopted by Brazilian port terminals evaluated under current market conditions. In a scenario where demand is higher than the optimum capacity, port service prices rise,

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meaning that the currently charged prices may be inflated and generally higher than those charged by port terminals in developed countries. The additional capacity generated by the arrival of LLX Logística and of other terminals that have already been announced will diminish the overload, which in a balanced market should lead to a reduction in prices. LLX Logística also believes that if the additional capacity is proportional to the additional demand resulting from increased foreign trade, prices will not suffer from deflationary pressure. This rationale by LLX Logística was used by Verax in its investment return analysis.

**Document Structure**

The Feasibility study is structured in the following manner: it begins with a presentation of the basic methodology used, followed by a general overview of the port complexes and of the logistic services that comprise the business plan based on information provided to Verax by the LLX Logística management.

Next, the study describes and analyzes the potential businesses planned by LLX Logística. The texts follow the same structure, with a few variations: (i) recent background (ii) forecast demand (iii) current and future capacity (iv) projections for the LLX Logística ports, and (v) risks.

Based on the demand and price projections we carried out a financial appraisal of the business units including the following estimates (i) billing; (ii) fixed and variable operational expenditures (Operational Expenditures or "OPEX"); (iii) Selling, General and Administrative Expenses (or "SG&A"); and (iv) implementation and maintenance investments for each port (Capital Expenditures or CAPEX).

The information relating to OPEX and CAPEX was taken from studies conducted by specialized engineering and consultancy companies which LLX Logística made available to Verax for this Feasibility study. The studies were conducted by qualified companies with renowned expertise in port engineering, such as Sandwell, Planave and RAM Engenharia, while in the case of the OPEX, specialized consultancy firms such as Logiserv and Natrontec were hired.

Although Verax believes that the information taken from the aforementioned studies came from reliable sources, naturally it cannot guarantee its completeness and accuracy. The validity of the most significant information was verified by Verax. Whenever conclusions different from those of LLX Logistica´s management were found, such were explained and the causes duly discussed, but verification of the information was not exhaustive. There were situations (explained in the text) in which Verax maintained information provided by LLX Logística.

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# 3 Analysis Methodology

The evaluation of LLX Logística's business case was carried out with the use of a financial model and can be translated into the investment return rate. As its entry data, the model uses estimates of the demand for port services, of the investment required, of the operating expenses and tax structure and of prices charged.

Verax used investment, operating expenses and tax data which were supplied by LLX Logística and based on engineering studies especially commissioned for that purpose.

The demand and prices were determined by Verax and are described in detail throughout this Feasibility study.

The demand for port services for each of the projects proposed by LLX Logística was based on a supply projection for these businesses, always bearing in mind the forecast capacity for each one of them.

The supply/demand equilibrium was obtained through a detailed analysis of the local conditions for each type of cargo to be handled. In most cases the following process was adopted:

1. Projection of the future demand for the service.
2. Analysis of the port capacity for the service.
3. Analysis of price behavior.
4. Mapping of port and general logistics expansions.
5. Forecasting supply / demand equilibrium (with the necessary adjustments).

Although this is more or less standard procedure, several services required specific analysis due to difficulties in determining one of the variables mentioned above.

**The year of reference for the demand projections is 2016**. This means that subsequent volumes, which are necessary for the financial perpetuity model, are determined through simplified approximations based on the behavior until that date. It is important to point out that large infrastructure expansion or implementation plans, such as for port and land access, are usually announced around three years before their conclusion. Bearing that in mind, for the supply-demand balance that supports almost all the analyses carried out by Verax, port capacity supply is considered in line with plans announced **only for until the 2010-2012 period**. Capacity supply after this period is estimated according to past development. This may imply in the supply forecast being underestimated but it is unlikely that it is overestimated.. It is possible that confidential planned expansions might raise the capacity supply by a greater degree than that which has been verified in the information available to Verax, as it is also possible that not all the announced expansions shall be completed.

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One should also take into account that the demand is often divided between the supply capacity so as to balance it amongst the market players. However, in the case of the LLX Logística ports, this situation will be different because by offering competitive advantages in relation to other ports they will be better positioned to absorb increased demand. A greater market share absorption capacity was assumed for LLX Logísitca in relation to agricultural bulk loads and containers at Port Brasil. As a result the idleness rates for those terminals are lower when compared to others. This procedure was adopted so as to prioritize the construction of a more modern project, with a deeper draft, better access than some of the existing terminals and a potentially better organized retro area. Once again it is important to bear in mind that the simulation is just a simulation. Numerous hypotheses may be contested by one argument or another. Again, the simulation translates the evaluation of the Verax consultants and therefore contains their interpretations and perceptions of the market.

Some services have not been evaluated in as much depth as others, which is explained in a timely fashion throughout the study. In these cases, Verax used the demand and price projections provided by LLX Logística and is therefore not accountable for the accuracy or validity of the information.

The first version of this study was concluded in October 2007 and updated in March 2008. All the analyses are based on scenarios from that date as well as on information made available at that time. Even though subsequent alterations have been made to the document due to adjustments to the LLX business plan, the scenarios of analysis remain widely based on the scenarios and analyses conducted in the original version.

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# 4 The Açu, Sudeste and Brasil Port Complexes

The LLX Logística port terminals are located in strategic areas of the country, as shown in the map below:


**Figure 1: Map of the LLX Logística port complexes**

The main characteristics of the LLX Logística port complexes are described below.

## 4.1 Port Açu

The Port Açu will be jointly built and operated by LLX Porto do Açu Operações S.A. (LLX Açu) and by LLX Minas-Rio Logística Comercial Exportadora S.A (LLX Minas-Rio). LLX Logística S.A owns 70% of the share capital of LLX Açu and 51% of LLX Minas-Rio. The remaining 49% belongs to Anglo American.

LLX Minas-Rio owns a 300-hectare area in the town of São João da Barra, in Rio de Janeiro state, where it will install a sea port terminal for iron ore. LLX Açu also owns a nearby area of approximately 7,500 hectares, where it will install the Port Açu complex. By means of an agreement signed with LLX Minas-Rio, LLX Açu has the right to share the port infrastructures of the Port Açu, including the access bridge and the sea-wall, as well as the option to build additional berths and carry out port logistic operations for third parties against the payment of a fee per ship/ per tonne to LLX Minas-Rio.

On June 20, 2007 the National Waterways Transport Regulator (ANTAQ) authorized LLX Minas-Rio to build and operate for an indefinite period, the private mixed-use Port

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Açu complex. The license authorizes both the handling of its own and third-party cargo. A Preliminary Environmental License was granted by the Environmental Engineering State Foundation (FEEMA) on December 28 2006, and an Environmental Installation License for beginning the construction work was granted on May 14 2007. In June 2006, the Minas Gerais and Rio de Janeiro state governments formalized their cooperation for the implementation of a logistics corridor between the two states. According to LLX Logística, the revised estimated investment for the Port Açu facilities is approximately USD 1,6 billion.

Port Açu will have two berths that are specially designed for the different types of products handled at the port, aimed at maximizing interaction and capacities and at meeting the requirements of a wide range of clients. The port's natural depth of approximately 15 meters will be increased to 18.5 meters to allow for the operation of larger vessels (Capesize).

Port Açu, where operations are scheduled to begin in the first quarter of 2010, will distribute iron ore produced by MMX (mentioned above), the parent company of LLX Logística, whose production is forecast to reach 26.6 million tons a year (Mtpy) of pellet feed in the first stage by 2011, and this amount is to double in the second stage, to be reached in 2014. The ore will be distributed through an approximately 525 kilometer-long ore pipeline linking the processing plant to be built by MMX Minas-Rio in the town of Alvorada de Minas, in Minas Gerais state, to Port Açu.

As of 2011, LLX Açu will start to operate the remaining piers to complement the port's ore activities with non-ore cargo. By the end of the study range, in 2032, it is forecast that Port Açu will handle 15.3 MT of mineral coal and coke, meeting the demand of the steel and pellet feed companies located in the port's retro are and coverage area. It shall also meet the needs of a MPX inside-the-fence thermoelectric plant with an installed capacity of 2,100 MW (three 700 MW modules) as from 2013, and the demands of the cement plants in the macro coverage area.

The port will also have a general cargo terminal which will handle, amongst others, steel products (11.2 MT), containers (330,000 TEUs) and granite (1.53 MT). Meanwhile, a liquid bulk terminal has been projected with an annual handling capacity of 4 million $m^3$ of Liquefied Natural Gas (LNG). Taking advantage of the privileged conditions available to meet the logistics and supply needs of the oil and gas exploration activities in the Campos Basin, two berths have been allocated for offshore logistics. These berths shall receive over 900 berthing operations a year and handle around 75,000 tonnes, of cargo, as well leasing an area of around 30,000 $m^2$ for the warehousing of supplied for offshore oil and natural gas exploration.

The adjacent 7,800-hectare retro area with multi-modal access and strategically located for Brazil's main economic region will allow the Port Açu to attract companies from various economic segments. The Port Açu Complex has also received the legal status of an Industrial District, which lays down favorable conditions for the installation and development of various types of industries including steel, thermoelectric, gas, automotive, metal-mechanic and refinery plants, as well as warehousing and logistics installations.

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## 4.2 Port Brasil

LLX Açu has signed an agreement with Espolio de Leão Novaes, by means of which it will receive a deed of assignment of inherited rights. Amongst the assets covered by the deed is the land with a total area of 19 million m², on a 4-kilometer long coastline, located in Peruíbe, 70 kilometers from Santos, in São Paulo state, where the Port Brasil will be installed. The final arrangements are being carried out for the transcription of the respective deed. Port Brasil will share the area with the Taniguá Industrial Complex, by means of the leasing of the area to other companies. The government has promised a 6 million m² area for the port, while the remaining 13 million m² will be divided between the industrial area and the environmental reserves.

The infrastructure of Port Brasil will include a 500,000 m² private maritime terminal, 11 berths and an 18.5 meter-deep approach channel allowing for the operation of Capesize vessels.

Operations at Port Brasil are scheduled to begin in 2012, and they will consist of distributing lump iron ore produced by MMX and by third parties in the region of Corumbá, in Mato Grosso do Sul state, with an estimated volume of 20 MT a year by 2015. Furthermore, by the end of the study range, in 2032, Port Brasil is forecast to handle 29 MT of agricultural bulk; 10 MT of fertilizers; 7.5 million m³ of liquid bulk and 3.2 million TEUs a year originating from different production areas in its hinterland.

The port's 13 million m² adjacent retro area is connected to the main highways and railways that access Brazil's most important economic region and is strategically located to overcome bottlenecks, increase operating efficiency and diminish the road and environmental impact in the region. Port Brasil industrial complex will be able to absorb companies from different economic segments, including consumer electronics, metal mechanic, logistics and distribution centers and assembly lines, amongst others.

## 4.3 Port Sudeste

LLX Açu has acquired a land lot in the town of Itaguaí, in Rio de Janeiro state, for Port Sudeste to be located near the VALE and CSN ports. Port Sudeste will handle iron ore from Minas Gerais state on a 512,000 m² area and operations are scheduled to begin in 2011. The port is strategically located near the Sepetiba Port, however a tunnel and access bridge are needed to connect the yards to the pier. It intends to reach a volume of 25 MT per year by 2015, remaining at that level until 2032.

The region can be accessed by an MRS railway line and by the BR–101 highway. The Federal Government has recently approved an investment for the construction of a road arch linking the terminals in the Itaguaí region to the BR-116 (Rio de Janeiro – São Paulo), BR-040 (Rio de Janeiro –Belo Horizonte) and BR-101 (Rio de Janeiro – Campos de Goytacazes) highways. This development will eliminate the need to cross

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Rio de Janeiro city and facilitate the connection between the Sepetiba Port and Brazil's main cities. A concession to manage the stretch of the BR-101 between Rio de Janeiro and the state border with Espírito Santo was recently granted to a private enterprise.

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# 5 Analysis of the demand for the main services at the Açu, Sudeste and Brasil Port Complexes

We have evaluated 17 business proposals made by LLX Logística[1]. Figure 1 shows the share of each business in the total EBITDA determined by Verax, classified according to the predictions made available by LLX Logística in its plan.

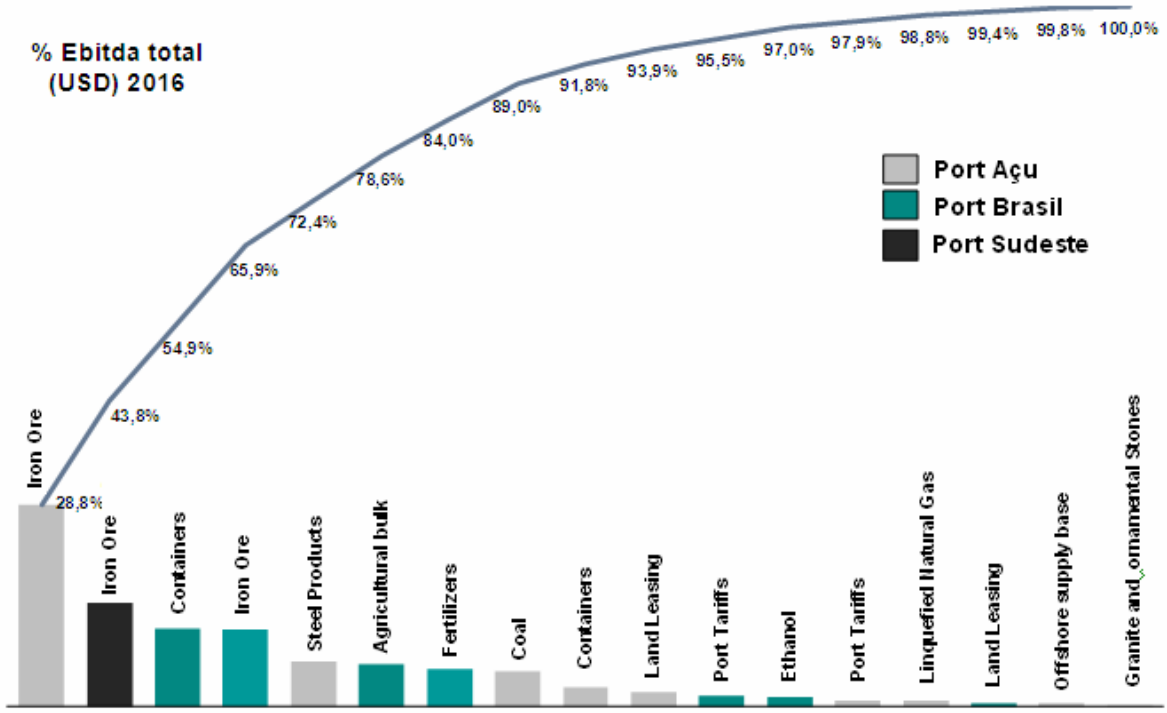


**Figure 2: Evaluated businesses and their share in global operations (% of the total EBITDA in 2016)**

Below is an description of the potential handling volumes and services of each type of business for each port in the year of 2016, for subsequent expansion by the year 2032. Based on the 2032 results, continued operations are presumed for complete evaluation.

[1] Two businesses of which the total revenues do not exceed US$1.0 million, have not been evaluated: tug boats and utilities. The leasing values for the area (Açu and Brasil Ports), port fees and offshore support base were estimated based on the proportion of the Port's total billing.

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The simulation was carried out in an independent manner by Verax, except in the following cases: 1) leasing of the areas in the retro area and in the industrial complex of the Açu and Port Brasils, in which the prices used in this feasibility study are those adopted by LLX Logística's financial analysis (the remaining aspects have been independently analyzed by Verax); 2) Regarding the volumes of iron ore to be distributed by the LLX Logística ports, where considerations were limited to those of a general nature and of access logistics; 3) in the analysis of the Port Açu's offshore support, in which Verax did not use its own assumptions but the ones used in the LLX Logística business plan. As regards this item, however, we do present the market background, a survey of current and future capacity and a careful consideration of the existing risks.

Throughout its execution, this exercise was carried out in an independent manner by Verax.

Each business is geared towards a specific supply, demand and pricing dynamic and was individually analyzed for defining a **base scenario** for the forecast demand.

Each business is presented according to its share in the EBITDA, in a decreasing order, and divided by port.

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# 5.1 Port Açu

## 5.1.1 Iron Ore

**Recent background**

Global iron ore production reached 1.7 billion tonnes in 2006, accounting for an 8.3% rise over the past 7 years. In 2006, Brazil was the world's second biggest iron ore producer with 317 MT, only surpassed by China with 520 MT. The Brazilian ore is of a very good quality and is ranked second in terms of exported volume after Australia.

In the first seven months of 2007, Brazilian exports totaled 144.7 MT with a revenue of US$7.5 billion – corresponding to respective rises of 5.4% and 19% against the same period in 2006.

Iron ore pricing is carried out via contracts established directly between the mining and steel companies. Unlike commodities, the product is not traded in the commodities exchange, as its composition and granulometry can vary greatly from region to region. Prices are fixed on an annual basis, even for longer contracts. Usually the first big contract signed determines the price variations within the year. VALE, the world's biggest iron ore producer, has led price negotiations over the past 5 years and through an aggressive policy it has ensured sharp price rises (71.5% in 2005, 19% in 2006 and 9.5% in 2007 and 65% to 71% in 2008).

The 65% to 71% adjustment agreed in the first contract of 2008 between VALE and a steel industry group surprised a large part of the market. Projections by investment banks estimate rises of 30% (up to 50%) in 2008.The ebullience in the iron ore market, as well as the shortcomings in the Brazilian infrastructure, have provided significant opportunities for economically powerful integrated players.

**Ore pipeline transport infrastructure**

MMX Minas Rio's plans are to implement two ore pipelines for the distribution of 53.2 Mtpy of pellet feed, reaching full capacity by 2014. The first pipeline will begin operations in 2010 and the second in 2012, and both will transport a maximum volume of 26.6 Mtpy of ore from the MMX Minas-Rio mines. The distribution of ore via this pipeline offers the same level of certainty as the iron ore port terminal operations in Açu. The MMX Minas-Rio ore pipelines will take iron ore to a port that will be built and operated by LLX Minas-Rio, a partnership between LLX Logística (51%) and Anglo American (49%). LLX Minas-Rio will have the exclusive rights to handle MMX Minas-Rio's ore against the payment of a tariff established in contract. Of the volume to be transported via the ore pipelines, 10 Mtpy shall go to the Açu steel plant and the other 43.2 Mtpy shall be exported. The rest of the ore to feed the steel plant, with a production capacity forecast at 9.6 Mtpy, shall be received by rail.

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The estimated deadline for the start of the operations is very bold and will require intense efforts by the company. However, it has already been facilitated by the granting of an environmental license and by advanced negotiations for the right of passage.

According to the company, MMX Minas-Rio has already started to produce the 26.6 Mtpy necessary for the first ore pipeline at Serra do Espinhaço. A second pipeline is already being considered for the beginning of the next decade, pending confirmation of the availability of mineral resources and the granting of environmental licenses. Thus, the projection for the ore pipelines is practically guaranteed.

The actual execution of the MMX Minas-Rio plans shall ensure the feasibility of an iron ore terminal on the northern coast of Rio de Janeiro state.

The strategy of integrating the entire production and distribution system with the ownership of the mine, of the ore pipeline, of the pellet plant and of the port terminal has also been adopted by Samarco Mineração S.A. (Samarco) and has shown long-term success. Samarco is currently expanding its ore pipeline from 15 to 22 Mtpy of pellet feed.

Samarco's example has legitimized the strategy to be adopted by MMX Minas-Rio and LLX Minas-Rio.

**Demand for the LLX Logística services for third-party transport and railway access infrastructure**

In addition to the iron ore volumes that will be transported through the ore pipelines, LLX Logística's plan for the Port Açu foresees a volume of 10 Mtpy of iron ore being attracted to the port from other regions in Minas Gerais, to arrive by railway. Part of that volume shall be absorbed from the Serra Azul region, where MMX Sudeste or AVX already controls a complex which includes the AVG mine, although production is scheduled to be distributed via the Port Sudeste. Another part shall come from mines located in the iron ore region of Mariana through which the FCA railway runs. This operation shall begin in 2013, with 4 MT, reaching to 20 MT as from 2017.

Currently there are 13 operating mines in this region, with estimated iron ore reserves of over 2 billion tonnes. VALE and CSN have one mine each in the region. The remaining 11 until recently belonged to small to mid-sized mining companies, mostly family businesses. However successive takeovers, instigated by the high ore prices have led many of them into the control of the large mining companies, such as MMX Sudeste, or steel companies which dominate the logistics infrastructure and wield greater buying power.[2].

[2] As well as AVG and the Minerminas, which gave rise to AVX, there was the takeover of Minas Itatiaiuçu by London Mining, of Mineração J. Mendes by Usiminas and of Empresa de Mineração Esperança by the US fund Ferrous Resources. Companies such as Minerita and MBL, one of the few mining companies which are still family-owned, are being pursued intensely and specialists believe that

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It is unlikely that VALE enters the competition for purchasing new mines at the present time, as the takeovers would cost more than the expansions to their existing mines. Of the others, the only companies which would benefit from having their own logistics would be CSN and MMX Sudeste. The FCA railway connection, as will be explained below, and the Port Açu place MMX on a level footing with CSN, which has a terminal and has stock interest in the MRS railway.

Between them, these 11 mines have an established production capacity of 13 Mtpy[3] a year. Current enthusiasm in the iron ore market has prompted several plans to expand this capacity. New investments are being planned and it was estimated in October 2007 that production volumes may quadruple within a few years, taking the capacity up to 52 Mtpy.

AVG Mineração and Minerminas, recently bought by MMX Sudeste (formerly AVX) shall distribute its whole production to Port Sudeste. The 20 Mtpy of iron ore from third parties in Açu would originate from other mines in the region which do not have their own logistics facilities.

The future availability of these volumes as well their being effectively attracted to the port Açu **was not evaluated by Verax**, which restricted its investigation to the status quo of control over, and expansions to, the mines in the region. Although these volumes are not yet entirely established in the announced expansion plans for the regions, the growth rate of **forecast** expansions indicates a positive outlook regarding the availability of such volumes in 2017. In particular as regards the steel plant planned for Açu, for which business negotiations are already at an advanced stage.[4]

The railway transportation of the iron ore is scheduled to take place through the existing railway network and two distribution plans are being studied and illustrated in Figure 3.

The first solution would be distribution via FCA stretch from Miguel Burnier to Campos de Goytacazes, from where it would follow a 45-kilometer stretch to Açu that needs to be installed.

The initial stretch between Miguel Burnier and Cataguazes, needs to have its installed capacity increased. This is a long, old and sinuous stretch that has not received the investment foreseen in the concession contract. VALE, which controls the FCA, has not

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their takeovers are practically inevitable ("Tão Valioso Quanto Ouro" Exame Magazine, Year 42, Ed. 911, pg. 78)

[3] Association of Serra Azul Mining Companies

[4] As per the news announced in May 2008, the president of the Techint group, Paolo Rocca, admitted to Valor newspaper that he is analyzing investment opportunities in Brazil. He confirmed interest in developing the steel plant project at Port Açu, in northern Rio de Janeiro state, which belongs to Eike Batista, of EBX. Techint's interest in securing a space in the Port Açu back-area with a steel plant to produce steel sheets and tubes, evaluated at US$ 3 billion, was revealed by Eike Batista himself in March this year.
Rocca stated: "We have analyzed this and other projects, but have not yet made a decision." He said that he is looking at other investment options in Brazil, where he controls TenarisConfab, a seamed tubing manufacturer. He admitted that the group had been interested in the steel plant project in Maranhão, which Vale do Rio Doce attempted to carry out, but that Techint was not convinced by the project location.

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yet signed the Conduct Adjustment Agreement with the ANTT (National Terrestrial Transport Regulator). Negotiations are underway, including some within VALE, which does not want to give up control of the railway. The possibility of third-party operation, under contract with Vale, is also being studied..

An increase to the line's transport capacity could represent a valuable opportunity after the construction of Port Açu, as the system would become an alternative to the EFVM, which is currently nearing its full capacity. There is the possibility of an understanding between the interested parties and negotiations are underway. The most likely business model is that whereby LLX invests in the rolling stock, other companies invest in the infrastructure and the FCA operates the line. However the stretch is old. As well following a sinuous route, it also uses special tracks, which cost up to 5 times more than the normal ones and need to replaced to some extent on order to capacitate the line.

The second solution would be the use of the MRS railway line starting at Minerminas, or with a possible connection to AVG. This alternative would require the transshipment of around 10 MT which would come from the Mariana region via the FCA to the MRS railway. The remaining volume of roughly 10 MT would be distributed from Serra Azul directly via the MRS. With the volumes grouped together, the 20 Mtpy of ore would be distributed via the Ferrovia do Aço railway line (linking Belo Horizonte to Barra Mansa, in Rio de Janeiro, and which is part of MRS), going down towards Barra Mansa and then to the Três Rios region where MRS (broad gauge) connects to the Centro Atlântica Railway line (FCA) (metric gauge). Upon reaching this stretch the ore would be unloaded into a yard and subsequently loaded onto an FCA train. The estimated cost is US$2 to US$3 per tonne and this type of operation is already being carried out on the Northern stretch of the Vitória Minas railway line (EFVM) by VALE. After the connection, the ore is transported by the FCA until Campos de Goytacazes, where it goes onto a 45-kilometer stretch to Açu that needs to be installed.

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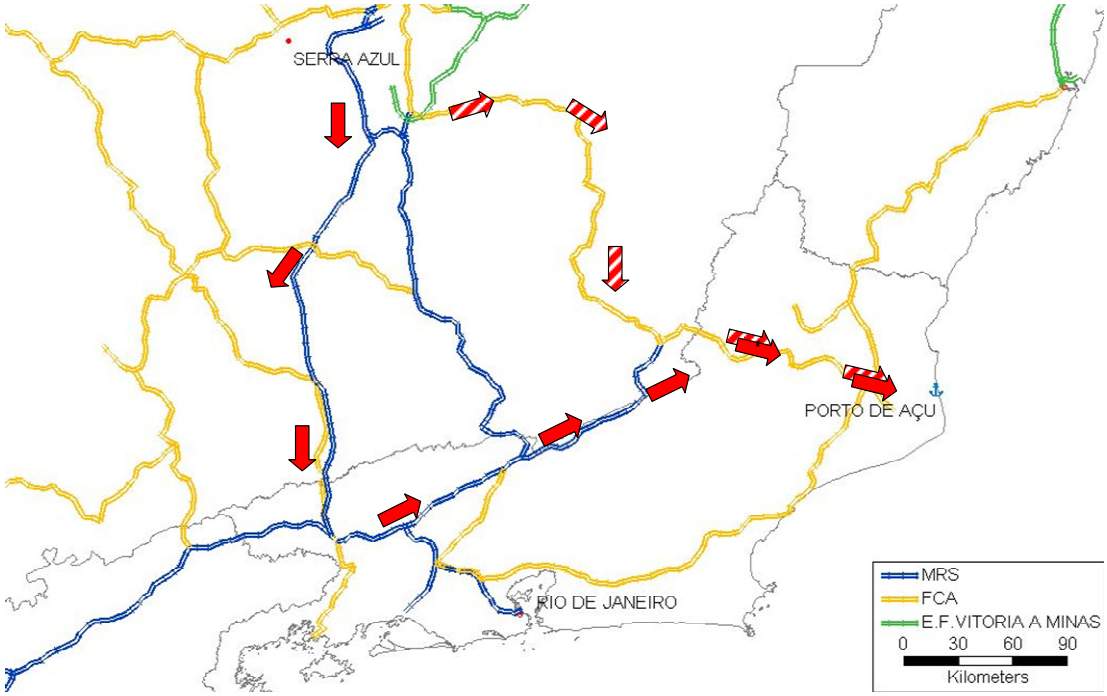


**Figure 3: Distribution alternatives between Serra Azul and Port Açu (Source: Verax)**

A forecast of the ore volume to be shipped from the port is shown in Table 1. The LLX Minas-Rio plans include the charging of US$6.65/t for shipping the iron ore from the ore pipelines, and US$10.50/t for the volumes delivered via the railway. However the plan does not set forth handling fees for the volumes of ore destined for the steel plant which arrive via the pipeline (10 Mtpy), but it does specify handling fees for volumes of sinter feed for the steel plant which would come via the railway.

The prices charged by LLX Logística for handling and shipping iron ore and paid by MMX Minas-Rio will be predetermined so as to ensure a specific return on the investment made by LLX Minas-Rio in the port infrastructure (15% pu of Internal Rate of Return to Firm ). The two companies have agreed that if the implemented project diverges from the original plan, the prices will be trued up.

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**Table 1: Iron ore handling at the port terminal (MT /year)**

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|
| Export iron ore via ore pipeline – MMX/Anglo American (MT) | 20.00 | 26.60 | 34.60 | 43.2 | 43.20 | 43.20 |
| Iron ore via railway line (MT) | | | | 4.00 | 8.00 | 12.00 |
| Iron ore for steel plant from ore pipeline – w/out handling fee (Mt) | | | | 4.00 | 8.00 | 10.00 |
| Iron ore – total (MT) | 20.00 | 26.60 | 34.60 | 50.60 | 61.20 | 65.20 |

| 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|
| 43.20 | 43.20 | 43.20 | 43.20 | 43.20 | 43.20 | 43.20 | 43.20 | 43.20 |
| 16.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 |
| 69.20 | 73.20 | 73.20 | 73.20 | 73.20 | 73.20 | 73.20 | 73.20 | 73.20 |

| 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|
| 43.20 | 43.20 | 43.20 | 43.20 | 43.20 | 43.20 | 43.20 | 43.20 |
| 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 |
| 73.20 | 73.20 | 73.20 | 73.20 | 73.20 | 73.20 | 73.20 | 73.20 |

Port Açu will not charge port infrastructure fees for the handling of iron ore. These fees are also not charged at the VALE terminals at the Tubarão and Ponta da Madeira Ports, t

## Risks

Most of the demand for the terminal's handling services (73%) is for loads coming through the pipelines. Therefore, the risks associated with this demand are the same as those associated with the pipeline operations, which depend on the Anglo American plans, which are already underway.

The 20 Mtpy volume can be transported via railway and the revenues associated with the handling and shipping of these products at Port Açu have already been considered.

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The plan does not, however, include the necessary investment in railway lines, namely in the FCA and the construction of the 45 kilometer stretch. Therefore, the revenues associated with these volumes depend on the actions of an interested concession holder. EFVM's current low capacity and the option of distribution via Port Açu should be acknowledged as an important alternative and the LLX Logística project should quickly attract political support.

Although MMX's biggest competitors have the independent or shared control of the MRS and FCA railways lines, the fact that the system is a public concession still under the supervision of the ANTT should mitigate the risks posed by a conflict of interests between the companies. As Vale is the controller of FCA and also one of the main shareholders in MRS, as is CSN, and they could play a role that goes against the company's interests, thus posing risks to the group's plans regarding the 20 Mtpy that are transported via the railway line.

Still regarding the rail line, the eventual transshipment from the MRS (broad gauge) to the FCA (metric gauge) tracks makes the operation more expensive and reduces the competitiveness of the ore from the South of Minas Gerais. The associated cost generates bigger risks to the investment, especially in the event of a global price depression, although this hypothesis is far from the current scenario and from the projections by the analysts of the industry. The option of using only FCA requires an investment to increase the installed capacity of the stretch in question, as the line currently operates with low capacity and its layout is obsolete.

Lately the MRS railway line has received several enquiries about its capacity to distribute new and large ore volumes, to which it has confirmed its intention to increase the installed capacity of its railway network in order to meet future increases in demand.

It is estimated that MRS handled around 130 MT in 2007, of which roughly 75% is iron ore coming through the Ferrovia do Aço railway line. The company has claimed to have the capacity to absorb up to 300 MT, with roughly 200 MT being transported through the same Ferrovia do Aço stretch. According to MRS, a check on whether this claim is accurate would have to be carried out through engineering projects based on distribution simulations via a dynamic system. Currently, the stretch in Brazil with the biggest flow belongs to the Carajás system–Ponta da Madeira, with an average volume of 100 MT and an announced expansion to 130 MT. The line is currently a single track, but with numerous overtaking points. Vale is reportedly increasing its installed capacity to 240 Mtpy, with duplication of the entire line.

In the event of shortages in the transport capacity, MMX would be at a disadvantage, as VALE and CSN together own 43.3% of MRS and would have precedence in the use of the railway network to export their own ore. Currently MRS provides services for MMX and has shown every intention of maintaining this partnership in the long-term.

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### 5.1.2 Steel products

The Port Açu Complex will start to handle Brazil's steel exports as from 2011, but the complex will have two different operating fronts. The first consists of an integrated coke plant to make finished and semi-finished export products and the second consists of the export of steel products made by existing companies.

***Steel plant for export of finished and semi-finished products***

**Recent background**

Since the mid-1990s Brazil's steel industry has seen relatively modest quantitative growth. Raw steel volume produced in the country rose from 25.1 MT in 1995 to 30.9 MT in 2006[5], accounting for an average annual growth of 1.9%. In the same period, Brazil's share in the international steel market fell from 3.3% to 2.5%

However, the decline in Brazil's international share is in direct contrast to the country's renowned competitiveness in the international steel market. One of the main indicators of this competitiveness is production costs, and Brazil's hot rolled coil production costs are among the lowest compared to the world's leading steel manufacturers. In this regard, Brazil is on the same level as Russia and India, and far below some Asian, European and North-American countries[6].

Meanwhile, global slab export volume reached 32.3 MT in 2006, 16% more than in 2005. Brazil is the fifth biggest exporter of this product with 3.0 MT in 2006, 7% more than in 2005. The main buyers of Brazilian slabs are North America (57%) and Southeast Asia (23%).

**Capacity versus demand (current and future)**

Brazilian steel reached an installed capacity of 37.1 MT in 2006 against 28.3 MT in 1995, an average annual growth of 2.5%. As said before, Brazil's steel industry has great potential, but its capacity has grown at a moderate pace over the past few years. One of the main obstacles to a sharper increase in capacity has been the **protectionist measures** adopted by the governments of potential importing countries. Meanwhile, domestic steel product consumption has also shown modest growth, from 12.0 to 18.5 MT between 1995 and 2006, a 4% annual rise.

[5] 2007 Annual Statistics for the Metallurgic Industry – Ministry of Mines and Energy
3: According to World Steel Dynamics (2006) – Steel production costs (US$/t): Russia 250; Brazil 266; India 266; China 335; Taiwan 353;South Korea 362; Eastern Europe 363; Canada 365; Australia 375; Japan 378; US 388 and Europe 445.

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Between 1991 and 1993 Brazil's largest steel companies (Usiminas, Companhia Siderúrgica de Tubarão, Acesita, Companhia Siderúrgica Nacional, Cosipa and Açominas) were privatized and between 1994 and 2004 there was a boom in investment in the industry. The average annual investment in the period rose to US$1.27 billion against US$476 million between 1984 and 1993. However, instead of just aiming at increasing production capacity, the focus of investment was shifted towards a diversification of the mix of products, hence the low rate of growth in the post-privatization period despite the significant investments made.

However, the Brazilian steel sector is beginning a new investment phase. The annual investment forecast for 2005-2010 is US$2.18 billion, which will be focused on increasing production capacity. According to an estimate by the Brazilian Steel Institute (IBS), Brazil's steel making capacity will increase from 37.1 MT of raw steel a year to 42.8 MT by 2010. This projection refers only to the expansion of plants in operation, accounting for a 5.7 MT increase.

As for the newcomers, the Companhia Siderúrgica do Atlântico (CSA)- a partnership between German steel maker ThyssenKrupp Stahl and VALE – is expected to add an extra 5.0 Mt to the capacity, in relation to an integrated coke plant scheduled to start operations in 2009 with a 5 Mtpy capacity in the initial phase and expansions scheduled to bring that figure up to 10Mtpy, which is receiving a US$4 billion investment and whose production will be destined for export. Considering the initial phase of this new plant Brazil's total steel capacity will reach 47.8 MT by 2010.

Several projects for new plants have already been announced, but as construction has yet not started, the most likely hypothesis is that these plants will be fully operating only as of 2010.

Recently, IBS released the following installed capacity estimate for 2012: (a) existing plants: 52.2 MT (b) new plants: 6.3 MT (c) plants under-study: 7.5 MT. This results in a total rise in installed capacity to 66 MT. Bearing in mind the recurring delays in the implementation of new plants in Brazil, it is assumed that an installed capacity of 66 MT would effectively be achieved only in 2016.

In terms of supply, as an approximate estimate based on an idleness rate of 8%[7], 66 MT of raw steel may result in 56 MT of steel products (semi-finished and rolled products). In terms of demand, the IBS has estimated Brazil's steel product consumption will reach 28.2 to 33.3 MT by 2015 and 29.5 to 35.5 MT the following year. Meanwhile, imports are expected to account for 10% of total domestic demand - 3.0 to 3.5 MT. A more optimistic outlook regarding domestic steel product demand foresees a maximum export volume of 24.5 MT by 2016, 92% more than in 2006, while a more pessimistic outlook of domestic demand would point to exports of 29.5 MT and a 136% growth. We could also work with the assumption that the increase in exports will be mostly of semi-finished products (namely slabs), for which protectionist mechanisms have rarely been applied

[7] Typical idleness rate for the industry is 8%. Recently in Brazil this rate has been higher mainly due to an accident at CSN in 2006 and to Gerdau's expansion without fully using its recently installed capacity.

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Baptista Fº. (2006)[8] pointed out that global slab demand reached 30 MT in 2005 and this figure will rise to 40 MT in 2010 and to 50 MT in 2015. On the other hand, if all the projects relating to slab production are carried out, supply would grow by 75.4 MT, which is totally inconsistent with the most optimistic demand forecast. In view of this, the actual construction of some projects will tend to discourage others from being carried out. This is particularly worrying in the case of projects that aim at supplying the spot market. In the case of back-to-back investments when there is a guarantee for the acquisition of semi-finished products, both by foreign partners and by the overseas subsidiaries of Brazilian companies, the risk is much smaller. Therefore, we can expect growth in the global slab market to be based much more on captive rather than spot sales.

According to LLX, there are indicators that the partner which intends to install its steel plants in Açu, manufacturing finished and semi-finished products, would have prior agreements to distribute the slabs produced there towards rolling plants abroad, which would reduce the business risk significantly. The recently announced interest of Techint in producing such products at Açu lends weight to the idea that the project will go through.

**Forecasts for Port Açu**

According to LLX Logística, the coke–fueled steel plant forecast for the Açu Industrial Complex will produce semi-finished (slabs) and finished products in 3 modules, to be installed in 3 phases: initial phase in 2013 with 3.2 Mtpy, with expansion to 6.3 Mtpy in 2015, and maturity in 2017 at 9.6 Mtpy.

Part of the production shall be transformed on site and the excess shall be transported to other units belonging to the group where the finishing processing shall be performed.

The project for this plant is rather daring. The forecast maturity volumes of the plant represent around 31% of the Brazilian raw steel production in 2006, that is 0.77% of worldwide production.

The intended volume of slabs for 2013, 2.5 MT, also represents 7.8% of the current global market for this byproduct. This figure is even more significant if we take into consideration that part the global slab market is captive.[9]

Considering the information presented, in brief, a new project at Port Açu Industrial Complex makes sense only if the project is associated with a foreign steel company that will use a significant proportion of the slabs to feed its rolled product production abroad. LLX Logística shares this perception and for this reason it is already seeking partnerships for the project. The main interested parties would be: (a) European companies that wish to interrupt their raw steel production (due to elevated costs and growing environmental restrictions) and maintain their rolled product output (b) Asian

[8] BAPTISTA Fº., B. (2006). Brazil's Vocation as a Steel Supplier: slabs or finished products? Latin American Steel and Steelmaking Raw Materials Conference. Rio de Janeiro: American Metal Market/Metal Bulletin.

[9] In fact, according to Schröder's evaluation (2007), the recent internationalization of Russian steel companies will facilitate the distribution of semi-finished products made in their country of origin

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companies that are engaged in aggressive growth strategies but which intend to focus on downstream activities. Brazil is currently the country in the best position to meet this demand.

LLX has been developing negotiations with potentially interested parties to install this plant, however no publicly-announced agreements have been reached as yet.

***Third-party steel exports at Port Açu***

**Recent background**

Brazilian steel product exports totaled 12.5 MT in 2006, of which roughly 6.4 MT (51% of the total) was shipped via the Steel Terminal of the Tubarão Port Complex (Espírito Santo state). This terminal is owned by three companies: Companhia Siderúrgica de Tubarão (CST, which is controlled by ArcelorMittal and has been renamed ArcelorMittal Tubarão), Açominas (controlled by Gerdau) and Usiminas. Each one owns 1/3 of the port.

Another important port in this area of trade is Rio de Janeiro, from where 2.1 MT of steel products were exported in 2006, or 17% of the country's total. This port has been used by several companies: ArcelorMittal Belgo (namely by the Juiz de Fora plant), Gerdau Aços Longos Brasil, Gerdau Açominas (Ouro Branco plant), CSN, V&M do Brasil and Siderúrgica Barra Mansa.

Brazil's third main steel product export port is Cubatão Port (São Paulo), with a total of 1.7 MT (13% of the total), of which Cosipa accounted for 94%. Another less important user of this port is Gerdau Aços Longos Brasil (3%).

In order to draw-up an estimate of the opportunities to attract steel loads from the other Brazilian plants to Port Açu Complex, we have analyzed the ten companies with the highest export volume via the ports in the Southeast region, which represents Açu's coverage area.

**Forecast Demand**

The companies analyzed exported 11.4 MT in 2006, 91% of Brazil's total exports of finished and semi finished products. We have determined the production capacity of each company (current and forecast for 2016), as well as the production share that will tend to be exported. All the companies considered were contacted by Verax to discuss their investment plans and, mainly, their export logistics. Three main assumptions were used to draw-up this estimate:

a) Even when the plant no longer has the conditions to carry out large-scale expansions due to a lack of space, we considered a potential increase of 2% a year in its installed capacity generated by the elimination of bottlenecks and by process optimization. This gain in productivity is considered as of the second year after the last planned expansion;

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b) We presumed that the all the plants, except when there is evidence to the contrary, will keep their commercial orientation, meaning that they will continue to give priority either to the domestic or to the international market;

c) The average idleness rate for the industry will be 8%.

According to the analysis, the ten companies' export demand from Southeastern ports will reach 22.1 MT by 2016, corresponding to an average growth rate of 6.8% a year. Each company's capacities and export volume is detailed in Table 2. It is important to point out that the data do not include the installed capacity and export volumes of newly-arrived companies in the market. One of the reasons behind this choice is that several of the announced new plant projects ended up being delayed or cancelled. Another reason is that new plants tend to build their own ports, as in the case of CSA – so as not to remain dependent on other companies.

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**Table 2: Capacity and exports of the main Brazilian steel companies, 2006-2016 [Mt]**

| | | 2006 | 2016 | Assumptions |
|---|---|---|---|---|
| Arcelor Mittal Tubarão | Raw steel capacity | 5.0 | 8.8 | Expansion to 7.5Mt concluded in 2007; optimization between 2009 and |
| | Exports | 2.5 | 3.5 | Slabs will continue to be a relevant part of production. |
| Usiminas | Raw steel capacity | 4.8 | 7.6 | Expansion to 7.0Mt concluded in 2011; optimization between 2013 and |
| | Exports | 1.1 | 1.6 | Domestic mkt to remain as the main focus |
| Gerdau Açominas – Usina Ouro Branco | Raw steel capacity | 3.0 | 9.0 | Expansion to 4.5Mt (2007), 6.5Mt (2011) and 9.0 (2016) |
| | Exports | 1.8 | 5.7 | International mkt to remain as the main focus |
| Arcelor Mittal Belgo | Raw steel capacity | 3.9 | 6.2 | Monlevade Plant duplicated in 2011, Juiz de For a Plant duplicated |
| | Exports | 1.4 | 2.1 | Domestic mkt to remain as the main focus |
| CSN | Raw steel capacity | 5.6 | 14.6 | Itaguaí Plant in 2012; Congonhas Plant in 2015 |
| | Exports | 1.6 | 5.5 | Itaguái Plant totally aimed towards exports; Congonhas Plant |
| Acesita | Raw steel capacity | 0.9 | 1.1 | No large-scale expansion project |
| | Exports | 0.2 | 0.3 | Domestic mkt to remain as the main focus |
| Gerdau Aços Longos Brasil | Raw steel capacity | 5.5 | 7.5 | Expansion investments distributed among various plants |
| | Exports | 0.9 | 1.2 | Domestic mkt to remain as the main focus |
| Barra Mansa | Raw steel capacity | 0.6 | 1.6 | Resende Plant in 2011; Duplication of Resende Plant in 2015 |
| | Exports | 0.1 | 0.4 | Domestic mkt to remain as the main focus |
| V&M do Brasil | Raw steel capacity | 0.7 | 1.9 | Jeceaba Plant in 2010; optimization between 2012 and 2016 |
| | Exports | 0.2 | 0.7 | Half of the tube production of Jeceaba's Plant is for export |
| Cosipa | Raw steel capacity | 4.5 | 4.5 | No large-scale expansion project |
| | Exports | 1.6 | 1.1 | Expansion of hot rolled coil production to cause reduction in exports |
| **Total** | **Raw steel capacity** | **34.5** | **62.8** | |
| | **Exports** | **11.4** | **22.1** | |

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**Current and future port capacity**

The Steel Products Terminal of the Praia Mole Port, is currently Brazil's main steel export port, accounting for 51% of the industry's total exports in 2006. If we take into consideration the current mix of products, the port's capacity is estimated at 6.5 MT, but in 2002 it managed to export 7.5 MT.

Furthermore, the port is undergoing a series of operational improvements that will enable the export volume to reach 8.5 MT in 2008 and 10.8 MT in 2010. Also, a project to double the port's capacity to 13 MT should be executed between 2009 and 2010, and even to 17 MT a year if necessary. There are no forecasts of further increases above this level.

Currently, the Steel Products Terminal receives vessels of up to 70,000 tonnes and will continue to do so after the expansions. The main steel exporters in the port are also its owners: ArcelorMittal Tubarão, Gerdau Açominas and Usiminas. The port also exports products by ArcelorMittal Belgo (Monlevade plant).

As mentioned previously, if the expansion project of the Steel Products Terminal of the Praia Mole Port is executed, the terminal will be able to handle 13 MT of steel products, and we presume that the port's capacity will in fact be doubled by 2016. According to the data in Table 2, ArcelorMittal Tubarão, Gerdau Açominas and Usiminas' joint exports are expected to reach 10.8 MT in 2016. If we add the exports by the Monlevade plant to this figure, it will total 116 million tonnes. Therefore, **this terminal would have sufficient capacity to handle the entire exports of the four plants mentioned.**

We estimated that ArcelorMittal Tubarão, Gerdau Açominas, Usiminas and the Monlevade plant of ArcelorMittal Belgo will expand their exports by 5.8 MT, or 54% of the total increase forecast for Brazil's steel exports. CSN alone will increase its exports by 3.9 MT (or 36% of the total), and the company will tend to concentrate all its exports at the Sepetiba Port instead of the Rio de Janeiro Port. As CSN has already exported some 600,000 tonnes via Rio de Janeiro Port, this creates a possibility of additional handling for other steel plants. Meanwhile, an increase in the exports of ArcelorMittal Belgo's Juiz de Fora Plant and of part of the exports of Gerdau Aços Longos Brasil, Barra Mansa and V&M do Brasil will reach 1.4 MT. If we deduct the 600,000 tonnes from the reduction in CSN's exports, we conclude that Rio de Janeiro Port will be able to raise its steel exports by 800,000 tonnes. In the case of the Cubatão Port, a probable reduction in Cosipa's exports will also favor exports by other plants.

Therefore, Port Açu will compete with the other ports in the region for part of the semi-finished and finished steel product exports. In order to do so, the port will have to offer advantages in relation to its competitors, be they in terms of infrastructure or prices charged. Port Açu might also benefit from the difficulties in expanding the railway transport between Minas Gerais and the Praia Mole Port, through the implementation of

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the EFVM. In this case, the revitalization of the FCA stretch discussed in the Iron Ore sections is crucial to attract these loads.

In order to assess the attraction of the Port Açu, we once again carried out a separate analysis of each of the ten companies mentioned above and of their current logistics and potential interests regarding the arrival of a new port complex in the market.

**Forecasts for Port Açu**

Among the ten steel companies analyzed, four are unlikely to use Port Açu. These are ArcelorMittal Tubarão, CSN, Cosipa and Gerdau Aços Longos Brasil.

Throughout the course of this year, ArcelorMittal Tubarão has achieved a 7.5 MT increase to its production capacity. In 2006, the company's steel product exports totaled 2.5 MT, or 20% of Brazil's total steel exports. Even if the company does not engage in a new expansion, assuming it attains process optimization, the plant's capacity may reach 8.8 MT by 2016, and its exports 3.5 MT. It is important to point out that between 2008 and 2009, before the duplication of its hot strip rolling plant, the company will export up to 5.0 MT. As from 2010, the export volume will tend to diminish due to increasing domestic sales. All of ArcelorMittal Tubarão's exports should continue to be concentrated at the Praia Mole Port, which is located near the plant. The same line of thought applies to the Grande Vitória Plant, owned by ArcelorMittal Belgo, which exports some 300,000 tonnes through the Praia Mole Port.

CSN has a 5.6 MT capacity, and the company has been studying the possibility of building two new plants, one in Itaguaí (Rio de Janeiro) and another in Congonhas (Minas Gerais), each with a nominal capacity of 4.5 MT. The first will be focused on exports while the second will sell half of its production on the domestic market. CSN's exports will rise from the current 1.6 MT to 5.5 MT by 2016. Currently 60% of the company's exports are via the Sepetiba Port (operated by the company) and 40% via the Rio de Janeiro Port. The company has already declared its intention to concentrate all its exports at the Sepetiba Port, where it also ships iron ore and unloads coal.

Cosipa only exports through its own port terminal, which is located near the plant in Cubatão, São Paulo. In addition to this, the tendency is for the plant to reduce its exports due to increased investments in hot rolling, which means a reduction in the volume of slabs available for export.

Gerdau Aços Longos do Brasil splits its 0.9 million tonnes of exports between 17 Brazilian ports. Some 0.4 MT are shipped via the ports of Rio de Janeiro and Angra dos Reis. The company has shown little interest in using Port Açu, as its largest plant, Cosígua, is located near the Rio de Janeiro Port.

Three other companies could utilize Port Açu, in view of difficulties in increasing export volumes via the EFVM-Praia Mole Port corridor. If we take into consideration the rationale that this port will be duplicated, the problems to be overcome are restricted

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to the use of the railway line. The companies that fit into this category are: Gerdau Açominas – Ouro Branco Plant; Usiminas and ArcelorMittal Belgo- Monlevade Plant.

The premise used for defining the base scenario is the absorption of 25% of the increase in the export volume of these three plants.

The Gerdau Açominas – Ouro Branco Plant has an installed capacity of 3 MT and will achieve an increase to 4.5 MT still this year. Its exports totaled 1.8 MT in 2006 and they are expected to reach 3.0 MT as of 2009. Approximately 90% of the plant's current exports use the EFVM-Praia Mole Port corridor and 10% use the MRS-Rio de Janeiro Port corridor. This plant has the geographic advantage of being able to use both railways and it has already declared that after increasing its capacity to 4.5 MT, it will continue to use the Praia Mole Port for 90% of its exports. Therefore, it is assumed that no additional production from this stage would be exported via Port Açu.

The Gerdau Açominas – Ouro Branco Plant is probably the steel plant with the biggest growth potential in Brazil, as it has been forecast to produce 10 MT. Under current conditions its installed capacity may reach up to 12 MT, but this would probably not happen until 2016. It is assumed as a premise that the company will expand to 6.5 MT by 2011 and to 9.0 MT 2016. It is worth highlighting that these increases have not been approved by the company.

Considering a capacity of 9.0 MT in 2016, exports would grow by 2.7 MT, to 5.7 MT from 3.0 MT in 2010. We estimate that 675,000 tonnes of this could be exported via the Port Açu. The Gerdau Açominas – Ouro Branco Plant has a strategic interest in concentrating its exports at the Praia Mole Port, which it co-owns. The company has already said that it does not consider using any other port for its rolled product exports and therefore only semi-finished products could be exported via another port.

Usiminas has an installed capacity of 4.8 MT, which is going to be raised to 7 MT by 2011. Although its focus is on the Brazilian automotive market, with exports playing a secondary role, the company still exported 1.1 MT in 2006. This volume is expected to reach 1.6 MT by 2016. The company uses the Praia Mole terminal (which it co-owns) and has affirmed its intent not to use any other port. We also must consider the fact that one of Usiminas' shareholders[10], VALE, has publicly stated the need for investment to expand the company, which means that it is probably ready to meet Usiminas' additional transportation needs. Therefore, we believe that Port Açu might be able to ship some 125,000 tonnes from Usiminas.

The Monlevade Plant, owned by ArcelorMittal Belgo, exports 0.4 MT a year via the Praia Mole Port. The plant has an installed capacity of 1.2 MT. The plant has considered doubling this figure, but a decision has not yet been announced. The expectation is that the plant's capacity will in fact be doubled by 2011, thus raising the export estimate to 0.8 MT, of which Port Açu would ship 100,000 tonnes.

[10] The president of VALE, Roger Agnelli, recently announced the company's intention to sell its stake in Usiminas due to strategic differences

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The remaining companies V&M do Brasil, ArcelorMittal Belgo Usina de Juiz de Fora, Acesita and Barra Mansa, may choose to use Port Açu in view of their difficulties in increasing exports via the Rio de Janeiro Port.

This is based on the assumption that Port Açu will be able to ship 25% of these companies' additional capacity.

Steelmaker V&M do Brasil mainly uses the MRS railway line to transport its load to the Rio de Janeiro Port. The plant has an installed capacity of 670,000 tonnes, of which approximately 200,000 tonnes was exported in 2006. The company plans to install a new plant in partnership with Sumitomo, with a capacity of 1 MT of raw steel and 600,000 tonnes of seamless tubes. According to documents provided by the company, production will be shipped via the Rio de Janeiro Port. We have estimated a 0.5 MT increase in the company's exports, of which 125,000 tonnes could be exported via Port Açu. There is an MoU signed with LLX Logística regarding the coal imports for the operation of this plant, which shall be duly addressed in this Study.

In the case of ArcelorMittal Belgo, the Juiz de Fora Plant exports 350,000 tonnes a year via the MRS – Rio de Janeiro Port corridor. ArcelorMittal Belgo plans to duplicate the plant after the duplication of the Monlevade Plant. Although the Juiz de Fora Plant tends to focus on the domestic market, an increase in its installed capacity from 1.0 million to 2.0 MT by 2015 would generate an additional export volume of 300,000 tonnes, of which 75,000 tonnes could be exported via Port Açu.

Acesita, meanwhile, ships around 80% of its exports via the Sepetiba and Rio de Janeiro Ports, which are reached through the MRS railway line. The remaining 20% are transported via the EFVM railway line to the Vila Velha port terminal, in Espírito Santo. This terminal, which is considered by the company as the easiest for its exports, is currently overloaded due to strong competition mainly from higher-added value products. Acesita does not have any foreseeable plans to raise its capacity, but if we consider a natural optimization of the company's process by 2016, its installed capacity would rise from 0.9 MT to 1.1 MT, and exports from 0.2 MT to 0.3 MT. According to Verax's estimates, Port Açu would be able to ship 25,000 tonnes by Acesita (the company's exports are almost solely done through containers).

Barra Mansa currently has a plant in the town of the same name with an installed capacity of 0.6 MT. All the plant's exports below 0.1 MT are done via the MRS railway line and the Rio de Janeiro Port. However, Barra Mansa is building a new plant in Resende with an initial capacity of 0.5 MT, scheduled to start its operations at the beginning of the next decade. The second stage, of also 0.5 MT, will be conditioned to market growth and should be concluded by 2015. If the projections are confirmed, the company's exports would rise to 0.4 MT, of which 75,000 tonnes could be shipped by the Port Açu.

Generally speaking, the Port Açu Complex could absorb part of the increase in exports currently shipped via the Rio de Janeiro Port, to which the load is transported by the MRS railway line. However, this will not be an easy task as the MRS network is used by most of the steel plants in the Southeast region.

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According to the projections, Port Açu would have the potential to absorb 1.2 MT of exports in 2016, as shown in Table 3, and the Gerdau Açominas - Ouro Branco Plant would account for 56% of the port's third-party steel shipments.

**Table 3: Port Açu and steel exports in 2016**

| Company | Port Açu's strategic importance | Port Açu's exports (thousand tonnes) | Comment |
|---|---|---|---|
| ArcelorMittal Tubarão | Low | 0 | Close to Praia Mole Port |
| Usiminas | Medium | 125 | Shareholder in Praia Mole Port |
| Gerdau Açominas –Ouro Branco Plant | Medium | 675 | Served by EFVM and MRS. Shareholder in Praia Mole Port |
| ArcelorMittal Belgo | Medium | 175 | Port Açu could serve the Juiz de Fora and Monlevade Plants |
| CSN | Low | 0 | Exports are concentrated in Sepetiba Port instead of Rio de Janeiro Port |
| Acesita | Medium | 25 | Exports done mostly through containers |
| Gerdau Aços Longos Brasil | Low | 0 | Uses several ports and railway lines |
| Barra Mansa | Medium | 75 | Export logistics is under revision |
| V&M do Brasil | Medium | 125 | New plant is being built in Jeceaba |
| Cosipa | Low | 0 | Close to the Cubatão Port |
| **Total** | | **1,200** | |

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## Conclusions: prospects forPort Açu

Port Açu could play a relevant role in Brazil's steel exports, with a potentially growing service demand reaching 7.50 MT in 2016 and 11.25 MT in 2032.

On top of the third party handling, this value also considers the potential installation of a steel plant at the complex that would export some 9.6 MT a year as of 2017. The steel plant's feasibility is based on the cheap supply of pellet feed by the MMX Minas Rio mines, on Brazil's low production costs and on the plant's proximity to the port. LLX Logística affirms that negotiations are underway with a large multinational steel group. Although demand for port services generated by the steel plant was included in the port's handling forecasts, the implementation of the plant is not part of the LLX Logística business plans.

We have estimated that steel exports will grow at an organic rate of 2% a year as of 2016, prompted by an increase in the steel plants' productivity.

The absorption of production by other steel plants in the region will depend on the installation of the berth and the proper handling equipment by 2011, as established in the LLX Logística plans.

**Table 4: Steel product handling at Port Açu Terminal (MT)**

| | | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|
| Steel products (MT) | Steel plant in Açu | 0.00 | 0.00 | 3.20 | 3.20 | 6.30 | 6.30 |
| | Other steel plants | 1.00 | 1.04 | 1.08 | 1.12 | 1.16 | 1.20 |
| | Total | 1.00 | 1.04 | 4.28 | 4.32 | 7.46 | 7.50 |

| 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|---|---|---|
| 9.60 | 9.60 | 9.60 | 9.60 | 9.60 | 9.60 | 9.60 | 9.60 | 9.60 |
| 1.22 | 1.25 | 1.27 | 1.30 | 1.32 | 1.35 | 1.38 | 1.41 | 1.43 |
| 10.82 | 10.85 | 10.87 | 10.90 | 10.92 | 10.95 | 10.98 | 11.01 | 11.03 |

| 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|
| 9.60 | 9.60 | 9.60 | 9.60 | 9.60 | 9.60 | 9.60 |
| 1.46 | 1.49 | 1.52 | 1.55 | 1.58 | 1.62 | 1.65 |
| 11.06 | 11.09 | 11.12 | 11.15 | 11.18 | 11.22 | 11.25 |

Current prices charged for the shipment of steel products are US$15/t for slabs and US$ 22/t for finished products.

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Although the mix of products to be shipped from Port Açu is partly comprised of slabs, LLX Logística believes that the generated economy in terrestrial logistics would enable the port to charge the same prices for slabs as for finished products currently on the market.

LLX informed that, in an MoU signed with the holding company of a leading multinational steel producer which is considering the development of a steel plant at Açu , handling prices have been agreed at US$ 22.2/t, which is in line with the current market prices. This price will be considered in Verax's simulations of return.

Port Açu would charge a port infrastructure utilization rate[11] for the handling of steel products. At the Santos Port this rate is currently US$0.74/t[12] for handled volume and US$0.14/t for berth occupation[13].

[11] At public ports the rates are defined by the port authorities, as defined by Law 8,630, from 1993 and under the supervision of ANTAQ. In the case of the LLX Logística ports, the rates will be set by the company based on the same table used by the public ports.

[12] Rates are charged according to the handling and type of cargo (general or containers). We presumed that steel product handling will be carried out through lots equivalent to containers with 30t of products each.

[13] Rates charged per linear meter of occupied wharf space for periods of 6 hours or a fraction thereof. The assumptions used to determine the total berthing time and the length of occupied wharf space were

- 240m long standard vessel with a container capacity of 3,000.
- Loading/unloading speed of 35 containers / h.
- Total wharfage/undocking time of 2 h.

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### 5.1.3 Coal

**Recent background**

Coal is the world's most abundant fossil fuel. Current proven reserves stand at over 900 billion tonnes, which corresponds to 147 years of consumption at current levels[14]. While on the one hand coal causes more pollution, it is also very cheap and is the most widely used electric power source in the world (38%[14] of the total). Table 5 shows a comparison between the prices of the main energy sources.

Brazil possesses reserves of coal with low calorific power and a high concentration of impure elements, and so cannot be used by steel plants. Its largest reserves are in the South. However, despite ocean freight costs, high quality imported coal is still Brazil's cheapest energy source.

**Table 5: Recent energy costs in Brazil**

| Current energy prices in Brazil | |
|---|---|
| **Energy source** | **US$/ MBTU** |
| Coal – South Africa FOB + freight (approximate)[15] | 2.94 |
| Bolivian natural gas – Southeast region (price and transport until city gate[16])[17] | 5.49 |
| Local natural gas – Southeast region (price and transport until city gate)[17] | 5.95 |
| A1 oil -Southeast region [17] | 8.00 |
| LNG spot + freight (approximate)[18] | 10.00 |
| Ethanol – Hydrated ethanol - São Paulo, spot[19] | 13.96 |
| Electric power - ACR – 5th Energy Auction[20],[21] | 14.62 |

[14] European Association for Coal and Lignite (Euracoal) – http://euracoal.be/
[15] Average price of South African coal (US$52/t) in January 2007 (Euracoal Market Report, January 2007), added to import freight. 6,000kcal/kg of calorific power is assumed (steam-coal). The average freight price of 18US$/t was estimated based on current bulk transport contracts and voyage charters signed by the Dampskibsselskabet NORDEN A/S navigation company in 2006, considering a distance equivalent to the route between Cape Town and the Port Açu.
[16] Natural gas transfer point between the exploration company and the gas pipeline, already under the ownership of the concession company.
[17] ANP. Average of 30 days between 08/06/2007 and 09/06/2007
[18] LNG sale price added to import costs. GásEnergy in the press (08/31/2007).
[19] BM&F Ethanol. Average of 4 weeks prior to 08/06/2007.
[20] Sale price of energy in a Regulated Buying Environment (ACR), carried out on 12/14/2006, for supply between 2007 and 2013 (A-1 Auction). The R$ 104.74/MWh price was converted at the exchange rate of 2.1 R$/dollar.
[21] Presumed thermal energy-into-electricity conversion rate of 3.412 MBTU per MWh, valid for a modern thermoelectric plant (BP Statistical Review of World Energy, June 2007).

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Unlike other fuels such as oil and natural gas, coal reserves are better distributed around the world and so the international trade is small in relation to consumption. Coal contracts are negotiated bilaterally and not on commodities and futures markets.The world's eight biggest coal exporters[22] in 2005 were Australia (231 MT), Indonesia (108 MT), Russia (76 MT), South Africa (73 MT), China (72 MT), Colombia (56 MT), the USA (45 MT) and Canada (28 MT), of which only Australia, Indonesia, Russia and the USA have anthracite coal, which is used in steelmaking. In terms of location, South Africa and Colombia are the most convenient suppliers of high quality steam coal to Brazil's thermoelectric plants. The world's biggest coal importers are Japan (178 MT), South Korea (77 MT) and Taiwan (61 MT).

Coal's attractiveness compared to other energy sources varies according to environmental pressure and to the prices charged for other sources such as oil and its derivatives and natural gas. Some Asian countries, especially China, have suffered much less from these pressures and their speedy economic growth has enabled them to use coal as a primary energy source. As a result, Asia has prompted an increase in global coal consumption, as shown in Figure 4.

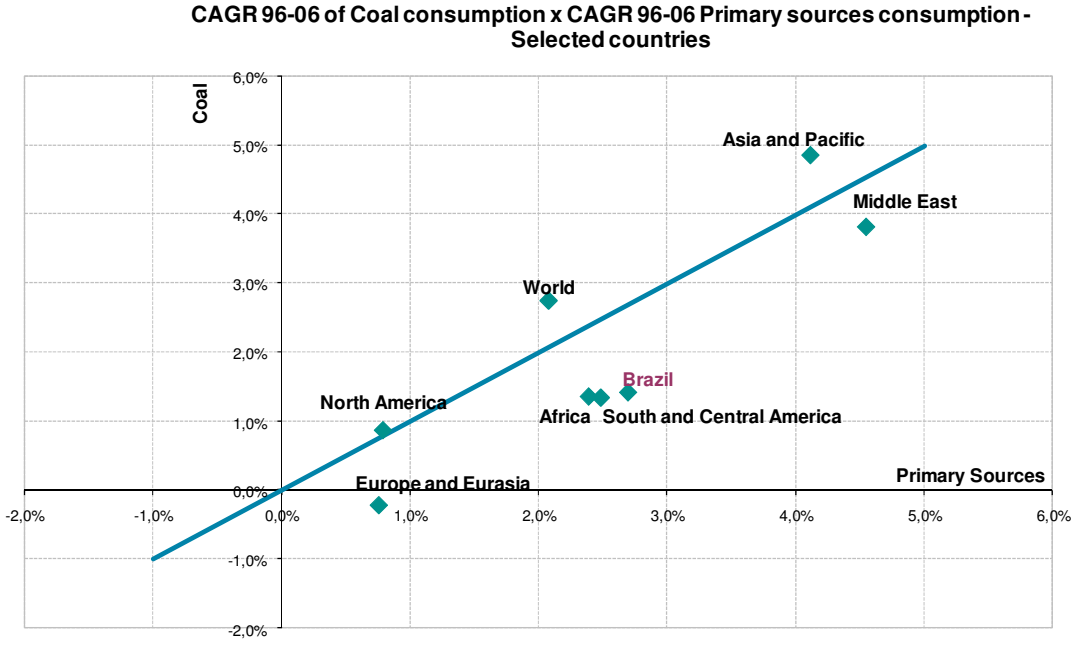


**Figure 4: Comparison between growth in primary energy sources and coal consumption, by regions of the world and Brazil**

[22] 2005 data, World Coal Institute (WCI) – http://www.worldcoal.org/.

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Brazil has prioritized other energy sources: in 2006 coal accounted for only 6.4% of the country's overall energy source and for 1.6% of the electric power system, and coal consumption totaled 13.1Mtoe[23] - a 1.42%[24] rise over the previous ten years[25] . Brazil currently has seven coal-powered thermoelectric plants, with an installed capacity of 1,415 MW. At the current growth pace, by 2016 Brazil will consume 15.1 MT through energy generation.

Brazil's coal reserves are estimated at 32.3 billion tonnes and are mainly concentrated in the South, where Rio Grande do Sul state holds the biggest mines and 89% of the region's total. However, the region's coal has low calorific power and a high impurity rate, and its entire production is sold to thermoelectric plants. For this reason, it is also cheaper, at around 16 US$/t against 70 US$/t charged for imported coal (CIF)[26].

However, the product's low quality and a lack of adequate logistic conditions means Brazilian coal is only of interest to thermoelectric plants located near the coal mines[27] – in the South. In addition to this, as it is not cokeable, local coal cannot be used efficiently in steelmaking. Therefore, Brazil's pig iron industry for export or steelworks absorbs almost all coal and coke imports, which are mainly from Australia (34%), the USA (28%) and Canada (13%).

National steam-coal production totaled 2.4Mtoe in 2006, 2.6% more than in 1996 (CAGR). Therefore we estimate that steam-coal production will reach 3.1Mtoe by 2016 and will be entirely aimed at thermoelectric plants, thus resulting in a deficit of 12.0Mtoe.

This deficit corresponds to the sum of the coal produced for coke plants and the majority of steam-coal for thermoelectric plants – for which at least 1.8 MT shall be imported by 2016 to meet an additional need of 700MW that were bought in an energy auction in 2005[26].

**Supply and demand of electric power**

EPE[26] estimates increases in electric power demand of 5.1% a year to 2015 at the current economic growth rate; of 5.8% a year in a scenario of high economic growth and of 4.1% a year in a scenario of low economic growth[28].

[23]The tonne of oil equivalent (toe) enables the measurement of coal energy consumption despite the differences in calorific power between the various types of coal.
[24] Compounded Annual Growth Rate
[25] BP Statistical Review of World Energy, June 2007
[26] 2030 National Energy Plan– Coal - EPE
[27] Ten-Year Energy Expansion Plan – Vol. VIII. - EPE
[28] Considers average GDP growth rates of 4.0%,between 2007 and 2011, and of 4.5%, between 2011 and 2015, in the reference scenario; of 4.5% between 2007 and 2011 and of 6.0% between 2011 and 2015, in

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Based on a GDP growth rate of 3.0% to 4.5% between 2007 and 2011, this study has concluded that there are no risks of a deficit above 5%, in a scenario of confirmed investment and consumption efficiency gains as predicted. If demand is high, an additional 4,700MW will be required by 2014.

However, Brazil's recent speedy economic growth has increased the deficit risks. If we consider the average forecast GDP growth rate of 4.8%, the deficit risk may reach 5.9% in the Southeast, even with an additional 1,400 MW in 2011 – to be sold at the 2008 energy auction. Without the 2011 addition, the risk would rise to 7.3%, which according to Instituto Acende Brasil (the Brazilian Light Institute) would result in a deficit of 28%[29,30].

In order to increase the electricity supply and mitigate deficit risks, the government has encouraged the construction of thermoelectric plants, which despite being more expensive to operate than hydroelectric power plants, can obtain environmental licensing and be built quicker.

Coal is a safe, cheap and an operationally flexible energy source, hence the increased interest in this raw material. On the other hand, as it naturally causes more pollution, the environmental licensing process is slower and only granted with the use of new technologies to reduce pollution and $CO_2$ emissions, making the process costlier. This has kept investors away from generation, given that under current rules, in order to take part in new energy tenders it is necessary to own a prior environmental license, while the investor remain accountable for obtaining other licensing.

In mid-2006 there were five technical, economic and socio-environmental feasibility studies for coal-driven thermoelectric plants, totaling 3,148 MW[31].

**Forecast for Port Açu**

It is estimated that the industrial plants at the Açu industrial complex shall require roughly 6.4 MT of coal in 2013, 8.8 MT in 2015, and reaching the maximum demand of 11.5 MT in 2017, after which time this figure should stabilize. This complex will comprise a large steel plant, attaining production levels of 9.6 Mt in 2017, the MPX thermoelectric plant generating 2,100 MW as from 2013, and a iron ore pellet plant, also as of 2013..

Furthermore, there is potential demand for the receipt and distribution of cokeable coal to other steel plants in the region, from which it is believed that Port Açu may absorb 1.3 MT in 2016. Also considered was the agreement between LLX Logística and a steel plant as regards coke imports, already covered by an MoU signed by the companies.

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the high scenario; and of 3.0% between 2007 and 2011 and of 3.5% between 2011 and 2015, in the low scenario

[29] Debate TV Estadão. "Until when will Brazil remain free of the threat of an energy blackout?". O Estado de São Paulo newspaper 09/09/2007, Economy Supplement, pg. B10

[30] The difference is mainly due to different criteria regarding what the critical level of water reservoirs must be before calling for rationing (10% for the first, 0% for the second)

[31] 2006-2015 Ten-Year Electric power Expansion Plan– Chapter III. - EPE

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Furthermore, it was considered that there would be a potential demand for coke from some cement factories spread around the region, estimated at 1.0 Mtpy, with which LLX Logística has maintained contact and even signed some MoUs.

The demands forecast by LLX Logística and covered by MoUs with steel companies and cement factories were considered by Verax in the return on investment analysis as volumes to be handled. **However there are no guarantees as to the volumes or terms forecast in the plan, which were indicated by LLX Logística.**

***Demand from the Açu Industrial Complex***

The steel plant which shall be installed at the Açu Industrial Complex will produce 9.6 MT of raw steel as of 2017, starting at 3.2 MT in 2013 and increasing to 6.3 MT in 2015, according to LLX Logística. Considering a rate of 0.8 tonnes of coal per tonne of steel produced, the demand shall be of 2.6 MT of mineral coal in the first phase, 5.0 MT in the second and 7.7 MT once maturity is reached as from 2017.

There is no coke or cokeable coal supply in Brazil, therefore once the plant is installed it will generate a stable demand for port services. An MoU has already been agreed with a large foreign holding company in the steel business to install the plant at the Açu Industrial Complex. Verax has considered the installation of this plant in its financial analysis, although the MoU does not represent a guarantee of the plan's actual execution.

Meanwhile, **the MPX coal-based thermoelectric plant** will start operations in mid-2012, consuming 1.2 MT of coal. In late 2012 an additional 700 MW module shall be installed and in mid-2013 the final module shall be added, with the same capacity. As from 2013 around 3.6 Mtpy shall be consumed to generate a little over 6,720 GWh a year[32]. A take-or-pay agreement shall be signed with MPX for the port handling of coal, accounting for 60% of the forecast total, which significantly reducing the business risks for LLX Logística.

Part of this energy will be sold to industries in the region through the free market The market has welcomed this prospect of guaranteed electrical energy supply to the industries in the Açu Industrial Complex.

Although demand for port services by the plant has been considered in our handling projections, the implementation of the plant does not feature in the LLX Logística business portfolio. On the other hand, an MoU and lease agreement have already been signed between the parties, thus ensuring the actual implementation of the thermoelectric plant..

Finally, the pellet plant will begin operations in 2013 and will consume 0.2 MT of coal that year and the next. Verax has not accessed any documentation ensuring the actual installation of the pelletizing plant at Port Açu. Although demand for port services by

[32] Based on the assumption of imported South African coal with 6,000 kcal/kg of calorific power and a thermal efficiency of 33% converted into electric power .These assumptions are in line with the 2030 National Energy Plan – Coal - EPE

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the plant has been considered in the port's handling projections, the installation of the plant does not feature in LLX Logística's plans.

***Demand from other steel plants in the region***

There are six steel plants in the region that use coal (the others use scrap iron): Arcelor Mittal Tubarão, Belgo – Monlevade Plant, Cosipa, CSN, Gerdau Açominas and Usiminas.

CSN and Cosipa have their own coal-unloading terminals, in Itaguaí-Rio de Janeiro and in Cubatão-São Paulo, respectively. Both ports can be expanded and the MRS Railway line utilized by the companies has sufficient capacity to meet their demands. Future steel plants CSA (Thyssen Krupp and VALE) and CSN's second plant, both to be installed in Itaguaí, will also use their own terminals.

Arcelor Mittal Tubarão is located in the vicinities of Tubarão port, and therefore does not need to receive its coal via Port Açu.

Usiminas, Gerdau Açominas and Belgo Monlevade are located in the Vitória-Minas Railway corridor (EFVM), owned by VALE, through which they receive iron ore and distribute steel products to the Steel Products Terminal, in Vitória-ES. As previously mentioned, the two companies own the terminal. Belgo Monlevade also distributes part of its production through the Steel Products Terminal, and the remainder is distributed through the Rio de Janeiro Port.

Coal for these plants is unloaded at the Steel Products Terminal, at the Praia Mole Port. The return of the empty freight cars is part of global iron ore distribution logistics. Therefore, it would be complicated to use another terminal.

However, difficulties are expected to arise from the insufficient capacity of the EFVM to distribute steel products to the port over the next few years. However, if improvements are carried out on the FCA, some of these products could be distributed via this railway (which brings less revenue to VALE). If confirmed, this hypothesis could result in coal unloaded at Port Açu. Under these conditions Port Açu could also handle coal for other steelmakers. However several VALE employees whom we consulted affirmed that the EFVM may receive investments which would significantly increase its capacity.

LLX Logística will look to establish a series of agreements with FCA to make the route feasible and connect the line to the Port Açu[33] (considering that 45 kilometers of tracks will be built to connect it to Campos de Goytacazes).

[33] The stretch between Miguel Burnier and Cataguazes is an FCA concession. The company has not made the investments foreseen in the contract and is at risk of losing control of the line to the ANTT. In this case the company would have to pay a R$300 million fine to the public coffers. The "subleasing" and increase in capacity of this stretch may become a valuable opportunity with the construction of the Port Açu. This is a possibility and negotiations are underway.

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The coal operation on this route would use the returning trains that had transported iron ore from Minas Gerais.

Meanwhile, of the plants in the Vitória-Minas axis, Belgo Monlevade would not demand coal distributed via the FCA, as the company already has a soon-to-be-expanded coke plant in the city of Vitória-ES. Monlevade's coal is received entirely via the Tubarão Port.

In this scenario, **only Gerdau Açominas and Usiminas would benefit from the possibility of receiving coal via Port Açu**.

Access to the **Gerdau Açominas** – Ouro Branco Plant via the FCA could be either via a small line that could be added after Miguel Burnier linking it to EFVM, or through rail transshipment onto trucks that would take the coal to Ouro Branco-MG, where the plant is located[34]. Both are metric gauge railways that can be interconnected.

The plant has an installed capacity of 3 MT, which will be raised to 4.5 MT before the end of the year. Its exports totaled 1.8 MT in 2006 and are expected to reach 3.0 MT as of 2009. This is probably the steel plant with the biggest growth potential in Brazil, as it was designed to produce 10 MT. Under current conditions, its installed capacity could reach 12 MT. However, this looks unlikely not happen before 2016. We presume that the company's capacity will be raised to 6.5 MT by 2011 and to 9.0 MT by 2016. It is worth mentioning that these increases have not been approved by the company's board of directors.

In order for the Port Açu to serve **Usiminas,** from Miguel Burnier onwards the coal could be transported via EFVM by means of payment to VALE for the right of passage, and then be taken to Ipatinga-Minas Gerais and João Monlevade-Minas Gerais.

This plant has an installed capacity of 4.8 MT, which is expected to reach 7 MT by 2011. Although its is focused on the Brazilian automotive market, with exports playing a secondary role, the plant still exported 1.1 MT in 2006, and this volume is expected to reach 1.6 MT by 2016.

**The demand for coal which can be supplied by the Port Açu was calculated based on a presumed market share of demand associated to the increases in the production of these two plants.**

However, this demand could only be absorbed as of 2011, when the port structures and the transport system will be fully implemented.

We believe that the two possible distribution systems could help increase the companies' flexibility.

[34] Alternatively, the coal can be transported via the FCA until Três Rios-Rio de Janeiro, where it could be transshipped into MRS freight cars and taken to the plant. However, this alternative is more costly than the first one.

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The base scenario foresees that 25% of additional demand can be absorbed by the FCA-Port Açu system. The following assumptions have also been adopted:

a) 0.8 tonnes of coal are used for each tonne of raw steel produced;

b) Even when the plant no longer has the conditions to carry out large-scale expansions, due to a lack of space, we considered a potential increase of 2% a year in its installed capacity generated by the elimination of bottlenecks and by process optimization. The optimization gain was considered as of the second year after the last foreseen expansion;

c) The average idleness rate of the industry will be 8%;

d) There will be no increases in capacity after 2016, only annual rises in productivity.

In addition to these demands, Verax also estimates the demand for coke from a steel plant in Minas Gerais, with constant annual volumes of 0.48 MT as from 2011, covered by an MoU with LLX Logística.

Another supply of demand considered is that from the cement factories[35] in the southeast region for coke imports, which total 0.99 MT (considered as constant throughout the period[36]. LLX Logística maintains that it has a series of agreements either signed or on the way to being signed with companies from the industry.

Table 6 shows the projections for coal demand that can be absorbed by the Port Açu, based on the assumptions mentioned above

**Table 6: Coal handling at the port terminal (Mtpy)**

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|
| Steel plant at the Açu Complex | 0.00 | 0.00 | 2.56 | 2.56 | 5.04 | 5.04 | 7.68 | 7.68 |
| MPX Thermoelectric plant at Açu | 0.00 | 1.20 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| Pellet Plant at Açul | 0.00 | 0.00 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| Total internal demand at Açu | **0.00** | **1.20** | **6.36** | **6.36** | **8.84** | **8.84** | **11.48** | **11.48** |
| Other steel plants | 1.25 | 1.25 | 1.30 | 1.35 | 1.40 | 1.82 | 1.82 | 1.88 |
| Agreements with cement factories | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| Total from third parties | 2.24 | 2.24 | 2.29 | 2.34 | 2.39 | 2.81 | 2.81 | 2.87 |
| **Total** | **2.24** | **3.44** | **8.65** | **8.70** | **11.23** | **11.65** | **14.29** | **14.35** |

[35] There are 4 cement factories, as well as a company from another industry interested in coke imports for self-sufficient generation of electricity.
[36] In the cement industry there are no advantages of a significant scale, which leads to decentralized production amongst various plants of a similar size. Therefore it is reasonable to assume a stable demand given that such is based on supply agreements to a certain number of industrial plants.

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| | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|---|---|
| Steel plant at the Açu Complex | 7.68 | 7.68 | 7.68 | 7.68 | 7.68 | 7.68 | 7.68 |
| MPX Thermoelectric plant at Açu | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| Pelletizing Plant at Açu | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| Total internal demand at Açu | **11.48** | **11.48** | **11.48** | **11.48** | **11.48** | **11.48** | **11.48** |
| Other steel plants | 1.95 | 2.01 | 2.07 | 2.14 | 2.21 | 2.28 | 2.35 |
| Agreements with cement factories | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| Total from third parties | 2.93 | 3.00 | 3.06 | 3.13 | 3.19 | 3.26 | 3.33 |
| **Total** | **14.41** | **14.48** | **14.54** | **14.61** | **14.67** | **14.74** | **14.81** |

| | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|
| Steel plant at the Açu Complex | 7.68 | 7.68 | 7.68 | 7.68 | 7.68 | 7.68 | 7.68 |
| MPX Thermoelectric plant at Açu | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| Pelletizing Plant at Açu | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| Total internal demand at Açu | **11.48** | **11.48** | **11.48** | **11.48** | **11.48** | **11.48** | **11.48** |
| Other steel plants | 2.42 | 2.49 | 2.57 | 2.64 | 2.72 | 2.80 | 2.88 |
| Agreements with cement factories | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| Total from third parties | 3.40 | 3.48 | 3.55 | 3.63 | 3.70 | 3.78 | 3.86 |
| **Total** | **14.88** | **14.96** | **15.03** | **15.11** | **15.18** | **15.26** | **15.34** |

Coal unloading prices are estimated at US$9.4/t, based on current market prices such as charged at Vitória Port. The price for coke handling was considered equal to that for coal handling.

Regarding port infrastructure utilization rates[37], no survey has been carried out in existing coal handling terminals. Therefore, we will base our estimate on the handling of fertilizer imports at Port Brasil. However, if competitor terminals do not charge this rate, as in the case of iron ore exports in VALE's terminals, LLX Logística might adopt this practice in order not to lose competitiveness, providing it is within its interest.

[37] In public ports these rates are set by the port authorities according to Law 8,630, of 1993 and under the supervision of ANTAQ. In the case of the LLX Logística ports, the rates will be set by the company, based on the table applicable to public ports.

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At the Santos Port the user rate charged on the unloading of fertilizer imports is US$1.22/t[38] for volume handled and US$3.45/m per berth per period[39].

**Risks**

As coal is abundant and well-distributed worldwide, a shortage of supply and sharp price variances are improbable. Therefore, the greatest risks are associated to the effective realization of the forecast domestic demand.

Therefore, the success of the coal operation is directly linked to the implementation of the steel plant, of the thermoelectric plant and of the pelletizing plant, as well as the pre-signed agreement with various companies in the southeast, none of which has yet been confirmed.

The installation of the steel plant depends on LLX Logística's ability to attract an international company, a task which requires agility due to the fact that several similar projects have been announced recently[40]. An MoU has already been signed with a large foreign holding company in the steel industry to install the plant at the Açu Industrial Complex. Although this does not entirely guarantee the actual installation, it does minimize risks in the sense that there is a common interest in the execution of the development.

Meanwhile, the implementation of the coal-driven thermoelectric plant depends not only on the participation of an international investor but also on the approval of an environmental license. According to MPX, the plant will be equipped with systems to reduce environmental impact. In the case of energy sales in 2011, it is necessary to obtain a previous license before the new energy auction in 2008.

Once the thermoelectric plant is installed, the coal supply is ensured by a take-or-pay coal handling contract, accounting for 60% of the forecast volume, significantly reducing the business risks from LLX Logística's point of view.

Regarding supply to other steel plants, there are risks associated with the non-revamping (in time) of the Minas Gerais rail line and with the possibility that this

[38] Rate charged according to the cargo handled and its nature (general cargo or container). In the case of the Santos Port, as there is no coal handling, the rate adopted was the same charged for the handling of other solid bulk.

[39] Rate charged per linear meter of occupied wharf for periods of 6h or fraction thereof. The assumptions used to determine the berthing time and the length of occupied wharf were:

- Standard 280m-long vessel and 150,000t of gross load, according to the measurements of the ships that will transport the iron ore, given that these are the ships that will bring coal on the return trip.
- Vessel loading speed of 2,000 t / h.
- Total wharfage/undocking time of 2 h.

[40] Among these projects are: CSA (partnership between VALE and Thyssen Krupp), 2 new plants by CSN, a plant to be built in Anchieta-ES (partnership between VALE and Baosteel) and Ceará Steel (partnership between Dongkuk Steel, Danieli and VALE), as well as others currently undergoing feasibility studies.

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solution might not be attractive to the companies, as it might require changes in planning, in tariffs or even in layout, for instance.

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## 5.1.4 Containers at Port Açu

### Recent background

The volume of containers handled in Brazilian ports has grown sharply, from 3.6 million TEUs in 2002 to 6 million TEUs in 2006, an 18.2% annual rise.

The Vitória Port, which is located in Port Açu's area of influence, grew at an average rate of 22.8% a year in the same period, thus raising the port's domestic market share.

The Vitória Port is currently overloaded and its main terminal, Vila Velha, handled 240,000 TEUs in 2006, 96% of the port's market share. The terminal's operations have also been hindered by the port's small retro area and the obsolete equipment in one of its two berths – the first aspect being the most critical.

Currently, the Vitória Port mostly handles loads from Espírito Santo state (approximately 70% or some 170,000 [41] TEUs), followed by Minas Gerais (approximately 18% or some 45,000 TEUs). See below a composition of the points of origin and destinations of the port's loads:

**Table 7: Origin and destination of cargo at Vitória Port**

| Exports via Vitória[42]- Origin | % | Total TEU | Total containers | Full containers |
|---|---|---|---|---|
| Espírito Santo | 57.2% | 70,204 | 53,789 | 36,774 |
| Minas Gerais | 27.7% | 33,931 | 25,998 | 17,774 |
| Bahia | 13.0% | 15,913 | 12,192 | 8,335 |
| Mato Grosso | 1.5% | 1,880 | 1,440 | 985 |
| Others | 0.6% | 769 | 589 | 403 |
| **Total** | **100%** | **122,696** | **94,008** | **64,270** |
| **Imports via Vitória -Destination** | **%** | **Total TEU** | **Total containers** | **Full containers** |
| Espírito Santo | 84.9% | 106,000 | 80,814 | 47,598 |
| Minas Gerais | 10.3% | 12,857 | 9,802 | 5,773 |
| Rio de Janeiro | 1.4% | 1,811 | 1,381 | 813 |
| São Paulo | 1.4% | 1,790 | 1,365 | 804 |
| Goiás | 1.1% | 1,330 | 1,014 | 597 |
| Others | 0.9% | 1,114 | 849 | 500 |

[41] Source: Aliceweb (containerable load divided by volume and adjusted according to the total number of containers per port).
[42] The main container export loads from Vitória are: pulp (36%), steel products (17%) and dimension stones (8%).

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| | | | | |
|---|---|---|---|---|
| **Total** | **100%** | **124,901** | **95,225** | **56,085** |

Despite the current bottleneck, the volume of cargo from Espírito Santo state that seeks other ports in Rio de Janeiro is still small, at 1.6% of the total. The volume of containerable load handled has remained practically stable, at 120,000t in 2006 and 44,000t[43]in the first eight months of 2007.

Meanwhile, cargo from Minas Gerais has shown a slight trend towards changing its port of destination. Over the past three years it has increased by 3% a year at the Vitória Port, by 9% a year at the Rio de Janeiro Port and by 37% a year at the Sepetiba Port. Although the volumes are still much lower than at the Vitória Port, which exports 47% of Minas Gerais' entire container volume, (against 21% in Rio de Janeiro and 21% in Santos), these figures reinforce the hypothesis of the existence of bottlenecks in Vitória.

In the long-term, the big difference in drafts will prove to be a crucial advantage to the region's deepest ports. Some shipyards have signed partnerships for greenfield investments in deeper ports, in order to obtain guarantees for transshipment services with bigger vessels.

The Vitória Port has a 12.5 meter-deep draft which cannot be deepened further due to the areas' geological formation. The Vila Velha Terminal also sits on an embankment, which hinders dredging operations near its berths.

**Demand forecast**

Our demand projection was based on three essential hypotheses: a) an increase in the foreign trade/GDP ratio (b) Açu in the same area of influence as Vitória (c) there will be a captive load provided by the industrial complex that will be created next to the port.

Demand projections have also take into account a big difference in Brazil's foreign trade volume/GDP ratio (24%[44] in 2004) against the global average of 44%. This difference has diminished, as the global rate has grown by 4% a year compared to a 5.1% growth in Brazil. The demand projections are based on the evolution of this ratio, and foresee a 9% growth in the annual container volume.

As of 2004, the ratio has been distorted by the dollar's sharp depreciation and by the recent change in the methodology of GDP calculation. Therefore, our estimates were based on the previous trend as we believe it offers a better reflection of the macroeconomic context.

Based on a GDP growth projection of 4.5% a year for the next ten years and on a foreign trade/GDP ratio of 30% in the period, Brazil will trade some US$ 502 billion in 2016 (against US$228.9 billion in 2006).

[43] Aliceweb – Development Ministry
[44] WTO; BACEN

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In this context, national container handling would rise from 6 million TEUs in 2006 to 15.7 million TEUs in 2016. Meanwhile, demand for the Vitória Port would rise from current 250,000 TEUs to 650,000 TEUs, providing the current market share is maintained.

If we consider a capacity utilization rate of 88%, as recorded at the Santos Port taking into consideration seasonal effects, in order to handle 650,000 TEUs the region must offer a capacity of 740,000 TEUs by 2016.

From 2001 to 2006, however, Vitória's market share grew by 4% a year. This fact is associated to growth in the steel industry and to the industry's tendency become more evenly distributed around the country, moving away from the centers of São Paulo and Rio de Janeiro.

If numerous companies are installed in the industrial zone of the Port Açu's retro area, potential container handling demand at the port will rise substantially, especially due to the natural attraction the complex will have for foreign trade-specialized companies.

The area available for the industrial complex is 3,380 hectares, and the expectation is that 65% of it will be occupied by productive activities in 2016. The load generation potential of the complex is estimated at 0.0057 TEU/m² of occupied area (this coefficient has been empirically determined by Verax based on the analysis of samples by companies geared towards export). These figures indicate a potential handling volume of 124,000 TEUs by 2016, which is conditioned to the success of the industrial complex.

**Current and future port capacity**

In 2006 the Vila Velha Terminal accounted for 96% of Vitória's market share and handled 4.7 TEU/m² against a benchmark[45] of around 4 TEU/$m^2$. This high productivity rate indicates that the lack of available area is a bottleneck for the terminal.

The company is planning to expand the area by leasing part of Capuaba, an unoccupied customs area of approximately 250,000 square meters. However, as seen with other areas in the region, its final concession could take time to materialize and might also end up being divided between other non-containerized port terminals.

The consolidation of the expansion plans and the acquisition of adequate equipment could lead the terminal to reach a capacity of 450,000 TEUs by 2010.

In addition to the Vila Velha Terminal, the Peiú Terminal handled 10,000 TEUs in 2006. However, as the latter has a diversified focus which includes vehicles and project loads, its container volume by 2016 is unlikely to be very significant, at an estimated 20,000 TEUs providing the terminal uses 20% of its area for that purpose. In addition to this, the terminal is unable to expand due to its 10.5m draft.

[45] Drewry - World Container Terminals 2006

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Therefore, the Vitória Port could reach a capacity of 470,000 TEUs by 2016. However, the Vitória Bay has space restrictions for the installation of other terminals.

There are, however, two other projects that could significantly raise container handling capacity in Espírito Santo state. The state government has announced a project for a deep-water container port to be built at the end of the Tubarão terminal. However, as well as there being no assurances that the investment will be made in the medium-term, there is a conflict of interests with VALE and the Praia Mole condominium (controlled by Gerdau, Usiminas and Cia. Siderúrgica de Tubarão). Meanwhile, the operation of a terminal in this geographical location would have logistical limitations

Recently VALE announced a plan to implement a multi-load large port in the region of Ubu that would be a big competitor for the Port Açu. The threat represented by this possible port **has not been considered in this analysis,** as there is a lack of precise and complete information about the plan. However, the plan itself reinforces the perception that the region needs an increase in its port capacity. Verax understands that any of VALE's plans in the region are far from being clearly defined.

If these latter ports are implemented, the potential market share of the Port Açu in container handling will be too small to justify the necessary equipment. The arrival of a first terminal will certainly discourage new projects.

**Forecasts for Port Açu**

Potential handling at Açu will be composed of loads derived from the Industrial Complex and loads captured within the region of influence, which include loads from Minas Gerais and the excess load from the Vitória Port.

The lack of capacity of the Vitória Port is estimated to redirect approximately 180 thousand TEUs to Port Açu, in 2016. This is a base scenario, which takes into account the current market share of the Vitória Port, which is around 4% of the entire Brazilian market.

Verax believes that, taking into account the historical data, this growth expectation is in accordance with market standards and expectations. This year, resulting **demand** at Açu would be 304 thousand TEUs.

The calculated capacity for the containers terminal at Açu is 350 thousand TEUs[46] per year, and is not a limiting factor for the estimated demand.

Different prices in the region may result in an unbalanced distribution. However, what we have observed in Brazil is that the price policy does not dramatically affect the market share distribution, but is a results of a level of market acceptance. An exception to the case is the recent handling level at the Sepetiba Port which, by means of an aggressive price policy, transferred shipowners from the Rio de Janeiro port.

[46] Hypotheses for the calculation of capacity: a) maximum berth occupation – 70%; b) productivity of 1 portainer - 25 transportations/hour; c) TEU/container ratio for the region – 1.3; d) seasonality coefficient – 0.88.

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**Table 8: Handling of containers at the port terminal (MTEUs/year)**

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|
| Containers at Açu [M TEUs] | - | 0.02 | 0.09 | 0.16 | 0.23 | 0.30 | 0.30 | 0.32 |

| 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.32 | 0.32 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 |

Part of this demand tends to be guaranteed by pre-established agreements with companies in the region. Until the development of this study a series of MoUs were already signed or in the final stages of execution, covering roughly 30,000 TEUs. In particular a significant volume of containerized sugar is being negotiated.

**Price of similar services**

The main revenue sources of the container terminals are: loading/unloading operations and imports warehousing. The price to be charged, considering the return on investment simulations, are based on the results of the Santos Brasil terminal, in Guarujá-SP. In the final quarter of 2007, this terminal presented an average billing per TEU handled of US$237[47], which includes all revenues considering average US$ exchange rate in the fourth quarter of 2007.

Current prices in Santos are in a stage of recovery following a severe drop. Should all the current conditions be maintained, operating at a similar level of efficiency to a major terminal in the Santos Port, Port Açu may achieve similar earnings per TEU. The entrance of new players driven by the high tariffs, however, may change this scenario.

The prices presented are merely indications of the current average prices and do not represent expected prices to be practiced in the future.

Fees will also be applied for the use of the port infrastructure[48]. The expenses incurred by the user for this rate in Santos is of US$22.16/container[49] for handled volume and US$4.96/container for berth occupation[50].

[47] Santos Brasil's Gross Revenue (4Q2007)= R$135.4 million; Santos Brasil total handling (4Q2007) = 320,000 TEUs; Average US$ price 4Q2007 = 1.79 R$/US$.

[48] In public ports, these charges are defined by the port authorities, based on Law 8,630, as of 1993 and with supervision by ANTAQ. As regards the LLX Logística Ports, they will be defined by the company itself, based on the applicable table of public ports.

[49] Rate charged according to the handling and type of cargo (general cargo or container).

[50] Rate charged per linear meter of wharf occupied, for periods of 6h or fraction thereof. In order to determine the total laytime and the length of wharf occupied, the following assumptions were adopted:

- Standard 240-meter long vessel with a capacity for 3,000 containers, and average consignment of 500 TEUs.
- TEU / container ratio of 1.5, characteristic of the Santos Port.

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## 5.1.5 Leasing of industrial area

### Recent background

The concentration of several companies in industrial districts is an efficient way to promote the region's economic development. They can share investments in the infrastructures for road and railway access, energy, sanitation and others. These investments can be performed by the government, which, in general, grants tax incentives and promotes a speedier acquisition of environmental licenses.

In districts located next to ports, product loading and unloading structures are shared, as well as investments in drainage and control of maritime operations, which is particularly relevant for companies geared towards foreign trade.

### Similar cases

The Açu Industrial Complex is similar to two projects in the Northeast region, which have been established for some years: the industrial complexes of Pecém, in Ceará, and Suape, in Pernambuco. All of them pursue the installation of large industries, such as petrochemical, thermoelectric or steel industries which, in addition to bringing benefits, attract other auxiliary companies.

Pecém was planned in 1995 and began operations in 2001, by means of a Ceará state government initiative. It consists of a port with a draft of over 15 meters and focused on liquid bulks (particularly oil and oil byproducts), iron ore, coal and containers.

Attached to the port, an area of 200 km² was reserved for the creation of an Industrial Complex. As well as a major steel company, Ceará Steel[51], which would have a production capacity of 1.5 Mtpy of thick steel sheets and coils, there would also be two natural gas-driven thermoelectric plants with a total installed power of 550 MW. The complex would also have metal-mechanic, automotive and refinery industries and a petrochemical plant.

The lack of guarantee as regards the natural gas supply, however, has not allowed the first plants to be installed and, thus, the complex has not yet began its expected course of development.

The Suape Port, on the other hand, was conceived in the 1973 Master Plan of Pernambuco state, and began operations in 1984. It has a 17-meter deep draft and has been operating for several years as a fuel distribution center in the Northeast.

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- Average vessel loading/unloading time of 35 containers / h.
- Total wharfage and undocking time of 2h.

[51] Partnership of the South-Korean steel company Dongkuk Steel with the Italian company Danieli and VALEVALE.

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The port has recently received several investments, among which we highlight the *South Atlantic Shipyard* and the Refinery to be built in partnership with Petrobras and with PDVSA. A further 70 companies are already installed there[52].

An example of the government participation as regards promoting industrial growth in the region is the Polyester Complex, through which the Pernambuco Development Program (Prodepe) has an agreement with the Italian group M&G to reduce ICMS (State VAT) by 80% for 4 years and by 70% for another 8 years. As for the Atlântico Sul shipyard, a 50% reduction to the IPTU (real-estate tax) a 60% cut in ISS (service tax) are being negotiated.

The management of the Complex has been seeking other structuring companies, closely linked to the port (high import and export demand). The most valued areas are reserved for this kind of company. Furthermore, Prodepe provides tax incentive rights, support for land purchase and carries out of infrastructure and facilities building work, as well as providing support for the industrial implementation, expansion or modernization.

**Forecasts for the Açu Industrial Complex**

Rio de Janeiro state is currently the second largest economic center in the country and accounts for 14.5% of the GDP. In order to maintain, or even to improve this position, the Rio de Janeiro State Industrial Development Company (CODIN) has also implemented tax incentive programs.

Being located in an area adjacent to the port, the Açu Industrial Complex will have an advantage from a logistics point of view. Another advantage is the installation of the thermoelectric plant, with 2,100 MW capacity (three 700 MW modules), which will allocate part of the energy to the Complex through agreements within the free contracting environment, thus ensuring supply even in the event of rationing of the interconnected national grid (SIN). Moreover, obtaining environmental licenses for the installation of plants in the region may be easier, as compared to other coastal regions, in view of the low biodiversity at the site.

The success of the industrial area leasing business will depend on the installation of infrastructure companies in the Port Açu region. This would lead to the arrival of other companies in the region, thus promoting the growth of the Complex. The location is favorable, lying between areas of major industrial activity: Rio de Janeiro, Belo Horizonte and mining areas, and Vitória. It will also depend on the government's ability to offer incentives that will make the LLX Logística proposal more attractive than Suape, Pecém and Anchieta (ES)

The LLX plan considers the availability of 3,380 ha[53], out of the 7,500 ha of the LLX Açu area, for the Açu Industrial Complex. This total availability was verified by

[52] These are petrochemical companies, logistics companies, soft drink industries and producers of dimension stones and ceramic, which bring with them suppliers and other related companies.

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Verax[54] based on the rates of occupation and the spatial requirements of similar port operations.

Of this area, LLX Logística shall allocate 1,200 ha to structural projects, especially the steel plant, the MPX thermoelectric plant and the pellet plant[55]. The remaining 2,180 ha shall be leased to other companies interested in developing the area.

Based on the Suape case[56], it was considered that 80% of the area set aside for leasing to (non-structuring companies), 1,744 ha, may be occupied by 2017, with this rate staying stable thereafter. It was assumed that the occupation would occur gradually, starting at 30% of the total in 2015, increasing to 55% in 2016, and reaching 80% in 2017.

Occupation of the part allocated for structural projects, on the other hand, develops proportionally to the installation of the steel plant[57] and the thermoelectric plant to be installed at the Industrial Complex: beginning with an occupation rate of 30% in 2012, rising to 60% in 2014 and reaching 100% in 2016.

[53] 100 hectares is equal to 1 million $m^2$ of area.
[54] 20% allocated to environmental reserves; 35% earmarked for public utilities; 300 ha for port operations of iron ore, 300 ha allocated to the strategic reserve and 200 ha for administrative areas; out of the 4,960 ha left, 35% will be allocated to public utilities; Iron Ore 0.008 m²/t; steel 0.009 m²/t; coal 0.03 m²/t; granite 0.033 m²/t; liquid bulk 0.038 m²/t; LNG 0.025 m²/t; containers 0.25 m²/TEU.
[55] Verax ascertained this figure by evaluating the ratio between the announced capacities and the area of various steel plants in Brazil (Arcelor-Mittal Tubarão and Belgo Monlevade, Gerdau Açominas, V&M, Cosipa, Usiminas and CSN and CSA). The average calculated was 0.5t/m², a value which when applied to the expected steel production in Açu results in a necessary area of around 1,900 ha. This sample, on the other hand, is composed mostly of old plants, with lower efficiency in terms of layout and space usage. The CSA ratio was preferred, as this is a modern steel plant in construction, with expects to double production in the same area (http://oglobo.globo.com/economia/mat/2007/12/20/327709905.asp). This would rise its index from 0.54 t/m² to 1,08 t/m². Applying this ratio to the Açu steel plant would result in a necessary area of 890 ha at maturity, which is coherent with the area reserved for the proposed structural projects. As well as this area, LLX Logística foresees that the MPX thermoelectric plant shall occupy around 500 ha, with still roughly 260 ha remaining for other structural projects.
[56] Suape, nearly 30 years after being created, has around 4,000 ha leased of the 5,060 ha available, that is 80% of the occupied area.
[57] One year in advance.

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The forecast occupation of the total are is shown in table 9.

**Table 9: Leasing of areas in the retro area and Industrial Complex (hectares²/year)**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|
| Area for structural projects | 360 | 360 | 720 | 720 | 1,200 | 1,200 | 1,200 |
| Area for other companies | - | - | - | 523 | 959 | 1,744 | 1,744 |
| Total Area | 360 | 360 | 720 | 1,243 | 2,159 | 2,944 | 2,944 |

| 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|---|
| 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 |
| 1,744 | 1,744 | 1,744 | 1,744 | 1,744 | 1,744 | 1,744 |
| 2,944 | 2,944 | 2,944 | 2,944 | 2,944 | 2,944 | 2,944 |

| 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|
| 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 |
| 1,744 | 1,744 | 1,744 | 1,744 | 1,744 | 1,744 | 1,744 |
| 2,944 | 2,944 | 2,944 | 2,944 | 2,944 | 2,944 | 2,944 |

LLX Logística considers, *a priori*, a lower leasing value for the structural project areas. The forecast is that US$2.00/m²/year will be charged for companies classified as structuring companies as compared to US$5.00/m²/year charged for others.

These prices were not verified by Verax against current market values and were used as suggested by LLX Logística.

LLX Logística based the leasing prices considered in its business plan on current prices for areas near the following ports: Al Jubail (United Arab Emirates) US$2/m², well below the prices charged in European ports such as in Rotterdam: €60/m².[58]

[58] Kinsturge – Airport and Ports / Property markets 2007

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### 5.1.6 LNG

**Recent background**

There is an intention to carry out unloading operations of LNG at the Port Açu Complex. The gas would be used in local energy generation and for supplying the distributor.

Natural gas ("NG") is one of Brazil's main energy resources both for industrial consumption as well as for electric power generation. It accounts for 9% of the total energy resources and 4% of the domestic electric resources, following Hydroelectric plants (UHEs) in terms of significance (77%)[59].

In view of the lack of new hydroelectric energy sources in addition to environmental limits in the concession of new coal power plants, natural gas is a solution for short and medium term generation.

It is a cleaner energy source, when compared to other fossil fuels, and cheaper in relation to oil byproducts, which explains the recent interest it has attracted.

**Table 10: Recent cost of energy in Brazil**

| Current energy prices in Brazil – recent values | |
|---|---|
| **Energy sources** | **US$ / MBTU** |
| Mineral coal – South Africa FOB + freight (approximate) [60] | 2.94 |
| Bolivian NG – Southeast region (price and transportation to city gate[61]) [62] | 5.49 |
| Domestic NG – Southeast region (price and transportation to city gate)[62] | 5.95 |
| A1 Oil - Southeast region[62] | 8.00 |
| LNG spot + freight (approximate) [63] | 10.00 |
| Ethanol - AEHC São Paulo, spot[64] | 13.96 |
| Electric power - ACR – 5th Auction of Existing Energy[65,66] | 14.62 |

[59] National Energy Balance, 2006.
[60] Average price of South African coal (US$52/t) in January 2007 (Euracoal Market Report, January 2007), plus import freight. Assumed 6,000 kcal/kg of calorific power (coal-steam). The average freight cost, US$18/t, was estimated from bulk transport contracts of in the voyage charter scheme executed by the shipping company Dampskibsselskabet NORDEN A/S, in 2006, considering a distance equivalent to the route Cape Town – Port Açu.
[61] Point of transfer of natural gas from the exploration company to the piped gas network, already owned by the concessionaire.
[62] ANP (National Petroleum Agency). 30 days average, between 8/6/2007 and 9/6/2007
[63] LNG sale price plus import costs. GásEnergy in the Press (8/31/2007).
[64] BM&F Ethanol. Average from 4 weeks previous to 8/6/2007.
[65] Sale price of existing energy under Regulated Contracting Environment (ACR), held on 12/14/2006, for supply as of 2007 until 2013 (Auction A-1). Value of R$104.74/MWh converted at the exchange rate of R$2.1/US dollar.

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**Current NG supply and demand**

In 2005 Brazil produced an average of 48 Mm³/d of NG, of which 69.2% (33Mm³/d) was consumed: 7Mm³/d (14.0%) in exploration activities and 55% (27Mm³/d) by regional gas distributors. The remaining was re-injected, burned or lost. In order to supply Brazilian needs 25Mm³ were imported, of which more than 90% came from the Brazil-Bolivia Gas Pipeline (Gasbol), and the rest from Argentina[67].

In addition to the shortage, the lack of transportation infrastructure in Brazil causes an unbalanced supply between different regions. The network is currently divided into 4 branches: South/Southeast/Mid-West, Espírito Santo, Northeast and North. The S/SE/MW network has the greater volume and a connection to the Campos Basin and to the Gasbol. The largest deficit is in the Northeast, for which reason Petrobras is building the Gasene – which will interconnect the networks of S/SE/MW to Espírito Santo, by the end of 2007, and to the Northeast network by the end of 2009.

Of the 58Mm³/d consumed in 2005, the industrial sector was the main user: 39%. Electric power generation consumed 38%, and other uses (vehicles, residential and commercial) accounted for 22.7%[68].

As a raw material for thermoelectric plants, it was strongly promoted by the government before the 2001 energy crisis[69]. After the rationing, however, the reduction in electric power consumption resulted in the non operation of the thermoelectric plants. Since then, electric power consumption has been growing at a speed greater than investments in transmission, distribution and mainly generation, thus creating the risk of another energy rationing.

The EPE[70] estimated a 5.1% growth in electric power demand until 2015 in a reference scenario, a 5.8% growth in a high-demand scenario and a 4.1% growth in a low-demand scenario[71].

By analyzing GDP growth rates between 3.0% and 4.5% between 2007 and 2011, the EPE study did not present deficit risks above 5%, assuming that investments and efficiency gains will take place as forecast. In the high-demand scenario, an additional 4,700 MW will have to be engaged by 2014.

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[66] Assuming a conversion rate of thermal power into electric power of 3.412 MBTU per MWh, valid for a modern thermoelectric plant (BP Statistical Review of World Energy, June 2007).
[67] ANP (National Petroleum Agency).
[68] National Energy Balance, 2006.
[69] After institutionalization by the Thermoelectric Priority Program, created by Decree 3,371/2000.
[70] Ten-Year Electric Energy Expansion Plan 2006-2015 – Cap. II. – EPE.
[71] Takes into account average GDP growth of 4.0%, between 2007 and 2011, and of 4.5% between 2011 and 2015, in the reference scenario; of 4.5% between 2007 and 2011 and of 6.0% between 2011 and 2015, in the high-demand scenario; and of 3.0% between 2007 and 2011 and of 3.5% between 2011 and 2015, in the low-demand scenario.

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However, the accelerated economic growth has increased the deficit risks. At the forecast average GDP growth rate of 4.8%, the deficit risk reaches 5.9% in the Southeast, considering the addition of 1,400MW by 2011 – which should be provided by the 2008 energy auction. Without the addition in 2011, the risk reaches 7.3%, in which case the Acende Brasil Institute warns of a risk of 28%[72,73].

In order to increase supply and mitigate the deficit risks, the government has been stimulating the construction of thermoelectric plants, which, although more expensive than the hydroelectric plants (per generated MW), can obtain environmental licenses and be built faster.

However, due to the consumption growth above the expected rate, delays in the schedule of NG supply by Petrobras and to the realization that domestic reserves were overestimated, there is a concrete outlook of a short and medium-term shortage of this resource.

This problem has a forceful impact on the industrial sector, since the state-owned company prioritizes thermoelectric plants, generating uncertainty in the industry regarding future supply. **Currently, there are no new industrial investments being made backed by natural gas supply**, and a few plants are re-converting to oil fuel for generation[74],[75].

**Forecast supply and demand of NG**

Petrobras[76] predicts a steep growth in demand for NG, of 19.2% p.a., by 2012, increasing consumption to 134 Mm³/d. 48 Mm³/d will be allocated to industry, 42 Mm³/d to electric power generation and 44Mm³ to other uses (vehicles, residential, etc.).

In 2012, demand will be supplied by a net domestic production of 72.9 Mm³/d, the importation of around 30Mm³/d through gas pipelines, with the Gasbol reaching its full capacity, and up to **31 Mm³/d by LNG imports**.

This volume is necessary, because Brazilian reserves are small.

The chartering of two LNG regas vessels has already been announced. These vessels will start operating in August or September 2008[77] (Pecem-CE) and in 2009 (Rio de Janeiro-RJ), with capacities of 7 Mm³/d and 14 Mm³/d, respectively. The chartering of a

[72] Debate *TV Estadão*. "Até quando o Brasil vai estar livre de um novo apagão?" (Until when will Brazil be free from another energy shortage). *O Estado de São Paulo* newspaper 9/9/2007, Economia, pg B10.
[73] The difference is mainly due to different critic level criteria for the water reservoirs, to start rationing (10% for the first, 0% for the second).
[74] "Indústria já sente "apagão do gás", dizem analistas" (Industry already faces gas shortage, according to analysts). *Gazeta Mercantil* newspaper 9/5/2007, Energia & Saneamento, pg C-2
[75] Regarding the situation, Petrobras signed with the National Electric Power Agency (ANEEL), in May 2007, an instrument undertaking to supply NG to 13 thermoelectric plants (UTEs) by the end of the year (to generate 2,540 MW), increasing to 20 UTEs by 2011 (6,737 MW). As a way to inhibit accelerating demand and meet its target, the state-owned company will increase its domestic natural gas tariff by around 40% in 2008.
[76] Petrobras – Strategic Planning 2008-2012.
[77] The first was originally scheduled to operate in Rio de Janeiro in May 2008, but was postponed.

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third unit is being negotiated by the state-owned company, and is expected to be installed between 2009 and 2010 in Suape – PE or São Francisco do Sul – SC.

## LNG import

The high LNG cost is associated mainly to the high operating and capital costs of liquefying plants and transportation, which utilize advanced technology and require large investments[78]. In 2006, there were only 13 exporting countries. The 5 major ones being: Qatar (85 Mm³/d, 14.7% of *market-share*), Indonesia (81 Mm³/d, 14.0%), Malaysia (77 Mm³/d, 13.3%), Algeria (68 Mm³/d, 11.7%) and Australia (49 Mm³/d, 8.5%).

Table 11 shows the 10 leading global importers of LNG in 2006, a list in which Brazil will feature in 2009, with at least 20 Mm³/d.

**Table 11: 10 main importers in 2006 and energy matrices[79]**

| 2006 LNG imports | | | Energy matrix | | | | |
|---|---|---|---|---|---|---|---|
| 10 major [Mm³/d] - % total | | | Oil | Natural gas | Coal | Nuclear | Hydroelectric |
| Japan | 81.86 | 38.8% | 45.2% | 14.6% | 22.9% | 13.2% | 4.1% |
| South Korea | 34.14 | 16.2% | 46.7% | 13.6% | 24.3% | 14.9% | 0.5% |
| Spain | 24.42 | 11.6% | 53.6% | 20.6% | 12.6% | 9.3% | 3.9% |
| USA | 16.56 | 7.8% | 40.4% | 24.4% | 24.4% | 8.1% | 2.8% |
| France | 13.88 | 6.6% | 35.3% | 15.5% | 5.0% | 38.9% | 5.3% |
| Taiwan | 10.20 | 4.8% | 46.2% | 9.5% | 34.8% | 7.9% | 1.6% |
| India | 7.99 | 3.8% | 28.4% | 8.5% | 56.2% | 0.9% | 6.0% |
| Turkey | 5.72 | 2.7% | 30.2% | 29.0% | 30.4% | 0.0% | 10.5% |
| Belgium | 4.28 | 2.0% | 55.4% | 20.7% | 8.3% | 14.8% | 0.8% |
| UK | 3.56 | 1.7% | 36.3% | 36.1% | 19.3% | 7.5% | 0.8% |
| Brazil | 0 | 0% | 44.6% | 9.2% | 6.3% | 1.5% | 38.3% |

Specialists say that the domestic hydroelectric output is close to its limit. New plants would be imply in gigantic flooded areas, causing major environmental impacts. The participation of hydroelectric plants in power generation tends to decrease as opposed to

[78] A liquefying plant is composed of one or more LNG "trains", where the NG is processed, removing from it fractions that freeze at -160° and then liquefying it. It is a highly technological investment, extremely expensive, and controlled by a few companies in the world.
[79] BP Statistical Review of World Energy, June 2007.

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NG, which will make the Brazilian matrix more balanced as compared to other countries.

Demand for LNG, driven by the effort by several countries to reduce mineral coal consumption and oil reliance, will stimulate a 14.5% annual growth in world liquefying capacity by 2010[80]. At this rate, global LNG trading (211 Mm³/d in 2006) will reach 317 Mm³/d in 2009, and Brazil is responsible for 6% of world trade[81]. Meanwhile transportation[82] capacity is expected to grow significantly by 2010, with a CAGR of 12.8% (from 220 to 332 vessels).

**Petrobras, unlike some of the major oil companies in the world, does not hold interest abroad in any liquefying plant and will import all LNG from other companies**, and with chartered vessels, since it does not have its own fleet of gas tankers.

## Forecast for Port Açu

The Industrial Complex of the Port Açu is expected to be self-sufficient in energy. LLX Logística foresees that MPX will install the first of three modules of a coal-driven thermoelectric plant in mid-2012, which will reach a maximum output of 2,100 MW in mid-2013. Later, one or more thermoelectric plants may be added to the complex, reaching a total installed capacity of 5,400 MW, the period for this taking place is still undetermined. NG is one of the most feasible options for this expansion.

Port Açu shall have a pipe and tank system to unload 2 Mm³ of LNG in 2013 and **4Mm³, as of 2014**. It shall also have an LNG regasification plant, which will enable the generation of 7.6 Mm³/d of NG as of 2014.

**Table 12: Handling of liquefied natural gas at the port terminal (Mm³/year)**

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|
| Liquefied natural gas (Mm³) | 2.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |

| 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |

Part of the forecast demand for LNG handling at Port Açu is already the subject of negotiations with two large companies. Each one should demand the handling of 0.5 Mm³ of LNG a year, accounting for 25% of the forecast handling volume at business maturity. LLX Logística has already signed an MoU with one of the companies and the other shall be signed in the first semester of 2008. There is also a third company

[80] The GNL *Shipping* Market in 2006, Barry-Rogliano-Salles.
[81] Considering that all LNG produced worldwide is exported.
[82] The world's largest shipowner is Japan, with 20.4% of the fleet, followed by the UK, whose large oil reserves, influent in this market, holds 13.5% of the available capacity.

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negotiating the LNG imports via Port Açu, but the potential handling volumes have not yet been estimated.

These structures shall be entirely built and owned by third-parties, with LLX Logística being responsible for the unloading operation and berth provision, amongst other services. Thus, the success of the project depends on the potential existence of a party interested in the investment, which has not been checked by Verax.

The company that joins the business may utilize NG in two ways:

1. Selling it to concessionaires that distribute piped gas,

2. Transforming it into electric power at the thermoelectric plant and selling electric power – primarily to local industries (as free consumers) – and offering the excess on the market.

**Sale of piped gas to concessionaires**

In the case of gas sales to the Petrobras gas pipe system there is the risk of a boycott. The state-owned company has the advantages of owning the gas pipeline network (without free access to other companies), of holding interest in some distribution concessionaires and of its politic power.

Although Petrobras considers gas as one of the backbones of its operations, it does not produce LNG nor does it have the necessary assets for its production and transportation. A supplier integrated in the LNG production must prefer agreements or partnerships with players independent from Petrobras, including the use of one's own infrastructure, if possible.

There are talks in progress between LLX Logística and a potential heavyweight player in the industry.

The potential company must focus on the sale to concessionaires without the participation of the state-owned company in the Southeast region. It will be necessary to build gas pipelines up to the distributor's network. The existence of an MMX mining pipeline connecting Port Açu to Minas Gerais state would enable the use of the right-of-way already acquired, which would considerably reduce the costs and periods for installation.

**Sale of Electric power**

In the generation of electric power, the generation company should prioritize energy supply to the local Industrial Complex, which translates into material safety for future investors in view of the uncertainties of the current supply scenario. The market has been very interested in this opportunity. One cannot forecast how much of energy will be used locally, but for certain most of it will be sold to the market.

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Due to environmental difficulties and the lack of possible places to build hydroelectric plants, an increased share of natural gas in the Brazilian electric power matrix is inevitable.

**Handling prices**

Brazil does not currently perform unloading of liquefied natural gas, and, thus, there is no price background for handling. The LNG unloading price could result, among other things, from the difficulty of handling operations in view of the low temperatures and the investment costs for the unloading and tank storage infrastructure. As for the Port Açu, these structures are supplied by third-parties, and therefore it is reasonable to estimate a price of US$5.00/m³.

The charging of utilization fees for the use of the port infrastructure will be considered LNG handling at Port Açu. As there are no similar projects implemented in Brazil, it is not possible at this stage to know details regarding the supply contract, the unloading rate and the size of vessels.

**Project risk**

The consumption of electric power is highly related to the variation of the country's GDP. An economic recession represents a risk for the project.

Under the market's strategic point-of-view, the success of an association with a strong partner for the import and regasification of the LNG is essential for the success of the thermoelectric plant which may be installed, and, consequently, of LLX Logística, as this will guarantee the product supply.

A considerable volume of energy demand shall result from the Industrial Complex, the good market acceptance of which can only be confirmed after its installation.

In terms of regulation, the approval of a specific regulation for the industry will rule the use of NG transportation and processing infrastructure. A bill of law regarding the subject has been in process for a few years now and is expected to be passed in the forthcoming months. One of the relevant topics foreseen is the adoption of the concession scheme in place of authorizations for the construction and operation of gas pipelines.

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## 5.1.7 Granite and dimension stones

**Recent background**

Granite represents a particularly relevant opportunity within the potential cargos of the Port Açu Complex and, thus, deserved a specific study.

Brazil is one of the world's largest producers of dimension stones, facing competition from China, Italy, India and Spain. In 2006 the country exported over 2.5 million tonnes, with sales worth US$1.045 billion. The average price was US$ 418 per tonne.

The main buyer was the United States, which accounted for 60.4% of total sales and 31.8% of the exported volume. Out of these sales, 99.8% come from the trading of processed stones, in the form of slabs and artifacts, the transportation of which is delicate.

Brazilian exports presented a strong growth between 2002 and 2006, of over 30% per year, driven, mostly by the upturn in the U.S. real-estate market and by the strong demand from the Chinese construction industry. In 2007, volumes are expected to decrease[83].

Around 52% of the exported volume is of processed stones, accounting for 82% of producers' sales. Regarding the product exported by Espírito Santo, rock which is processed in some manner is worth 5 times more than the rock in its raw form. The industry has been making efforts to increase the share of finished products in the balance.

The first wave of rock exports, mainly to Italy, Spain and China, consisted basically of raw blocks; the second wave, marked by the conquest of the US market after some investment in technology, increased the share of polished slabs; now for the third wave, the industry is looking to increase the share of finished products: sinks, tiles, doorsteps, benches, stairs, etc.

The geographic distribution is highly concentrated in the states of Espírito Santo and Minas Gerais, accounting for around 80% of the total domestic production. Blocks of raw material is transported as general cargo. The blocks of up to 30 tonnes are transported essentially by train (80% of the total) to the port terminal, and then loaded on to general cargo vessels, thus requiring stowage. Meanwhile, finished and semi-finished products are fragile and transported in containers. In this case, the most common transportation method is by road, resulting in a high level of damage.

[83] According to the balance of Brazilian exports published by the Brazilian Association of the Dimension Stones Industry (ABIROCHAS) in January 2007, a few factor contributed negatively to the recent drop in exports: the evolution in the Brazilian exchange rate, the behavior of the U.S. real-estate market, the shortcomings in Brazilian logistics, increased international competition and others.

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Around 80% of the exports in 2006 were carried out through the Vitória Port (72% in value), which the closest port to the producing region.

The Vila-Velha Terminal (TVV) ships both raw rocks and containerized processed rock; the Peiú and CODESA terminals ship only raw blocks.

The TVV has been working with a loading window of around 2 days, due to the lack of warehousing area. Under these conditions, there is often not enough time to complete the loading and the exporter is forced to pay an additional R$280 per container in warehousing and handling fees.

Despite the additional 500-kilometer distance to the Rio de Janeiro port and 580 kilometers to the Sepetiba port, a considerable volume of rocks is shipped from these ports, since the Vitória port is exceptionally overused.

The expectation of local producers is that the problem at Vitória will be resolved through the creation of a new port. They hope this terminal will be created in Barra do Riacho, a port located to the north of Vitória, where investments are planned by the federal government, or even at the Ubu inlet, further south in the state, where the Smarco pellet terminal is located.

A port terminal in the region with a specialized service for this kind of cargo can attract significant volumes.

With the product's increased added value and its entry into new markets, ABIROCHAS projects sales of around US$1.8 billion in 2010. Of this total, 15% would come from granite blocks and 30% from polished granite slabs.

Port Açu will be able to attract part of the stones in block form (1.1 million tonnes in 2006), if there is easy access to the FCA rail network and if the revitalization plan of the railway that extends from Vitória to Campos de Goytacazes is carried out. Furthermore, if this transportation is made available to containers as well, the port could dispute some of the containers of processed stones (600 thousand tonnes or nearly 25 thousand containers in 2006).

The plan includes the expectation that ore processing companies may set up in the retro area of the Port Açu. This region is especially attractive considering its proximity to potential raw material sources. In this case, the volumes of stones shipped in containers would increase against those shipped in raw state, which is not considered in the volume estimates.

These volumes represent optimistic estimates and require the implementation of an exclusively-dedicated operation. The loading of raw stones is currently performed by traditional cranes and this is a slow operation, occupying much of the docking berth and reducing the available volume capacity. LLX Logística believes that it will be possible to load rocks utilizing portainers, which may speed up loading, but will still be slower than containers, because this requires stowage. Verax has not assessed this possibility.

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We consider that 40% of the volumes mentioned correspond to an intermediate scenario if there were operations in 2006. A growth of 5% during the first 8 years and 3% after that is considered reasonable until the planned port capacity of 1.53 Mtpy is achieved. It is reasonable to assume that half of these volumes shall be loaded in containers.

**Table 13: Handling of granite in the port terminal (Mtpy)**

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|
| Granite [Mt] | 0.54 | 0.90 | 1.18 | 1.24 | 1.28 | 1.32 | 1.36 | 1.40 |

| 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.44 | 1.48 | 1.53 | 1.53 | 1.53 | 1.53 | 1.53 | 1.53 | 1.53 | 1.53 | 1.53 | 1.53 | 1.53 | 1.53 |

There were difficulties in obtaining prices effectively charged for the shipment of this product. Information supplied by different agents was contradictory. Based on markets and similar activities, Verax considers prices of around US$10/tonne for blocks and US$8/tonne when shipped in containers as reasonable.

The prices presented are only indicative of current average prices and do not constitute expected future price values.

Currently the majority of the Brazilian port terminals are overused in relation to their economically optimum rate of occupation. In view of this, the LLX Logística project makes sense. In a scenario of higher demand than the optimal capacity, the prices for the port services go up, which means that prices currently charged may be inflated and, in general, higher than those charged by the terminals located in developed countries. Additional capacity supply generated by the startup of LLX Logística means a change in the sense of reducing or eliminating this stress, leading to a price reduction in a balanced market.

Fees for use of the port infrastructure will also be charged for the handling of granite at Port Açu[84].

By assuming a loading operation for stones equivalent to container loading, as suggested by LLX Logística, this cost can be calculated. A user of the Santos Port would pay approximately US$0.74/tonne[85] for the volume handled and US$0.14/tonnes for berth occupation[86]. These values have been considered as revenue in the planning of the Port Açu.

[84] At public ports, these are rates defined by the port authorities, based on the Law 8,630 of 1993 and supervised by the ANTAQ. In the case of the LLX Logística Ports, these will be defined by the company itself, based on the table applicable to public ports.

[85] Rate charged based on the handling and type of cargo (general cargo or container). It is assumed that every granite operation will be performed in batches equivalent to containers with 30 tonnes of product each.

[86] Rate charged per linear meter of wharf used for period of 6 hours or fraction thereof. For the establishment of total laytime and the length of wharf occupied, we have used the following assumptions:

- 240 meter-length standard vessel with capacity for 3,000 containers.
- Vessel loading/unloading speed of 35 containers per hour.
- Total wharfage/undocking time of 2 hours.

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### 5.1.8 Support base for offshore operations

Verax has not evaluated the LLX Logística plan for the support base for offshore operations at Port Açu, but considered all the assumptions regarding the LLX operation in creating the financial model.

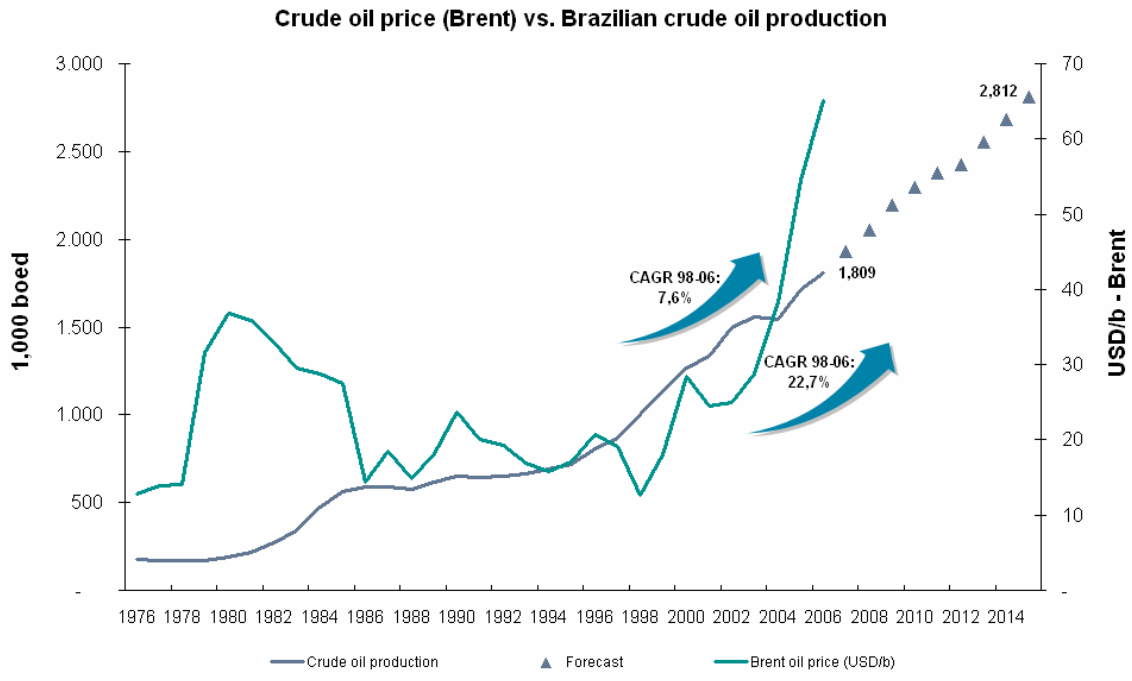
Nevertheless, in order to provide some guidance for the investors' considerations regarding this business activity, Verax discusses some aspects of this market and carries out a survey of the current and future capacity of offshore support bases and an assessment of the existing risks.

**Recent background**

The price per barrel of oil on the international market has been increasing vigorously over the last years. In this context, many deep-water oil and gas exploration projects with higher costs and risks have been carried out in Brazil and around the world. Over 80% of the Petrobras production comes from the Campos basin, not to mention the majority of its proven reserves.

Since the 1998 shortfall, the (Brent) oil price increased at an average rate of 22.7% until 2006. Domestic production rose 7.6% per year while global production grew 1.3% per year.

**Figure 5: Evolution of oil barrel price and domestic production[87]**




[87] BP Statistical Review of World Energy, June 2007; Petrobras – strategic planning 2008-2012.

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Although the price has fluctuated, it has remained high in the last few months and Petrobras forecasts the expansion of their extracted volume from 1,809 Mmboe/d[88] in 2006 in 2006 to 2,812 Mmboe/d in 2015[89], growing 5.0% p.a..

Out of the total 577 million barrels produced in Brazilian seas in 2006, Rio de Janeiro accounted for over 95%. Northeastern states produced 2% and the rest was spread amongst Espírito Santo (1%), São Paulo (less than 1%) and Paraná (less than 1%).

Offshore support vessels (OSVs) assist platforms in several stages[90] of offshore oil exploration, from seismic research to decommissioning, mainly serving the production and drilling platforms. Each platform is served by several OSVs.

Petrobras and its subsidiaries does have their own OSV fleet[91]. The vessels serving their platforms are owned and operated by firms which are usually the Brazilian branches of multinationals. The operations are however programmed by Petrobras itself, which therefore controls occupation and allocation. The forms of contract are usually fixed in days of operational availability.

Petrobras is responsible for the vast majority of operations executed in Brazilian waters. Other parties which demand these services are well drilling companies, such as Noble do Brasil and Pride do Brasil, which require supplies for their platforms. As other oil companies become more active, such as OGX Petróleo e Gás Ltda. (OGX), the offshore support market will tend to grow. Even in the prospection phase, which would be the OGX's first activity, there is an intense demand for these units.

**Demand for support vessels**

In June 2006, the OSV fleet hired by Petrobras consisted of 150 vessels[92], 118[93] of which were operating in the Southeast region (Campos Basin, Espírito Santo and Santos) and the other 32 in the Northeast region. By the end of 2007 the fleet is expected to have **136 OSVs**[94] hired to operate primarily in the **Southeast region**.

As well as concentrating 98% of the domestic offshore production, the region possesses the vast majority of the new blocks explored, where intense drilling activities demand massive volumes of OSV services.

The projected numbers of OSVs potentially attracted to the port were calculated based on the expansion of offshore units and by considering the absorption of a percentage the offshore support market.

---

[88] Million barrels of oil equivalent per day.
[89] Petrobras – Strategic planning 2008-2012
[90] Seismic research (0 to 10 years), drilling (between 15 and 60 days), completion (between 15 and 30 days), production (generally between 2 and 10 years).
[91] Transpetro has only one OSV in its fleets.
[92] It also had 48 hired helicopters.
[93] 51 modern suppliers (Platform Supply Vessels – PSV), 26 tugboats/ suppliers/ anchor handlers (Anchor Handling Tug Supply – AHTS), 23 line handlers (Line Handling – LH), 9 utility vessels (Utility vessels – UT), 7 tugboats/suppliers (Tug Supply – TS) and 2 former supply vessels (Supply Vessels – SV).
[94] Between June 2006 and December 2007 18 OSVs were supposed to be delivered, built by Brazilian shipyards (Lloyds World Shippind Encyclopaedia, January 2007).

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In April 2007, there were 100 Petrobras production platforms. In the Southeast region they were: 40 in the Campos Basin, 2 in the Santos Basin and 1 in the Espírito Santo Basin. The other 57 are jackets installed in the Rio Grande do Norte Basins – Ceará, Sergipe – Alagoas or Camumu (Bahia)[95]. Furthermore, 44 offshore rigs were operating for the state-owned company in the country[96], 35 (80%) of which are estimated to operate in the Southeast region basins, and the remaining in the northeast and north regions of the country.

Thus, 78 Petrobras units or units hired thereby operate in coverage area of Port Açu and Port,Sudeste 12 of which are fixed and 66 floating. Production units make up a maximum production capacity of around 3.5Mmboe/d.

By 2012, Petrobras will add around 16 units to the Southeast region, 13 of which are expected to be floating units[97]. By then, 9 offshore rigs are expected to be in operation in addition to the current ones in the region[98], totaling 22 floating units.

The **9th ANP bidding round** took place in November 2007, through which some companies other than Petrobras began to increase their share in the national territory, such as the recently-created OGX[99], a company belonging to the same parent company as LLX Logística. The greater the share of these companies, the greater the number of OSVs needed tends to be, for which the service density interactions are lower. The Santos Basin was the main subject of interest, with an offer of 94 high potential offshore blocks[100]. In the Campos basin there were 17 (high potential[101]) offshore blocks on offer in the Espírito Santo basin, 6 (new frontier), in the Pará-Maranhão basin, 50 (new frontier) and in Pernambuco-Paraíba, 13 (new frontier).

[95] Petrobras website: www.petrobras.com.br.
[96] Petrobras website, Petrobras Figures section. September 2007.
[97] Petrobras – Strategic Planning 2008-2012. New projects foreseen are P-52, P-54 and P-55 (Roncador), P-51 and P-56 (Marlim Sul), Papa-Terra, Maromba, P-57 (Jubarte Fase II), Cachalote, Baleia Franca, Baleia Anã, all in the Campos Basin. Mexilhão, Uruguá-Tambaú, Pirapitanga, in the Santos Basin. Golfinho and Peroá-Cangoá, in the Espírito Santo Basin.
[98] Considering the same proportion of number of offshore rigs / oil production in 2007 (ANP)
[99] OGX was created in July 2007, through the private capital raising of US$ 1.285 billion.
[100] ANP: www.brasil-rounds.gov.br/round9/resumo_setores.asp
[101] ANP classifies the blocks in 3 categories: “Mature Basins” are areas with already explored blocks presenting low risk, “High Potential”, located in areas with a highly probably oil reserves and less risks; and “New frontiers” which are less explored and present higher risks.

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***Demand generated by OGX***

In the 9th ANP bidding round, OGX completed the purchase of 21 blocks, 16 of which are in shallow water (less than 400 meters from the water line) and 5 in deep water. OGX shall also purchase the rights to an exploration block in the Santos Basin in March 2008, taking its tally of offshore blocks up to 22. Of these, 8 are partnerships (with Maersk Brasil Ltda. and Perenco S.A) in which OGX shall not be the operator. In all the company paid out around USD 800 million. Figure 6 shows the distribution of these blocks in Brazil.

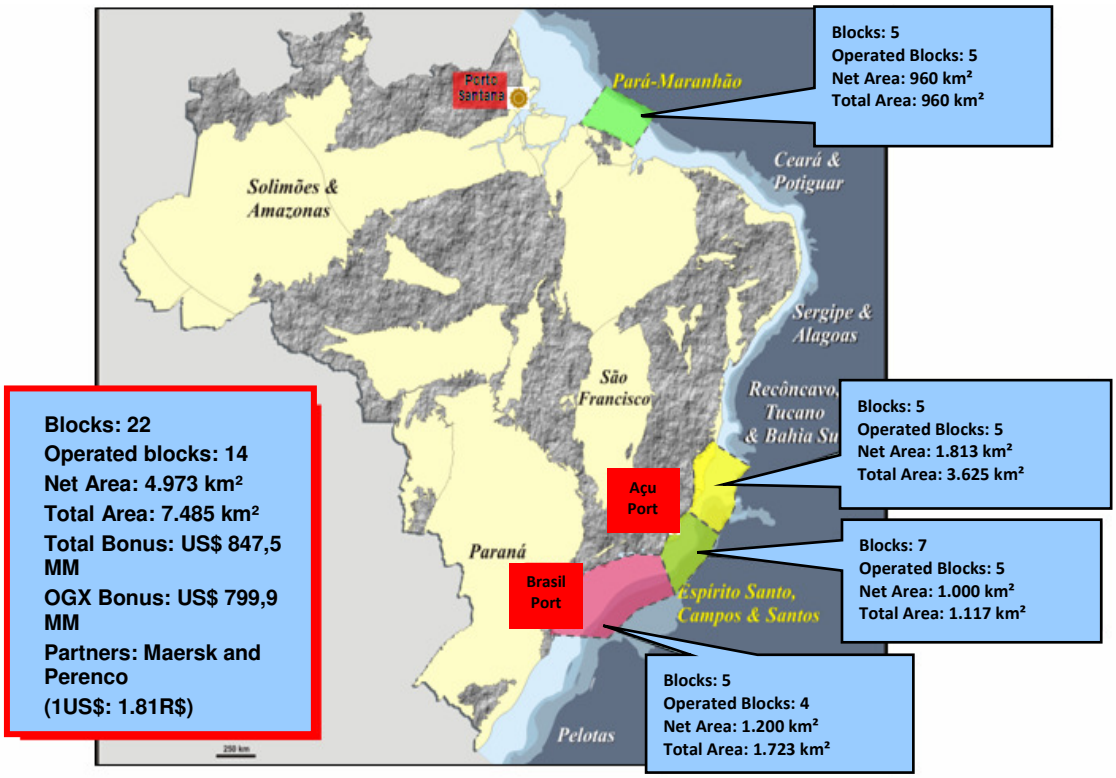


**Figure 6: Blocks purchased by OGX in the 9th ANP bidding round, by region (LLX Logística)**

In the Campos and Espírito Santo basins, Port Açu coverage area, there are 12 ports which are located 200 and 300 km from the Port, respectively, as Figure 7 shows.

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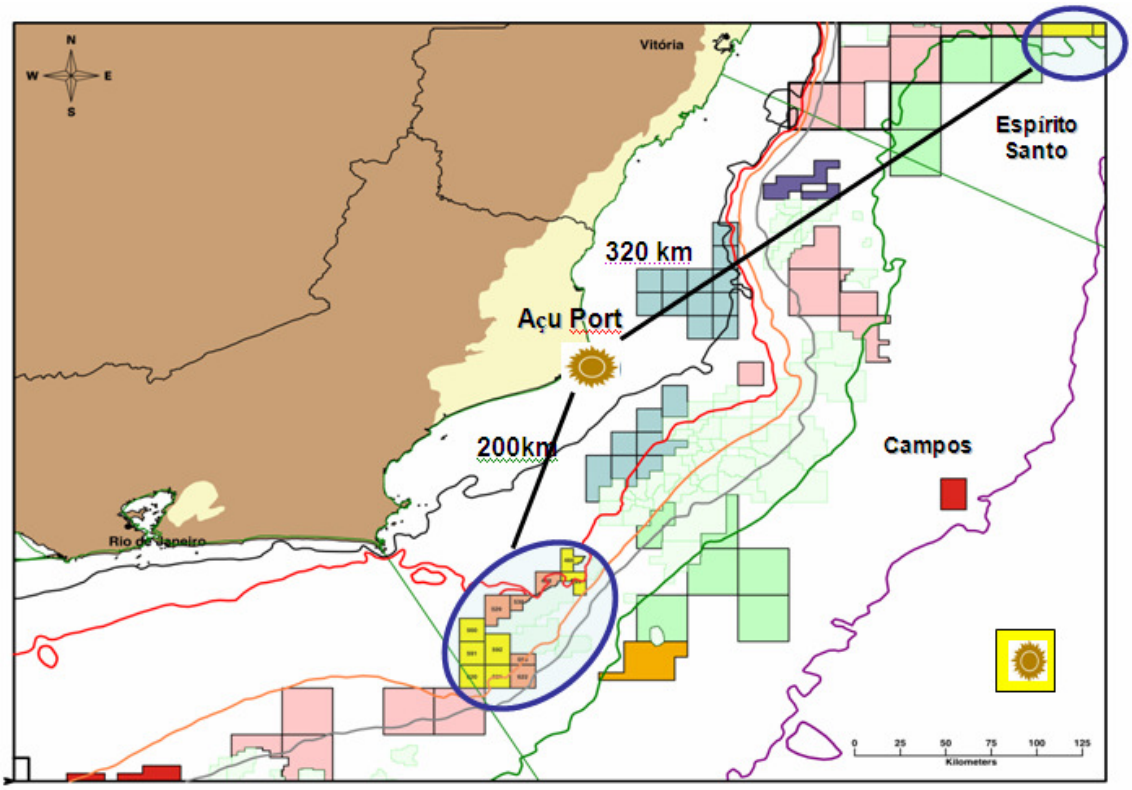


**Figure 7: Location of the 13 blocks purchased by OGX in the 9th ANP bidding round in the Port Açu coverage area**

The concession for execution of the MEP[102] in these blocks is valid for 3 years (shallow water in Campos) and 4 years (deep water in Espírito Santo). If economically feasible discoveries are made then the concession holder can declare the commercial viability of the block, thus beginning a 27 year period to carry out a development plan of the area and exploit it commercially.

Throughout these activities, platforms shall be activated and, with therefore OSVs shall be needed to transport the necessary supplies. In line with the interests of the parent company, OGX shall ensure that it enters port facility service agreements with the Aço Port and its service providers.

## Current and future port capacity

Petrobras owns a private port in Macaé, the **Imbetiba Terminal**, which is the main support base for the Campos Basin. Located 13 Km away is the *Parque dos Tubos*, a large warehouse complex where supplies and equipment to be used on the platforms are stored.

[102] The Minimum Exploration Program (MEP) is a plan of the minimum seismic and well drilling activities in each block required by ANP. If the concession holder fails to meet these requirements, it loses the concession..

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The 6-berth terminal has already operated with a volume well above the design capacity, but the addition of new bases has recently relieved the load. Still, its proximity to the platforms and the low quality of services provided by the terminals through which Petrobras has tried to operate are still causing a **stressed operation, generating queues at the terminal**. The high occupancy increases the non-availability of berths for operations which require greater time intervals, such as the loading of heavy equipment, maintenance of vessels specified in contract, etc.. In these operations, OSVs frequently use other berths, which are not owned by Petrobras.

In addition to the Macaé base, Petrobras exclusively operates other berths in third-party terminals: at the Companhia Portuária Vila Velha (CPVV), in Vitória-Espírito Santo, at MultiPortos, in the Guanabara Bay (Rio de Janeiro-RJ) and in Itajaí-Santa Catarina. It also uses the Ubu Port (Espírito Santo) for specific services[103]. There are other bases in the region which do not operate only for Petrobras but for drilling or subsea construction companies that provide services to Petrobras or other oil companies in Brazil.

It is estimated that the 9 berths operated by Petrobras in the region will serve its fleet at the ratio of 15 OSVs/berth by the end of this year.

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**Table 13: Offshore base in the South and Southeast regions (2006)[103]**

| Base | City | Exclusive Petrob Berth? | # berths | Monthly wharfage | Maximum draft (m) |
|---|---|---|---|---|---|
| Imbetiba | Macaé-RJ | Yes (6/6) | 6 | 440 | 8.0 |
| MultiPortos | Rio de Janeiro-RJ | Yes (1/3) | 3 | 41 | 7.0 |
| CPVV | Vitória-ES | Yes (1/3) | 3 | 60 | 9.15 [104] |
| Ubu | Anchieta-ES | n/a | n/a | n/a | 13 [105] |
| Brasco [106] | Niterói-RJ | No | 3 | 19 [107] | n/a |
| Nitlog [108] | Niterói-RJ | No | 5 [109] | n/a | 8.0 [110] |
| Itajaí | Itajaí-SC | Yes (1/1) | 1 | 21 | n/a |
| Planeta [111] | Angra dos Reis-RJ | No | 5 [112] | n/a | 8.84 |

[104] Presentation "*Fórum de Logística, Infra-estrutura, Serviços e Suprimentos da ONIP*". Fernando Cerveira, Petrobras Transportation Services and Storage Unit. June 14, 2006.
[104] CPVV website: www.cpvv.com.br
[105] Disregarding tide. Antaq website: www.antaq.gov.br
[106] Belongs to the Wilson Sons Group, which has operations in shipbuilding, offshore shipowning and port logistics.
[107] IPO Prospectus by Grupo Wilson Sons (2007). According to the source, there were 229 wharfages in the year of 2006.
[108] Base operated by the North-American company Edison Chouest in a leased area of the Niterói Port. The company has strong presence in the offshore industry of the Gulf of Mexico, where it operates the Port Fourchon – used by operations of several oil companies in the region. It is the greatest provider of the Brazilian shipowner Alfanave and the shipyard Navship.
[109] The measurement by Google Earth (September 2007) indicates 420m, equivalent to 5 berths of 84m each.
[110] Channel depth. The wharf is 9.0 m deep.
[111] Activities were suspended in view of frauds in Petrobras biddings, made public in 2007.
[112] 400m long wharf, supposing 80m/berth.

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The way the Petrobras-supporting bases operate is basically determined by Petrobras itself, including the management of replacement material, and the shipowners follow a pre-established schedule.

The state-owned company does, however, have an interest in outsourcing the port operation. Therefore, there is an opportunity for new ports that would provide services to Petrobras, possibly in an exclusive manner. There are internal obstacles regarding Petrobras, generated by the low quality of services in its last two experiences of using third-party terminals.

The new bases that will provide services to Petrobras are expected to have easier access to the supply industries (an aspect in which the bases of Niterói-RJ, Rio de Janeiro-RJ and Vitória-ES are found lacking), wider and higher piers than those currently in Macaé and a draft of over 7.7m.

In view of various difficulties[113], the state-owned company is engaged in implementing a **new terminal of its own** near the Ubu Port, where it already performs some operations. It will probably have **5 berths** and serve the Campos and Espírito Santo Basins.

Another terminal planned for the region is in Barra do Furado (Campos de Goytacazes region), to be built by the Edison Chouest Group. This project is currently on hold, awaiting definition by Petrobras and other companies regarding the possibilities of use. The main setbacks are related to the high level of investments needed, such as dredging, which would depend on the confirmed interest of the oil company, which seems to be searching for an alternative solution.

[113] At CPVV, the first space operated by Petrobras outside Macaé, access is insufficient and the layout, with 3 aligned berths, is not the most favorable. Furthermore, Petrobras had problems renegotiating the contract with the company, which took advantage of its greater bargaining power due to the region's lack of bases. Unhappy with that, Petrobras sought alternatives. It entered into an agreement with MultiPortos, which has not, however, fulfilled all its specified obligations, as well as there being access problems and a shallow draft. They also tried to build a terminal in Arraial do Cabo, but environmental issued led the project to a halt.

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Figure 8 shows the position of these bases in relation to the exploration fields.

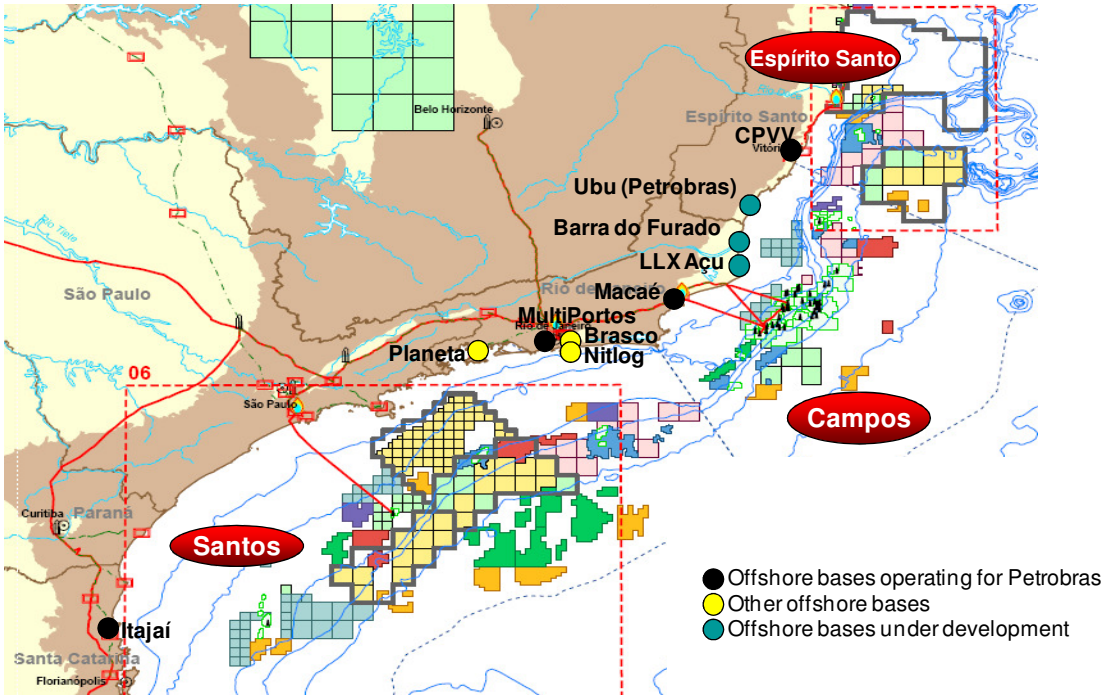


**Figure 8: Main existing and planned offshore support bases (Sources: ANP, Petrobras)**

If all these new developments are in fact launched, the demand for services in the 2 berths at the Port Açu support base could be significantly harmed.

### LLX Logística figures for the offshore base at Port Açu

The financial analysis of the project will take into consideration the figures estimated by LLX Logística referring to spot wharfage and wharfage under contract for its 2 berths, handled load, retro area leasing, and used infrastructure, as the shown in table 15:

This demand shall be guaranteed, according to LLX Logística, by the support services for the exploration of the blocks bought by OGX in the 9th ANP bidding round and other blocks that the company may come to acquire in the future. Furthermore, it shall also provide services to other companies in the industry, such as Petrobras, Shell or other drilling companies.

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**Table 15: Wharfage of support vessels at Port Açu (#/year)**

| | 2011 | 2012 | 2013 | 2014 | … | 2032 |
|---|---|---|---|---|---|---|
| Wharfage under contract [#] | 832 | 832 | 832 | 832 | … | 832 |
| Spot Wharfages [#] | 84 | 84 | 84 | 84 | ... | 84 |
| Handled load [t] | 75,276 | 75,276 | 75,276 | 75,276 | ... | 75,276 |
| Retro area leasing [m²] | 30,750 | 30,750 | 30,750 | 30,750 | ... | 30,750 |
| Used infrastructure [m²] | 5,973 | 5,973 | 5,973 | 5,973 | ... | 5,973 |

The wharfage market prices, according to LLX Logística, vary between US$3,500, for medium- and long-term contracts, and US$15,000, for spot wharfage. The price of load transportation is US$75/t, the lease of the area to interested companies is worth US$15/$m^2$/year, and the warehousing price is US$900/$m^2$/year.

**Risks**

As from 2017 the berth dedicated to support vessels shall be relocated so as to make room for steel product operations. At that time the company shall install a new support vessels berth, which is not foreseen in the investments and availability model.

In relation to the OGX demand, there is an intrinsic risk to the industry regarding the failure to discover financially viable reserves in the blocks which the company has purchased. In this case, the demand for support services would have a return in the 3 or 4 years of the MEP concession, but would not continue throughout the 27 additional years for commercial exploration of the blocks.

Regarding the demand originating from services to Petrobras, it is unlikely that vessels providing services to Petrobras would use a base that does not belong to that company. That stems from the difficulties the company has recently experienced, whether regarding the quality of the services offered, or regarding Petrobras' low bargaining power in a scenario of increasing terminal prices.

Petrobras has very concrete plans to set up a new base in the area. It is speculated that this base is being planned for the Ponta do Ubu port, in Espírito Santo.

This new Petrobras base in the region could greatly limit the demand on the Port Açu for services to the state-owned company.

There is also the risk of reduced demand due to the Edison Chouest support base in Campos de Goytacazes, which may be built and put into operation, becoming a competitor to LLX Logística for the support of other oil companies operating in the area.

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## 5.2 Port Brasil

### 5.2.1 Iron ore

**Recent background**

Worldwide production of iron ore reached 1.7 billion tonnes in 2006, consolidating an 8.3% growth over the last 7 years. Brazil is the second largest producer in the world, with 317 million tones, surpassed only by China, producing 520 million tonnes in that same year.

It is estimated that China imported around 400 million tonnes of iron ore in 2007, against the 330 million tonnes in 2006. Brazil shall benefit from this growth, since it is the second largest exporter in the world, behind Australia. In the first seven months of 2007, Brazilian exports amounted to 144.7 million tonnes, worth US$7.5 billion, corresponding to a growth of 5.4% and 19%, respectively, compared to the same period of 2006.

The pricing of iron ore is made through contracts established directly between mining companies and steel companies. Iron ore is not traded on the commodities exchanges, as its composition and granulometry vary considerably depending on the production area. Prices are established on an annual basis, even for longer contracts. Generally speaking, the first major contract to be established determines the price variation for one year. VALE, being the largest producer of the material in the world, has managed to lead the price negotiations in the last five years. As a result of an aggressive policy, prices have been rising steeply (71.5% in 2005, 19% in 2006, and 9.5% in 2007 and 65% to 71% in 2008)..

The 65% to 71% adjustment agreed in the first contract of 2008 between VALE and a steel industry group surprised a large part of the market. Projections by investment banks estimate rises of 30% (up to 50%) in 2008.The ebullience in the iron ore market, as well as the shortcomings in the Brazilian infrastructure, have provided significant opportunities for economically powerful integrated players.

Thus, the current high trend in the iron ore market has opened the way for newcomers, justifying LLX's interest in new businesses related to this market.

**Forecast demand**

The iron ore to be exported through Port Brasil will come from the Corumbá region (MS), which has the third largest iron ore reserve and the second largest manganese reserve in Brazil. The main iron ore producers in Corumbá are VALE, through Urucum Mineração S.A., and Rio Tinto Zinc (RTZ), through Mineração Corumbaense Reunida

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S.A., which account for over 80% of the production [114] (considering iron and manganese)..

Roughly half of the load forecast by LLX Logística for Port Brasil shall come from the MMX Corumbá system, belonging to the same parent company, with estimated reserves of 88.6 MT. The expansion plan announced by MMX foresees the production of 4.9 Mtpy by 2011, of which 0.4 Mtpy shall be consumed locally in the production of pig iron and semi-finished steel products. After operations begin at Port Brasil, this mine could raise its capacity to 10 Mtpy, so as to provide the forecast demand for the port.

Another portion of the expected handling demand may come from a large mining company which recently announced a plan to invest in expanding its capacity to 15 Mtpy and could be a potential client for Port Brasil, using the ALL railway to distribute most of its ore. LLX Logística believes that it shall distribute up to 10 Mtpy of iron ore originating from that company's forecast volume and other producers in the region, as from 2014.

Although the volume established by the plan is not 100% guaranteed, the total volume intended by LLX Logística of 20 Mtpy is feasible, since the Corumbá area has been a target for investments in recent times, boosted by the increase in the iron ore price and the recovery of the ALL railway linking the region to Port Brasil which will enable the distribution of greater volumes.

This plan to absorb loads from third parties is not impossible, although it is aggressive and entails a change to the announced investment plans in waterway distribution. Port Brasil plan is based on the principle that, with the project becoming feasible and the regional railway being upgraded, the mining companies will opt for this alternative. As discussed later, the overland solution is indeed less costly, although altering the route would require new allocation of the assets already acquired for waterway shipment. Even if one considers any assets already acquired for waterway distribution as costs already incurred, then one would have to consider the financial cost of the loans granted for such in the expenditure of an alternative freight solution.

**Additional comments about the port and access infrastructure**

The possibility of accessing Port Brasil by railway may constitute an important competitive edge, but it demands substantial investments.

The current production of the MMX Corumbá mine, of approximately two million tonnes, and that of the other mines in the area, is currently shipped on the Paraguay river to San Nicolas (2,600 km). The main difficulty in this operation is the slow speed of the convoys and the transshipment on to ocean vessels. The draft at the river mouth is presently a little over 10 meters, allowing only the Handysize, Handymax and Panamax ships to be loaded, the latter two only with partial loads.

[114] Market share of the company in total mineral production sales in the state.

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The expansion in iron ore exports using this method of shipment will require Capesize vessels, able to carry 2 to 3 times as much load as the vessels used today, and with a freight approximately US$ 6-8/tonne cheaper than that of a Panamax (depending on the sea freight cycle). In order to receive Capesize vessels, the transshipment operation needs to take place in an area far from the coast, called the D zone. However, that area does not have sheltered waters, ruling out transshipment operations for some periods. According to the RTZ Expansion Plan, cargo would first be loaded on to a Panamax vessel, to be later transferred to a Capesize vessel located in the D zone.

Meanwhile, the railway distribution would use the Ferrovia Novoeste S.A. metric gauge line ("Novoeste") (~ 1,600 km), operated by ALL, and which leaves Corumbá and becomes part of Ferroban[115]. Novoeste is practically inoperational today. Derailings are so frequent to the point of becoming predictable. The railway is in need of heavy investments, which are being assessed. The creation of a Specific Purpose Enterprise between the controlling group and potential investors is being studied. The profitability of the business would stem from the transportation of iron ore, cellulose and of significant amounts of agricultural and liquid bulks. The Ferroban section, which starts in Bauru and reaches Peruíbe, is inoperational in the stretch which continues to Peruíbe and Cajati. By having Port Brasil as the destination, the line would have the advantage of avoiding the town of Santos and its heavy rail traffic.

Currently, RTZ has plans to ship a forecasted 15 MT by the waterway in the next few years. This will require a significant expansion of its barge fleet, of 5 tugboats and 80 barges plus third-party vessels to 28 tugboats and 700 barges. Although there are already investments in this regard, it is highly likely that such a big increase in the fleet will worsen the traffic on the waterway. According to Fluviomar, a company operating over 20 convoys in the Paraguay river, there will be a demand for the transportation of 44.4 MT (28 MT of which will be iron ore) via the waterway as of 2010, compared to the 13.6 MT shipped in 2006.

Table 16 shows a comparison between the estimated costs for waterway distribution of the iron ore from the Corumbá region, distinguishing the operations involving Panamax vessels from those involving Capesize vessels, and for railway distribution (Novoeste/Ferroban). It shows that the use of the railway holds more advantages.

Besides presenting 10% lower operational costs than the waterway, the railway needs lower or equivalent investments, thus becoming a competitive option for shipping cargo from that region if the waterway alternative is discarded in time.

[115] Ferrovia Novoeste S.A. is the company that bid for the concession of the West Rail Network of the Rede Ferroviária Federal (Federal Rail Network) in 1996, formerly the Estrada de Ferro Noroeste do Brasil. In 2002, it merged with Ferrovia Bandeirantes S.A. (Ferroban) and Ferrovias Norte Brasil S.A. (Ferronorte), forming Grupo Brasil Ferrovias. In 2004, a spin-off created Nova Novoeste, controlling the West Rail Network and a section of the metric gauge from Ferroban, between Mairinque and Bauru. That was called the Metric Gauge Corridor of Brasil Ferrovias, operating from Corumbá, in Mato Grosso do Sul, where it is linked to the Bolivian rail network, to Mairinque, communicating with the branch to the Santos Port, in São Paulo. The remainder of the group's rail network was called Broad Gauge Corridor (Nova Brasil Ferrovias). Finally, in May 2006, along with Brasil Ferrovias, Novoeste Brasil merged with América Latina Logística, by means of a share swap operation between their respective controlling shareholders. The initial stretch from Corumbá belongs to Novoeste, and in the State of São Paulo it becomes part of the Ferroban, both belonging to ALL.

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However, the waterway option may offer a cost reduction of up to 8%, if the barge-operating companies manage to get a permit to run larger convoys, but that process is complex, and there is still no consensus between the several governmental agencies about how it should be approached. The issues of river port expansion, maintenance dredgings, waterway signs, and the unavailability of the river bed for periods of up to 10% of the year indicate that there is some way to go before a 250% flow increase in the Paraguay river would be feasible. The railway is, indeed, the most interesting solution.

With the announcement of the Votorantim cellulose plant in Três Lagoas (MS, near the border with São Paulo state), over 50% of the ALL-operated Novoeste/Ferroban railway shall be restored for the transportation of 1.1 Mtpy to the port of Santos. These investments are being undertaken jointly by the company itself and ALL and represent a large step in the upgrading of the railway capacity for transporting bulk volumes.

**Table 16: Comparison between the costs associated with iron ore logistics in Corumbá/Mato Grosso do Sul**
**(Sources: MMX Corumbá, Drewry, RTZ, Verax's Analysis)**

| | Waterway (*Panamax*) | Waterway (*Capesize*) | Railway |
|---|---|---|---|
| Cost of transportation from the mine to the port [US$/tonnes] | 25[116] | 25 | 22 [117] |
| Cost of loading [US$/tonnes] | 5,5 | 11,5 | 10.5 [118] |
| Cost of sea freight [US$/tonnes][119] | 40 | 33 | 33 |
| Total cost of logistics [US$/tonnes] | 70.5 | 69.5 | 65.5 |
| Investment needed for 1 million tonne increase to annual capacity [in US$ million] | 67 | 78 [120] | 49-71[121] |

As regards the port that will be used, there are no competitors in the area for iron ore transportation. Neither Santos nor Paranaguá have a deep enough draft to receive large vessels, and in the case of Santos, there is a severe shortage of area.

[116] Values currently paid by MMX Corumbá in normal operating conditions of the waterway.
[117] Based on rates currently charged by MRS for iron ore transportation.
[118] Lifting price at the Brasil Port
[119] Considers freights of last year, of US$130,000/day for *Capesize* vessels and US$70,000/dia for *Panamax* vessels. Evaluation was made for a typical route between Port Brasil and Europe, with a duration of 34 days, 4 of which are laytime and the rest journey time.
[120] Takes into consideration the acquisition of Panamax vessels for carrying out the transshipment
[121] There is a portion of the railway cost that is not variable (estimated at R$600 million), and therefore it is diluted proportionally to the handling. The remainder refers to the acquisition of a locomotive and cars. The low and high limits of the constructed simulations are for the handling of 20 million and 80 million tonnes, respectively.

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In conclusion, it is a real possibility that the predicted volumes of iron ore from Corumbá could be attracted to load at Port Brasil, but it would depend on the removal of several obstacles.

## Forecast for Port Brasil

The amounts of iron ore predicted by LLX Logística to be loaded at Port Brasil are shown in Table 17. The price charged by LLX Logística for the unloading or iron ore from the train cars and loading the ships at the port is expected to be US$10.5/tonne. This value is based on the contract negotiations underway between MMX Corumbá and LLX Logística. As waterway transport has many disadvantages in relation to distribution via Port Brasil, it is assumed that LLX Logística shall practice these prices without losing its competitive edge against the second option.

**Table 14: Handling of iron ore at the port terminal (Million tonnes/year)**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|
| Iron ore - MMX (Mt) | 5.0 | 6.7 | 8.3 | 10.0 | 10.0 | 10.0 | 10.0 |
| Third Pary Iron Ore (Mt) | 2.5 | 5.8 | 9.2 | 10.0 | 10.0 | 10.0 | 10.0 |
| **Iron ore - total (Mt)** | **7.5** | **12.5** | **17.5** | **20.0** | **20.0** | **20.0** | **20.0** |

| 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| **20.0** | **20.0** | **20.0** | **20.0** | **20.0** | **20.0** | **20.0** | **20.0** | **20.0** | **20.0** | **20.0** | **20.0** | **20.0** | **20.0** |

The fee for the use of the port infrastructure will not be charged in the transportation of iron ore at Port Brasil. These fees are also not charged at the Tubarão and Ponta da Madeira ports.

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## 5.2.2 Containers at Port Brasil

### Recent background

The volume of containers handled in Brazilian ports has shown a marked growth, increasing from 3.6 million TEUs in 2002 to 6.2[122] million TEUs in 2006. In that period, the Santos Port increased its market share from 35.2% to 38.7% of the total containers handled in the country (a more relevant role both in terms of volume and growth); the Itajaí port improved its share, increasing from 9% to 11%; the Rio Grande so Sul port fell from 12% to 9%; the Paranaguá port rose from 7% to 8%, and the sum of the other ports dropped from 38% to 33.3%.

The volume of containers handled is directly linked to the volume of Brazilian foreign trade, increased volumes for cabotage shipping and to the containerization rate of general cargo. With the exception of this last factor, market pressures have led to an expressive growth in loads. However, the transportation of containers in Santos is approaching the limit of its current capacity, which translates into higher costs and efficiency loss. Therefore, new terminals and expansions are being announced that may increase the current capacity by 3.5 times until 2016.

The port's serviceability depends heavily on the dredging of the Santos channel, deepening it from the current 12 meters to the natural 14 meters (it may even reach 15 meters in the first stage of the tender, and 17 meters at a later stage). If the trend towards increasing the size of vessels continues, as it has recently, the Santos Port may begin to be left out in favor of deeper ports in the same area, as the dredging plans in that port are facing big obstacles.

Under such circumstances, Port Brasil will have a significant advantage over the Santos Port, but this advantage will diminish as the dredging is carried out to increase the depth of the latter.

### Forecast Demand

The demand projection took three essential assumptions into consideration: a) increased foreign trade in relation to the national GDP; b) increased cabotage transport; and c) competition between Port Brasil and the Santos Port for the loads in their area of influence. The evolution in containerization rates of general cargo is no longer an important driver behind this growth.

The demand forecasts for export shipments take into account a reduction in the gap between the Brazil and the world average, as regards the volume of foreign trade over the GDP (24% and 44%, respectively, in 2004), since the world index is growing at 4%

[122] Source: ANTAQ.

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per year and the Brazilian index at 5.1%. That would correspond to an approximate 9% annual growth in the volume of containers shipped for export..

As of 2004, the ratio between foreign trade and the Brazilian GDP was distorted by the severe depreciation of the U.S. dollar and by the recent change in the method for calculating GDP. Therefore, for this simulation, the maintenance of the trend in the period previous to these events was considered.

Thus, with the estimated growth in the Brazilian GDP of 4.5%[123] per year for the next ten years, and taking into account that the ratio between foreign trade and GDP could reach 30% in that period, the country is expected to trade US$ 502 billion in 2016 (in 2006 that volume was US$228.9 billion).

In this context, the transportation of containers for export in the country, assuming growth at the same rate as that of foreign trade, would increase from 5.1 million TEUs in 2006 to 12.4 million TEUs in 2016.

As regards cabotage shipments, in accordance with the main shipowners active in the country, further growth is expected for the next 10 years, equivalent to an annual rate of 11.4%. Thus, by 2016 cabotage volumes will have tripled in relation to 2006, reaching 3.3 million TEUs. Added to the forecast handling for exports, this projects a handling of 15.7 million TEUs in 2016 (2.5 times the volume handled in 2006).

Shipments from Santos in 2006 represented 44% of the loads shipped for export and 22% of the cabotage loads in Brazil. In the last 5 years, however, cabotage operations at Santos have presented a higher growth rate than at the other Brazilian terminals and tripled the port's market share. Therefore, to forecast the demand for the region, Verax assumed that its share in the cabotage market would continue to grow, reaching 35% in 2016, while the share in export shipments shall remain constant over the years.

Therefore, the demand forecast for Santos would rise from 2.4 million TEUs in 2006 to 6.6 million TEUs ten years later. In order to keep the current 88% capacity utilization rate at the terminals, the Santos Port should offer a capacity to transport 7.5 million TEUs in 2016.

**Current and future port capacity**

The four private terminals at Santos show growing productivity rates, some of them similar to those of the best ports in the world. Hence, there is an expected increase in the port's total capacity, which was taken into consideration in the analysis carried out by Verax. Along with that increase in productivity, announcements of expansions to the existing terminals lead us to believe that the transportation capacity of these terminals will exceed the 2.7 million TEUs calculated in 2006 to reach 4.8 million TEUs in 2016.

Furthermore, new terminals promise to start operating in the coming years: Embraport, with 1.8 million TEUs and beginning operations in 2010; Nobara, with 1.2 million, in

[123] Average of optimistic forecast by several investment banks and organizations.

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2010; Teval, with 600 thousand in 2008, and Lixão/Alemoa, with 1 million in 2012, which would expand the Santos capacity to 9.5 MTEUs in 2016. However, not all those terminals will effectively come into operation, since as the terminals (or even new ports) start operating, some plans shall be reassessed or even dropped.

In 2016 Port Brasil will have 4 of its 6 berths in operation. Assuming that these berths operate at rates indicates by benchmark figures, the handling capacity is estimated at 1.8 million TEUs[124]. The supply of that capacity will guide the attraction of cargos, as will be seen below.

**Forecasts for Port Brasil**

Assuming that Port Brasil will compete with the Santos Port for the preference of the loads generated in their influence area, each of their advantages and disadvantages must be considered.

Some ports, mainly in the South region, are being created with the participation of major shipowners, as is the case of the Aliança/Hamburg Süd company, at the Itapoá port, and MSC, at the Navegantes port. The attraction of a major shipowner to Port Brasil may generate value for both parties.

On the other hand, the draft admitted by the other ports is not as deep as that predicted for Port Brasil, of 18.5 meters. The Santos Port expects to deepen its channel by means of a large-scale dredging project, but the 15 meter depth will not be achieved in the short term. Besides, the lack of an appropriate retro area available for expansion in Santos and the access difficulties raise the price of logistics costs and may benefit Port Brasil, since it will not be constricted by a large city in its surroundings.

In order to determine the demand that must be absorbed by the Port Brasil, a probability analysis was performed of the effective materialization of the expansion to the capacity at Santos, which depends on previous events[125]. The analysis includes the time needed

[124] Hypotheses for calculating the capacity: a) maximum berth occupation – 70%; b) productivity of 1 portainer – 25 operations/hour; c) TEU/container ratio for the area – 1.5 d) seasonality coefficient – 0.88.

[125] The composition of scenarios took into account whether the dredging of the Santos channel will be carried out or not by 2009, which would affect the attractiveness of the expansion of the existing terminals and the entry of new terminals in that port. The expansion of the TECON and TECONDI terminals and the entry of the Nobar and Embraport terminals were considered individually, and with likeliness depending on previous events. The Lixão/Alemoa and Teval terminals were not considered very likely, as the entries of the Brasil Port and remaining terminals were more likely. Thus, the following scenarios were obtained:

1) If dredging is carried out in Santos (80% chance): Probability of the event occurring: Embraport and Nobara enter, and there are expansions in Tecon and Tecondi = 8.5%; Embraport and Nobara enter, and there are no expansions in Tecon and Tecondi = 20.1%; Embraport enters, Nobara does not, and there are expansions in Tecon and Tecondi = 4.1%; Embraport enters, Nobara does not, and there are no expansions in Tecon and Tecondi = 8.5%; Nobara enters, Embraport does not, and there are expansions in Tecon and Tecondi = 3.8%; Nobara enters, Embraport does not, and there are no expansions in Tecon and Tecondi = 9.3%; neither Nobara nor Embraport enter, and there are expansions in Tecon and Tecondi = 1.9%; neither Nobara nor Embraport enter, and there are no expansions in Tecon and Tecondi = 3.8%.

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for each event, and determines the expected value of the capacity supply in 2016. Based on the consolidated regional supply (Santos and Port Brasil), the forecast demand of 6.6 million TEUs a year is distributed proportionally to the capacity of the terminals. This analysis reveals an expected value of 1.45 million TEUs for the Port Brasil in 2016.

Table 18: Handling of containers at the port terminal (MTEUs/year)

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|
| Capacity | 0.80 | 1.20 | 1.30 | 1.41 | 1.8 | 1.88 | 1.96 | 2.05 |
| Handling | 0.60 | 0.87 | 0.97 | 1.11 | 1.45 | 1.51 | 1.58 | 1.65 |

| 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.14 | 2.23 | 2.33 | 3.13 | 3.26 | 3.41 | 3.49 | 3.56 | 3.63 | 3.70 | 3.78 | 3.85 | 3.93 |
| 1.73 | 1.80 | 1.88 | 2.53 | 2.64 | 2.75 | 2.82 | 2.88 | 2.93 | 2.99 | 3.05 | 3.11 | 3.18 |

In addition to these volumes, there is a load attraction potential related to the benefits that Port Brasil offers compared to its competitors. The prior planning of the port infrastructure will ensure a more efficient operation, reduction of bottlenecks and, above all, reliability.

From the standpoint of the companies which use port services, Port Brasil will offer larger delivery windows and superior access logistics, while for the shipowners, the possibility of using larger vessels and the concentration of feeder operations are strong selling points.

In view of these reasons, it is believed that as from 2016, when the region shall be operating close to its full capacity, Port Brasil shall have priority in the taking on the demand, maintaining an occupation rate close to 80%[126] throughout the following years.

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2) If dredging is not carried out in Santos(20% chance): probability of the event occurring: Nobara enters, Embraport does not, and there are expansions in Tecon and Tecondi = 15.4%; Nobara enters, Embraport does not, and there are no expansions in Tecon and Tecondi = 3.8%; Embraport (partially) and Nobara enter, and there are expansions Tecon and Tecondi = 10.2%; Embraport (partially) and Nobara enter, and there are no expansions in Tecon and Tecondi = 2.6%; Neither Nobara nor Embraport enter, and there are expansions in Tecon and Tecondi = 2.2%; Neither Nobara nor Embraport enter, and there are no expansions in Tecon and Tecondi = 0.6%; Embraport (partially) enters, Nobara does not, and there are expansions in Tecon e Tecondi = 4.2%; Embraport (partially) enters, Nobara does not, and there are no expansions in Tecon e Tecondi = 1.0%.

[126] Occupancy rate limit for the terminal. When above this level the shipowners start to seek other terminals which can offer greater flexibility for wharfage.

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**Price of similar services**

The main revenue sources of the container terminals are: loading/unloading operations and import warehousing. The prices to be charged, considered in the simulations of investment return, are based on the prices charged by Santos Brasil terminal in Guarujá-SP. In the fourth quarter of 2007, this terminal presented an average billing per TEU handled of US$237[127], which includes all the revenues and considers the average US dollar exchange rate in the fourth quarter of 2007. Prices currently charged at Santos are under recovery after a steep drop. If all the current conditions were kept constant, and with an operation at efficiency levels similar to a large terminal at Santos Port, Port Brasil could picture a similar income per TEU. The entry of new players spurred by high tariffs, however, might change this scenario.

The prices presented are only indicative of current average prices and **do not constitute expected future price values.**

Revenues through port utilization fees are also associated to the handling of containers [128] . The user's expense with this fee at Santos is approximately US$22.16/container [129] for volumes handled and US$4.96/container for berth occupation[130].

**Demand risks**

The business risks are associated to two aspects. The first one relates to the country's development, reflected in the GDP growth, and to the international scenario, reflected in global trade growth. If the 4.5% growth rate of GDP is not maintained, or if current expectations for the development of global trade do not come to pass, the demand for port services shall fall short of the forecast. But each of these facts can compensate for the other, thus reducing the risk. The second aspect is the implementation period, which the industry sees as the effective period for startup of operations. If Port Brasil starts operations before all other terminals or even prior to the dredging of Santos, the announced expansions there may be retracted, reducing the amount of competitors for the Port.

[127] Gross Revenue of Santos Brasil (4Q2007) = R$135.4 million; Total handling Santos Brasil (4Q2007) = 320,000 TEUs; average U.S. dollar 4Q2007 = 1.79 R$/US$.

[128] At the public ports, these rates are defined by the port authorities, based on Law 8,630 of 1993 and supervised by the ANTAQ. As for the LLX Logística Ports, these will be defined by the company itself, based on the table applicable to public ports.

[129] Rate charged according to the handling and type of cargo (general cargo or container).

[130] Rate charged per linear meter of wharf used for period of 6 hours or fraction thereof. For the establishment of total laytime and the length of wharf occupied, we have used the following assumptions:

- 240 meter-length standard vessel with capacity for 3,000 containers, and average consignment of 500 TEUs.
- TEU/container ratio of 1.5, typical of the Santos Port.
- Vessel loading/unloading speed of 35 containers per hour.
- Total wharfage/undocking time of 2 hours.

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## 5.2.3 Agricultural bulks

### Recent background

The same port export infrastructure may be used for the shipment of soybean and sugar and the vast majority of the terminals at Santos and Paranaguá handle or have handled both of these products. Thus, the forecast demand of loading services for these products at Port Brasil has been calculated by adding the volumes of soybean (grain and bran) and sugar.

### Soybeans

Brazil is the second largest global producer of soybeans, with 58 Mtpy in 2006, which represents 27% of world production. This crop represents the largest planted area in the country accounting for approximately 35% of the total crop area, and its volumes have grown at an average rate of 8.2% per year in the last 10 years. The main drivers of this growth are the increased productivity per hectare and the expansion of planted area toward the Midwestern region.

The main producers are: Mato Grosso (20.1 Mt / 34.6%), Paraná (10.8 Mt / 18.6%), Goiás (7.9 Mt / 13.6%), Mato Grosso do Sul (4.2 Mt / 7.2%) and Minas Gerais (3.3 Mt / 5.8%).

Soybean is the chief agricultural commodity exported by Brazil, accounting for a volume of 39.8 Mt in 2006 and 3.9% of total exports in value. The most used ports are Santos (9.9 Mt) and Paranaguá (9.1 Mt), which are the natural destinations of production coming from the Midwestern region. The former presented an expressive growth of 16.9% per year over the last 5 years for this product, while the latter presented a drop of 3.2% per year over the same period.

### Sugar

Brazil is the largest global producer of sugar with more than 30 Mt in the 2006 harvest. Sugar cane plantations represent 11% of total farmed area in the country and their volumes have increased at an average rate of 2.4% per year in the last 10 years. The main drivers for this growth are the increase of productivity per hectare and increased demand for sugar and ethanol.

In 2006 the Brazilian sugar cane production was 435 Mt and the main producers are the states of São Paulo (255 Mt / 60.3%), Paraná (30 Mt / 7.0%) and Goiás (25 Mt / 6.0%).

Sugar is the second chief agricultural commodity exported by Brazil, accounting for a volume of 18.8 Mt in 2006 and 2.85% of total exports in value. In view of the geographical proximity of the planted areas, the two major sugar exporting ports are Santos and Paranaguá, with 13.3 Mt and 2.6 Mt (2006), and average growth rates of 12.8% and 1.9% per year, respectively, over the last five years.

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The Santos Port is important because it is at a convergent point between the main highway and railway routes, thus it has an advantage over Paranaguá. Both ports face infrastructure problems which are below ideal levels, especially regarding the soybean harvest, when monthly volumes are 100% greater than the annual average at Santos and 140% greater at Paranaguá. Currently, the terminals at these ports are operating at over their optimum occupancy capacity.

Port Brasil shall be located in the central region of the coastal area which includes these two important destinations and has high potential to attract loads from this corridor.

The methodology developed for calculating the forecast demand for the port is based on two other projections: that of the export volumes for the different regions in Brazil which ship via the ports of Santos and Paranaguá, and the current and forecast future capacity supply of the terminals at both ports based on press information. Finally, we evaluate the volumes to be absorbed by Port Brasil, by means of assumptions of market share acquisition.

## Demand projection

### Soybeans

According to the study entitled "Projeções do Agronegócio: Mundial e Brasil" (Agribusiness Projections: Worlwide and in Brazil), the global production of soybeans will become more concentrated and Brazil will be the largest producer with 34% of market share by 2016 (vis-à-vis 27% in 2006). In this scenario, the outlook for Brazilian exports is that they will reach 48.8 Mt in 2016, consolidating an average annual growth of 2.3% per year for this period.

### Sugar

The Brazilian production of sugar is expected to grow at an average rate of 4.6% per year and to reach 41.8 Mt by 2016. India is expected to overtake Brazil as the world's largest producer in 2007 with 33.2 Mt versus 31.5 Mt in Brazil. According to this scenario, the outlook is that Brazilian exports will reach 24.5 Mt by 2016, consolidating an average growth of 3.6% per year for the period.

***

The break in export flow for the different ports used the following hypotheses: a) each productive state increases their export volumes at historical rates adjusted by the Brazilian export levels forecast by the Ministry of Agriculture, which reveals decreased growth for the next years; b) each state will maintain its volumetric proportion of preference for the ports, with similar rates to current rates; c) total demand at the ports of Santos and Paranaguá is a result of the composition of volumes distributed from each producing state to that destination.

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The region of interest has presented demand of port capacity for soybeans (grain and bran) of 18.2 Mt in Santos and 9 Mt in Paranaguá by 2016. The average growth in accumulated demand for services at these ports will be 7% and -0.1% per year for the period, respectively. Demand for sugar was 18.5 Mt in Santos and 3.9 Mt in Paranaguá by 2016, with an average growth of 3.4% and 3.7% per year for the period, respectively.

Thus, in 2016, Santos will have a demand of 36.7 Mt and Paranaguá 12.9 Mt for both bulk products together.

## Current and future port capacity

The nominal export capacity for vegetable bulks (soy, sugar and corn) at the Santos Port is 34.2 Mt per year. The main terminals are: Teaçu, Teaçu II (Cosan), Teaçu III (Copersucar), ADM do Brasil, TEAG (Terminal de Açúcar do Guarujá), TGG (Terminal de Granéis do Guarujá), Cargill, Ferronorte, Citrosuco, Quintella, Rodrimar, Itamaraty and Coinbra (Louis Dreyfus). However, exports of solid bulk present great seasonal fluctuation throughout the year, and thus the nominal capacity must be corrected by a coefficient determined by the port's average use index. This average capacity use coefficient is currently approximately 80% for this port. The application of this coefficient indicates an effective capacity of 27.4 Mt.

The expansions to the vegetable solid bulk terminal, announced in the press and considered in this simulation exercise for the Santos Port are: a) TGG in 2007; b) Cereal Sul in 2007; c) Embraport (bulk terminal in 2014); Teval in 2007. Effective forecast capacity for 2016 is 35.7 Mt. In the influence area of the Santos Port, the capacity offered by Port Brasil in 2016, considered in the analysis, was 31.5 Mt.

At Paranaguá, the current nominal capacity for vegetable solid bulk is 25.3 Mt, used for the export of soybeans, sugar and corn. Sugar exports at the Paranaguá port are highly concentrated by PASA Operações Portuárias S.A. (a cooperative of sugar producers from the north of Paraná state). The seasonality observed in this port is 67%, bringing effective capacity down to 17 Mt.

There are no expansions announced for the vegetable solid bulk terminals in Paranaguá, only an expansion to the storage silos, increasing the effective capacity to 18.3 Mt.

## Forecasts for Port Brasil

The capacity supply of Port Brasil considered in the following analyses was 31.5 Mtpy, determined as from the start-up of operations of the terminals built[131].

[131] In 2016 two berths will be made available for the transportation of grains, equipped with two ship loaders with a nominal capacity of 7,000 tonnes/hour. Bulk terminals indicate an effective nominal capacity index of approximately 50%. We have further considered an optimum utilization of berths of 65% of the time (loading time divided by total time of the year) based on the team's experience.

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We considered that demand at Port Brasil will be composed of export loads that would originally have been intended for the ports of Santos and Paranaguá.

However, there is a need to consider that the large traders which already control terminals at the current ports will not cease their operations there, except during any capacity shortage, which will happen to some extent.

LLX Logística is at an advanced stage of negotiations with an important trader, with the intention of signing a contract to come into effect in 2012 which would guarantee a significant volume exclusively from this sugar trader. Verax agrees that a port with the operational characteristics of Port Brasil is capable of attracting a representative partner which either already has restricted capacity at its terminal or will have in the near future.

The Santos terminals controlled by traders currently operate typical volumes of around 3 Mtpy. Therefore, the methodology to estimate handling at Port Brasil considers an initial volume of 3 Mt of sugar guaranteed by the agreement with that trader as from 2012, which volume then increases the industry growth rate (4% p.a.). In addition to this demand, the methodology considers that the port shall compete for extra load volumes, just like other terminals, in proportion to their capacities.

However, Verax considered it reasonable to assume that the weight of the capacity of Port Brasil should be greater than that of the other terminals in view of its favorable characteristics, such as the draft and others already discussed. Thus, a 50% greater weight was adopted in relation to the other terminals.

In conclusion, of the potential volume of 54.5 Mt[132] from the region in 2016, 3.5 Mt is guaranteed to Port Brasil due to the success of these negotiations. Of the remaining volume, 50% shall be handled by traders in their own terminals[133] and the other 50% shall be distributed amongst the 3 ports proportionally to the remaining capacity supply, but considering a 1.5 weight in favor of the Port Brasil in virtue of its competitive advantages.

If the obstacles faced by current ports were considered as an advantage for Port Brasil, we could estimate higher acquisition volumes. However, the opening of a new port may lead to shorter waiting times and improved operating efficiency of the terminals in operation. This will be due to a 60% rise in the port capacity for handling the region's agricultural bulk with the arrival of Port Brasil. Therefore, competition would take place below the optimum operating volume, thus making it reasonable to consider the premise of demand being absorbed at a proportional rate to the available capacity.

These hypotheses provide a forecast 18 Mt per year of transported cargo by Port Brasil by 2016, with an approximate proportion of 55% of soybeans and the remainder of sugar.

[132] This volume includes 3 Mt of corn an 1.8 Mt of wheat in 2016, as it these loads use the same port facilities as soybeans and sugar. However, the ports of Paranaguá and Santos, respectively, are given preference for the transportation of such cargo, and the Brasil Port will probably not attract such loads due to the proximity of the other ports to the production centers and the small volume of demand.
[133] These traders currently control a volume of over 60% of the total exports, but with the increased volumes, this fraction should settle at around 50%.

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It is worth emphasizing that these estimated values may differ especially in view of the domestic agricultural production. Despite there being only slight variations in exports, due to harvest intervals or high international prices, there is a natural reaction time for the industry to correct the supply-demand gap. This response time is expected to be greater at the start of Port Brasil operations and therefore was considered a mitigating factor in the forecast handling of 50% and 75% for the first and second years, respectively.

Another important factor considered is the capacity of Port Brasil to attract loads, which may be affected by the entry of new terminals or by improvements to the infrastructure of competing ports. As from 2016 forecast volumes become progressively uncertain, and an average growth of 3% per year has been estimated.

**Table 19: Handling of agricultural bulks in the port terminal (Mtpy)**

| | 2012 | 2013 | 2014 | 2015 | 20166 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|
| Agricultural bulks Mt | 5,9 | 9,1 | 16,9 | 17,5 | 18 | 18,6 | 19,1 | 19,7 |

| 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20.3 | 20.9 | 21.5 | 22.2 | 22.8 | 23.5 | 24.2 | 24.9 | 25.7 | 26.4 | 27.2 | 28.1 | 28.9 |

## Current price of similar services

Currently, lifting prices charged in the ports of the Santos and Paranaguá region range from US$8.5 and US$9, with lower prices at the latter. Verax deemed reasonable a price of US$8.75 per tonne for the services to be provided by LLX Logística.

The majority of the Brazilian bulk terminal ports are currently operating with levels of occupation above the optimum economic level as a whole. In view of this, the LLX Logística project makes sense. In a scenario with higher demand than the optimal capacity, the prices for port services go up, which means that current prices may be inflated.

Utilization fees for the port infrastructure will be charged for the handling of agricultural bulks at Port Brasil[134]. The price of this fee paid by the users at Santos is US$1.22/tonne[135] for handled volumes and US$3.45/meter of berth for the period[136].

[134] At the public ports, rates are defined by the port authorities, based on Law 8,360 of 1993 and supervised by the ANTAQ. For the LLX Logística ports, these rates will be defined by the company itself based on the table applicable to public ports.
[135] Rate charged according to the handling and type of cargo (general cargo or containers).
[136] Rate charged per linear meter of wharf used for period of 6 hours or fraction thereof. For the establishment of total laytime and the length of wharf occupied, we have used the following assumptions:

- 200 meter-long standard vessel with capacity for 70,000 containers.
- Vessel loading/unloading speed of 1,000 t/h.

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These values have been determined as equivalent to the cost that shipowners would pay per tonne handled in operations at the Santos Port.

**Risks related to attracting the forecast volumes**

The main risk factors for this business belong to two classes: (1) those associated to agricultural production volumes, which may decrease in virtue of international prices, the exchange rate and several weather factors; (2) those associated to the improved market perception regarding the effective implementation of improvement works to access and draft depth at the ports of Santos and Paranaguá. Furthermore, new terminals not yet announced and therefore not included in this simulation exercise may emerge, increasing competition for cargo in the region's terminals.

The deep draft, good access conditions and the fact that this is a private port, with more efficient management and higher decision making promptness/flexibility, are all advantages for Port Brasil in the dispute for loads. A means of attracting loads faster would be by attracting traders of agricultural products to operate at the facilities, ensuring a fixed volume. Some traders have already shown interest in investing in the region and negotiations with at least one investor are at an advanced stage.

- Total wharfage/undocking time of 2 hours.

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## 5.2.4 Fertilizers

### Recent background

Historically the volume of fertilizers used by Brazilian agriculture is equivalent to 3% - 4% of the weight of crops harvested. Between 1998 and 2006, the growth in exports of this material was 6.3% per year, reaching 12 Mt last year, for a domestic consumption of 21 Mt, the growth rate of which was 4.5% for the period. Only potassium chloride, one of the raw materials used for making fertilizers, accounts for 1.0% of total Brazilian imports, in terms of value.

Domestic production of the main elements used in the manufacture of fertilizers (rock phosphate for producing phosphorus, potassium chloride for potassium and ammonia as source of nitrogen) is low. With the exception of ammonia, which is produced by the petrochemical industry, the other two elements are extracted from natural mines which are relatively scarce in Brazil. Still, in some cases, the holders of extraction rights are fertilizer producers, for whom imports may define the balance of the market. Over recent years, import volumes of these products have grown more than the domestic production.

The main Brazilian ports for the handling of fertilizers are Santos and Paranaguá, which imported 2.2 Mt and 4.4 Mt in 2006, a growth of 3.6% p.a and 3% p.a respectively over the last five years. Together, these ports account for 55% of the total imported volume.

**Port Brasil** is located in the middle of the coastal area which includes the two ports that concentrate over half of the country's fertilizer imports and has a high potential to attract this type of business.

The methodology developed for calculating the demand projections at Port Brasil is based on three other projections: that of the Brazilian agricultural production; that of the correspondence in imported weight and agricultural production; and the projection for volumes shipped via the ports of Santos and Paranaguá. Lastly, we evaluated the volumes to be absorbed by Port Brasil, by means of assumptions of market share acquisition.

### Forecast Demand

Brazilian agricultural production in 2006 totaled 625 Mt. The projection foresees a total production volume of 1,022 Mt in 2016, constituting an average annual growth of 5%[137].

[137] Source: "Projeções do Agronegócio: Mundial e Brasil" (Agribusiness Projections: Globally and in Brazil) performed by the Strategic Management Department of the Agriculture, Livestock and Supply Ministry, published in December 2006.

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Historical data for the consumption of fertilizers versus agricultural production and import versus consumption indicate a linear ratio between the variables. For the agricultural production of 2016, we expect the consumption of fertilizers to be around 43 Mt, 31 Mt of which shall be imported, at an average weight growth rate of 8.1% per year. Because domestic supply is restricted, imports grow faster with the increase of production.

The breakdown of imported volumes destined for the Santos and Paranaguá ports was based on the current market shares of 18% and 37%, respectively and in relation to the products. Thus, the projection indicated a potential demand of 5.7 Mt in 2016 at the Santos and 11.5 Mt at Paranaguá, with annual growth rates for the 2007-2016 period of 7.7% for both ports.

**Current and future port capacity**

Currently, the Santos Port operates at the limit of its handling capacity for fertilizers. Vessels are sometimes forced to wait up to 20 days to dock, leading to the Paranaguá Port managing to steal a portion of the volumes which would naturally use the Santos Port. This problem has become so serious that one commercial fertilizer manufacturer located in Cubatão has received raw materials via the Paranaguá Port.

In Santos, the main terminals that import this material are the TGG-Termag, with an expected capacity for 2007 of 3 Mt for fertilizers and the TUF (the sea terminal of Fosfértil) with a capacity of 2.3 Mt. Paranaguá has three berths at the commercial wharf intended for fertilizer operations and the TGPA (the Paranaguá bulk terminal) with an estimated capacity of 6.0 Mt as from 2008. All the values already include recent expansions. The Paranaguá Port has recently announced the expansion of its warehousing facilities for this product.

There are no expansions announced for the Santos Port region and the overuse of the fertilizer terminals which afflicts the port reveals the existence of an important market niche for Port Brasil.

**Forecasts for unloading services demand of Port Brasil**

The potential demand for unloading services of fertilizers at Port Brasil corresponds to the volumetric increase of imports of the product. As the demand per port capacity will exceed the available capacity announced at the present moment, a company entering the market will obtain a large portion of the excess volume in relation to the capacity of the current ports under an ideal operating system.

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In 2016, it is estimated that there will be an excess volume of 7.0 MT of fertilizers in relation to the capacity available at Santos and Paranaguá and, therefore, this amount should be absorbed by Port Brasil.

Such scenario is deemed as optimistic, since as both competing ports operate under stress and charge high service rates, the capacity at Santos and Paranaguá is expected to increase by up to 1 Mt before Port Brasil[138] begins operations. Therefore, Port Brasil is expected to handle 6 Mt in 2016, without any ramp up in the volumes attracted as a result of already heightened demand. From that year onwards, the forecast becomes progressively uncertain and, therefore, demand for Port Brasil was calculated considering a 3% p.a increase.

**Table 20: Handling of fertilizers at the port terminal (Mtpy)**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|
| Fertilizers [Mt] | 3.04 | 3.89 | 4.69 | 5.69 | 6.03 | 6.46 | 6.65 |

| 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.85 | 7.06 | 7.27 | 7.49 | 7.71 | 7.94 | 8.18 | 8.43 | 8.68 | 8.94 | 9.21 | 9.48 | 9.77 | 10.06 |

## Current prices of similar services

In recent years, the lifting prices practiced in both ports vary from 9 to 12 US$/t, at Paranaguá, and from 23 to 26 US$/t, at Santos. The higher prices at Santos resulted from a higher capacity restriction at that port.

When taking into consideration the long queues for wharfage, there is a 5-10 US$/t loss in the amount due to the loss in productivity of the carrier's fleet. Under the current purchase structure of the raw materials, the exporter will bear any losses incurred. However, it is reasonable to assume that an improvement in the port service will reduce the total cost for the importer and may be absorbed by some measure taken by the unloading port.

The fees for unloading fertilizers are high in Santos as a result of pressures on the system. Therefore, the LLX Logística project makes sense. The added supply of capacity resulting from the entrance of LLX Logística in the market, as well as other terminals already announced, would imply in a tendency for such stress to be reduced or eliminated, leading to lower prices in a balanced market. This price drop should be particularly drastic for the price of lifting fertilizers in Santos.

[138] Although there have been no announced expansions, new warehousing facilities and the purchase of equipment for operation in berths formerly intended for agricultural bulks will increase the capacity.

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Furthermore, fees will be charged to use the port infrastructure[139] in the handling of fertilizers. The user's expense for this fee in Santos amounts to 1.22 US$/t[140] for the handled volume and US$ 3.45/m of berth per period[141].

Such amounts were calculated so as to be equivalent to the expense incurred by the shipowner per each ton handled at the Santos Port.

**Risks**

There are two main business risk factors: the first is related to the variation in agricultural production that may be caused by fluctuations in price or in the exchange rate and weather factors; the second is related to the competition amongst the existing or future ports. Such competition could heat up following improvement works at the Santos and Paranaguá ports, such as dredging and access logistics improvements.

The natural deep draft, good access conditions and the fact that the port is privately owned and, consequently, managed more efficiently, favor the Port Brasil in the dispute for loads. A means of attracting loads faster would be by attracting traders of agricultural products to operate at the facilities, ensuring a fixed volume. Some traders have already shown interest in investing in another regional port during interviews held in June 2007.

[139] At the public ports, rates are defined by the port authorities, based on Law 8,360 of 1993 and supervised by the ANTAQ. For the LLX Logística ports, these rates will be defined by the company itself based on the table applicable to public ports.
[140] Rate charged according to the handling and type of cargo (general cargo or container).
[141] Rate charged per linear meter of wharf used for a 6-hour periods or fraction thereof. In order to calculate the total laytime and the length of the wharf occupied, the following assumptions were assumed:

- Standard 200 meter-long vessel with a capacity for 70.000 t.
- Vessel unloading speed of 1,000t/h.
- Total time for wharfage/undocking of 2 h.

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## 5.2.5 Ethanol

### Recent background

Brazil has the largest sugar cane crops in the world, with over 450 Mt estimated for harvest 2006/2007[142]. Sugar cane plantations represent around 10% of the total farmed area in Brazil. Although it is a traditional industry, sugar cane production has been increasing constantly at an average rate of 4.1% p.a. over the last 16 years. The main productive states in Brazil of the 2005/06 harvest were São Paulo, 62.8% of the production, Paraná and Minas Gerais, with 6.4% each, Alagoas, 5.8% and Goiás, 3,8%. The total production of other states corresponded to a 14.8% share.

According to the Sugarcane Industry Association (UNICA), on average, 50% of the sugar cane production is used to manufacture ethanol and 50% for sugar. According to the Ministry of Agriculture, ethanol production reached 17.3 Mm³, in 2006.

Although export volumes are still relatively low compared to other agricultural commodities such as sugar and soybean, ethanol exports have been increasing dramatically, presenting a 31.4% rise only in 2006, when Brazil exported 3.5 Mm³.

Santos and Paranaguá are the main exporter ports, accounting for 66% and 19% of total ethanol exports, respectively, and reflecting an increase of 38.7% and 52.8%, respectively, in relation to the previous year.

In view of its privileged location, that is, between Santos and Paranaguá, Port Brasil shall be able to solidly compete for the demand for port services for ethanol shipments.

### Forecast Demand

The forecasts for ethanol production and export for the next 10 years reveal a large increase in demand for port operations. According to UNICA, The Sugarcane Industry Union, Brazilian exports should reach 12.3 Mm³ in 2016, corresponding to an average annual growth of 13.4% between 2006 and 2016. Exports shall account for 26.2% of the country's ethanol production, forecast at 46.9 Mm³ for the same year, also by UNICA. Therefore, the average growth of ethanol production for the period shall be 10.5%. Although the UNICA forecasts are not the most optimistic, they do seem so when compared to those of the Ministry of Agriculture, for example. The Ministry of Agriculture foresees an average increase rate of 8% p.a. for Brazilian ethanol production, thus reaching 37.7 Mm³ in 2016. According to the same source, exports should reach 9.3 Mm³ in the same year, reflecting an annual average growth rate of 11% p.a., and representing 26% of the total production. Other estimates are often more optimistic, such as the intermediary estimate (the pessimistic estimate is similar to that provided by

[142] IBGE

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the Ministry of Agriculture) of CERA[143], which points to a volume exceeding 14 $Mm^3$ in 2016.

In order to estimate the division of the demand for handling ethanol between the ports, the following assumptions were assumed:

a) Continuation of the current scenario of division of production in the states, with production dominated by São Paulo and higher growth rates in the Midwest and Minas Gerais;

b) The proportion of total ethanol exports absorbed by the ports of the region has remained constant, with Santos and Paranaguá claiming an 84.5% share;

c) Port Brasil will compete with the Santos and Paranaguá ports for the service demand.

If the current status quo is maintained, Verax predicts the following demand for the handling volumes of ethanol in 2016: 8.11 $Mm^3$ at the Santos Port, 2.29 $Mm^3$ at the Paranaguá Port, both of which with an average growth rate of 13.4% p.a. until 2016. Evidently, the presence of Port Brasil alters these volumes.

This is due to the concentration of the production regions in the influence area of both ports. The increased sugar cane production in the Midwest lends advantage to shipping via the Santos or Port Brasil.

**Current and future port capacity**

According to Verax's forecast, the current capacity for ethanol handling in the Santos Port is approximately 2.6 $Mm^3$/year, compared to 1.3 $Mm^3$ in Paranaguá. In order to make this estimate, the total handling capacity of liquids at the terminals of both ports and the percentage of ethanol transportation of each port were considered.

A critical analysis of the announcements of expansions and new terminals was performed to calculate the future capacity. In Santos, high investments are expected such as for the Embraport terminal, the Alcohol Export Terminal of Santos (TEAS), Copape and Odfjell. Some of these investments will probably not be made, while others will probably be implemented but have not yet been announced, and, therefore, the net effect of both cases was deemed null. By adding the possible expansions to the reasonable probabilities, the Santos Port could obtain an added ethanol capacity of 11.8 $Mm^3$/year in 2016. As for Paranaguá, only one major investment has been announced and will be made by the state government, raising the current capacity of the port to 4.3 $Mm^3$ of liquids in the same year. It is worth noting that the current handling capacity at the liquid terminals of Santos is approximately 18.6 $Mm^3$/year, 9 $Mm^3$ of which are the responsibility of Petrobras.

In both cases, the announced investments would be more than sufficient to meet the estimated demand for ethanol transportation and, therefore, Port Brasil would face

[143] Cambridge Energy Research Associates, Inc. (CERA). Ethanol-powered Brazil: The Land of Green Gold? February, 2007.

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strong competition. However, if exporting the product on large suezmax vessels is justified, as advocated by a considerable number of analysts, including Petrobras professionals, Port Brasil will have a competitive advantage with its deep draft. Nonetheless, it is worth mentioning that exports on smaller draft vessels will not be totally extinguished and will still be of some importance in the matter. Indeed, although there are many references stating otherwise, it seems more plausible that the ethanol market would change from 20.000 m³ shipments to 40,000 m³ shipments, and in the long term, would eventually adopt 60,000 m³ shipments.

Port Brasil project is not yet widely known by the market. Investors interested in ethanol exports usually mention the São Sebastião and Rio de Janeiro ports as options, instead of Santos, due to their drafts. A comparison between the Port Brasil Project and the São Sebastião Port shows that the former has better access, while the latter may enjoy greater governmental promotion.

There are great concerns regarding these exports via the São Sebastião Port and the consequential necessary expansions would face snags of an environmental nature. Both Petrobras and private companies have already stated their interest in using the port, but plans do not seems to be developing fast. More recently, the São Paulo State government has began promoting the port, taking into account that it is managed by the state government, whereas the Santos Port, its biggest competitor, is managed by the Federal Government. Furthermore, it is highly likely that if Port Brasil is implemented, the São Paulo State government will give up on its plans for São Sebastião in view of the superiority of the LLX Logística project.

The main supporter of the Rio de Janeiro Port, Petrobras/Transpetro, intends to take advantage of two of its main characteristics: use of the only extensive alcohol pipeline in Brazil connected to a port terminal and the possibility of loading vessels with a gross capacity of up to 130,000 tonnes. Even if both these aspects are real, the alcohol pipeline project is not economic for ethanol export and can only be justified for a long-term strategic plan. If it is used for such purpose, this will only be temporary, until other options become available; at any rate, this does not seem to represent a substantial threat to Port Brasil.

**Forecasts for Port Brasil**

The demand for ethanol transportation from Port Brasil would result from absorbing demand from the ports of Santos, in particular, and Paranaguá, on a smaller scale.

To calculate the estimated demand to be absorbed by Port Brasil, firstly the demand from producers with their own port terminals was ascertained. It was assumed that this portion of users would not migrate to a new port.

The analyses concluded that there is a reasonable probability of attracting an alcohol pipeline to Port Brasil (even though the Transpetro alcohol pipeline is set forth in the government's Growth Acceleration Plan - PAC). There are many potential investors unsure about the ideal destination port (São Sebastião or Santos). Port Brasil would

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share many of the advantages that São Sebastião holds over Santos (draft and avoiding the Santos traffic), with the additional benefit of being near the producer markets.

Furthermore, depending on the route of the pipeline, Port Brasil could be an even more interesting option than Santos. If the pipeline starts in Conchas/SP, upstream of the Tietê-Paraná waterway, then the route could be shortened by approximately 100 km, provided that it could continue directly to Peruíbe, without passing through São Paulo or Paulínia[144] At the present moment, Transpetro and other private companies are considering the distribution of ethanol via Tietê-Paraná waterway.

Port Brasil would be the best option for pipeline distribution of ethanol (within the Santos coverage area) due to the greater ease in acquiring the right of passage, the draft and for not being in the area of the Santos organized port. However players in the industry see the deadline for its implantation as the greatest difficulty in attracting the pipeline. Nevertheless, due to the delay in establishing a consolidated international market for ethanol, as well as the delay in implanting effective projects, it is possible that the Port Brasil will offer favorable timing to attract this pipeline.

Therefore, Verax adopted a probability factor of Port Brasil attracting a pipeline of 50%. There are currently projects for pipelines from 3.5 Mtpy to 8 Mtpy. To determine these volumes, Verax assumed a pipeline with a capacity of 6 Mm³/year.

In the same manner that a pipeline would bring great benefit to Port Brasil, if a pipeline were built to another port this could substantially reduce the volumes of ethanol sent to Port Brasil. Therefore, the handling of significant volumes of ethanol at Port Brasil will essentially depend on which port will be located at the end of the alcohol pipeline.

The attraction of volumes to each port, as well as by the pipeline, was established proportionally to the capacities offered by each of the agents. Due to its greater efficiency and lower transport costs, it was assumed that the pipeline has an attraction power twice as great as the other modes of distribution.. Dividing the demand proportionally to the capacity is a weak assumption in the event of excess capacity and/or if any terminal has much lower operating costs than the others. However, at the present moment, this is not the case, and the hypothesis of dividing the market according to capacity has proven to be correct.

In conclusion, if Port Brasil manages to attract the alcohol pipeline, then it should handle 4.44 Mm³ of ethanol in 2016, or a 36% market share.

If the alcohol pipeline leads to another port, the demand for ethanol handling at Port Brasil shall be approximately 1.73 Mm³/year in 2016, that is equivalent to a 14% market share. Finally, if no alcohol pipeline is installed at all, Port Brasil should handle 2.73 Mm³/year, representing a market share of approximately 22.2%. In all the simulations, the installed capacity of Port Brasil for handling ethanol was considered to be 5.76 Mm³/year in 2013 and 2014, and 7.8 Mm³ as of 2014[145]..

[144] The same line of thought is valid for distribution at other strategic points such as Mairinque
[145]. The capacities were calculated according to the static storage capacity of the Brasil Port, based on the CAPEX provided by LLX Logística, with a monthly turnover considered twice the static capacity.

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In addition to the possibility of Port Brasil failing to attract the installation of an alcohol pipeline, other risks for the port are related to ethanol exports increasing at a lower rate than that estimated by UNICA. This drop in volumes could result from price variations, the appreciation of the Brazilian Real, natural causes and increased competitiveness from the Santos and Paranaguá Ports. The competitiveness of such ports may be strengthened by new investments leading to deeper drafts, better access infrastructure or new and as yet unscheduled expansions.

Table 21 shows details of the forecasts taking in account the comments above.

**Table 21: handling of ethanol at port terminal in view of the existence and location of an alcohol pipeline in the region (Mm³py)**

| | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|
| Ethanol (Mm³) | Alcohol pipeline at Port Brasil | 2.58 | 2.97 | 3.54 | 3.98 | 4.44 | 4.70 | 4.98 |
| | Alcohol pipeline at another port | 0.84 | 0.96 | 1.38 | 1.55 | 1.73 | 1.84 | 1.94 |
| | No alcohol pipeline built | 1.35 | 1.55 | 2.16 | 2.44 | 2.73 | 2.90 | 3.08 |

| 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.25 | 5.53 | 5.81 | 6.14 | 6.48 | 6.85 | 7.25 | 7.67 | 8.12 | 8.59 | 9.10 | 9.65 | 10.10 | 10.52 |
| 2.05 | 2.16 | 2.27 | 2.39 | 2.53 | 2.67 | 2.83 | 2.99 | 3.17 | 3.35 | 3.55 | 3.77 | 4.10 | 4.52 |
| 3.26 | 3.44 | 3.63 | 3.85 | 4.08 | 4.33 | 4.60 | 4.89 | 5.20 | 5.54 | 5.90 | 6.30 | 6.72 | 7.19 |

Given the high disparity of volumes ascertained for the scenarios analyzed, the probability of each one was established in order to estimate the amount of ethanol to be handles at Port Brasil. Due to the several projects already announced for the construction of alcohol pipelines and the evident intention of many of the large producers to use such pipelines (or even construct and operate them), the probability of no pipeline being built was considered as nil. The probabilities considered for either Port Brasil or a different port attracting the alcohol pipeline were considered as equal, at 50%.

According to the figures predicted for each scenario analyzed and the probability of each one happening, the levels of ethanol handling at Port Brasil were estimated for until 2032.

According to the CAPEX schedule provided by LLX Logística, the Brasil Port will begin operations with three 80.000 m³ tanks and a new tank with the same capacity will be built to operate as of 2014

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**Table 22: handling of ethanol at the port terminal (Mm³py)**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|
| Ethanol (Mm³) | 1.71 | 1.96 | 2.46 | 2.77 | 3.08 | 3.27 | 3.46 |

| 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.65 | 3.84 | 4.04 | 4.27 | 4.51 | 4.76 | 5.04 | 5.33 | 5.64 | 5.97 | 6.33 | 6.71 | 7.10 | 7.52 |

Currently, the handling price in Santos is approximately US$15/m³, whereas in Paranaguá it is US$13/m³ for spot contracts. When part of service agreements, the price drops in proportion to the volume. US$2/m³ volume discounts seem reasonable. When compared to international prices and past values, the prices seem high, but they have remained relatively stable in recent years. Therefore, the value considered for the simulations is US$13/m³ for operations at Port Brasil.

The high price level for shipments should continue until there is a significant increase to the supply capacity. Historical figures for shipping high volumes of fuels on the international market are under US$ 10/m³. It is worth stressing that, also on a historical basis, the transportation prices in Brazil are higher than in the international market.

Fees to use the port infrastructure[146] shall be charged for handling ethanol at Port Brasil. The value of this fee in Santos is approximately US$1.22/t[147] for handled volume and US$0.12/t for berth occupation[148].

## Risks

The risk of a low increase in ethanol exports is very low, although it does exist.

However, there is a risk that operations prior to the installation of Port Brasil create a sufficient infrastructure to meet the export needs. In this case, the opening of Port Brasil could lead to excess capacity supply with the disadvantage of the port failing to attract an alcohol pipeline. Such risk is increased due the fact that the implementation of the Transpetro alcohol pipeline is specified in the governmental Growth Acceleration Plan

[146] In the public ports, pursuant to Law 8,630/93 and supervised by ANTAQ, the rates are established by the port authorities. For the LLX Logística ports, the rates are established by the company itself based to the table applicable to public ports.
[147] Rate charged according to the handling and kind of cargo (general cargo and container). The volume of ethanol in m³ was converted into the weight equivalent in t.
[148] Rate charged per linear meter of wharf occupied for 6h-periods or fractions thereof. In order to establish the total laytime and the length of the wharf occupied, the following assumptions were assumed:

- Standard 170 meter-long vessel with 30,000 t capacity.
- Vessel loading speed of 1,000 t/h.
- Total wharfage/undocking time of 2 hours.

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(PAC), with construction work scheduled to begin next year. However, while the conclusion of the pipeline was previously scheduled for 2010, the government has already revised its predictions due to the uncertainty in the ethanol market and has limited itself to stating that the project should go ahead after 2010.

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## 5.2.6 Leasing of industrial area

Port Brasil will have an area to be leased for the installation of industrial plants, namely the Taniguá Industrial Complex. The potential income resulting therefrom is an important source of revenue for Port Brasil, and part of the LLX Logística business model.

Bringing together several companies in industrial complexes is an efficient way of absorbing integrated forces and promoting the economic development of a region. The industries may share investments in the infrastructure, including, but not limited to, highway and railway access, energy and sanitation. Such investments can be made by the government which, in general, grants tax incentives and speeds up the process of acquiring environmental licenses.

In industrial complexes located near ports, loading and unloading facilities are shared, as are investments in dredging and maritime operation control and, therefore, they are especially interesting for companies focused on foreign trade.

Although there is great interest in the installation of industrial plants/companies, there is a severe lack of space in the Baixada Santista region, due to the population density, the environmental problem in Cubatão and the difficulty in obtaining environmental licenses.

The availability of an area for such an industrial complex would become interesting should the zoning plan for the region make provisions for some kind of pre-environmental licensing mechanism for a certain class of industrial plant.

Therefore, leasing the area would seem to be an option not only for industries interested in setting up in a port district, but also for various operators that would be able to benefit from possible expansions, from the proximity to inter-modal services and from a suitable urban design, which would enable them to combine production flows leading to a gain in competitiveness.

Hence, Verax considers the project as an opportunity which is in line with the global plan.

The ownership structure of this plot of land, or even the legal reserve, has not been accessed by the Verax team, which considered that it could be fully occupied, according to information provided by LLX Logística.

**Forecasts for Port Brasil**

Of the 1,900ha, the LLX Logística plan makes 598 ha available for the Industrial District. This availability was checked by Verax[149] based on the occupancy and space requirements of similar port operations.

[149] Of the 1.900 ha, 380 ha is intended for environmental reserves (20%); 600 ha for the retro area (32%); and of the remaining 920 ha , 322 ha are for public utilities(35%), and the remaining 598 ha for leasing

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The scenario developed by Verax assumed occupation of 95% of the area by 2017, 15% more than the occupancy rate at the Industrial and Port Complex of Suape.

The usable area available for leasing in Suape is approximately 5,060 ha[150], nearly 10 times greater than that of Taniguá: 598 ha. Occupation will start at 25% in 2012 and, with an average growth rate of 30.6% p.a. (CAGR), it will reach 95% occupancy in 2017, then remaining constant until 2032. The estimates are in Table 23 below:

**Table 23: Leasing of areas in the retro area and Industrial Complex (Mm²/year)**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|
| Leasing of area [Mm²] | 1.50 | 1.95 | 2.55 | 3.33 | 4.35 | 5.68 | 5.68 |

| 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|---|---|---|
| 5.68 | 5.68 | 5.68 | 5.68 | 5.68 | 5.68 | 5.68 | 5.68 | 5.68 |

| 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|
| 5.68 | 5.68 | 5.68 | 5.68 | 5.68 | 5.68 |

The leasing rates are estimated according to the LLX Logística projections of US$ 5/m²/year. Verax has not obtained data for a similar situation to test the validity of this hypothesis.

## Risks

There is the risk that the new zoning plan will not be approved by the local authorities, for the development of the Industrial District, impacting DAIA´s environmental licensing procedures as regards the occupation of the land.

Another risk is that the company is unable to reallocate the current occupants of the area.

purposes. Port operations: Iron ore 0,008 m²/t; agricultural bulks 0.014 m²/t; fertilizers 0.014 m²/t; liquid bulks 0.038 m²/m³; containers 0.25 m²/TEU.

[150] Source: interview with one of the Coordinators of the Industrial and Port Complex of Suape.

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## 5.3 Port Sudeste

### 5.3.1 Iron ore

**Recent background**

In 2006, worldwide production of iron ore totaled 1.7 billion tonnes, consolidating an 8.3% growth rate over the last 7 years. Brazil was the world's second largest producer, with 317 Mt, trailing only China, which produced 520 Mt in the same year.

It is estimated that China exported around 400 Mt of iron ore in 2007, compared to 330 Mt in 2006. Brazil is benefited by this development as it is the world's second largest exporter, surpassed only by Australia. Brazilian exports totaled 144.7 Mt, with a value of US$7.5 billion, in the first seven months of 2007, corresponding to increases of 5.4% and 19%, respectively, in relation to the same period of 2006.

The pricing of iron ore is established through contracts made directly between the mining and steel companies. The iron ore is traded on commodities exchanges, as its composition and granulometry vary greatly according to the production region. The prices are established on an annual basis, even for long-term contracts. In general, the first major contract to be executed establishes the price variation for one year. VALE, as the world's largest producer of the product, has managed to lead price negotiations in the last 5 years. As a result of an aggressive policy, prices have been substantially increasing: 71.5% in 2005, 19% in 2006, 9.5% in 2007 and 65% to 71% in 2008.

The 65% to 71% adjustment agreed in the first contract of 2008 between VALE and a steel industry group surprised a large part of the market. Projections by investment banks estimate rises of 30% (up to 50%) in 2008.The ebullience in the iron ore market, as well as the shortcomings in the Brazilian infrastructure, have provided significant opportunities for economically powerful integrated players

The enthusiasm in the iron ore market of as well as the shortcomings in the Brazilian infrastructure, have provided significant opportunities for economically powerful integrated players. At the present moment, the high profit margins of the business with the current prices has made more expensive mining operations feasible and also stimulated heavy investments in the production capacity of mines already in operation.

**Demand at Port Sudeste**

Port Sudeste encompasses an advanced terminal for iron ore shipments. The complex shall be located next to the Itaguaí Port (with the CSN and VALE terminals). A tunnel connecting the ore yard to the bridge with sea access shall be built.

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The LLX Logística plan includes the handling of up to 25 Mtpy of iron ore as from 2015, with annual increases of 5 Mt as from 2011, from the Serra Azul area, south-west of Belo Horizonte.,

This region currently has 13 mines in operation, with estimated reserves of over 2 billion tonnes of iron ore[151]. Both VALE and CSN have one mine each in this region. The remaining 11 until recently belonged to small to mid-sized mining companies, mostly family businesses. However successive takeovers, instigated by the high ore prices have led many of them into the control of the large mining companies, such as MMX, or steel companies which, in general, dominate the logistics infrastructure and wield greater buying power.[152]

The LLX Logística plans for Port Sudeste assumes a volume of 15 Mtpy as from 2015, originating from the MMX Sudeste mines (formerly the AVG and Minerminas mines), with gradual increments of 2.5 Mt as from 2011. Furthermore, there will be volumes to be absorbed from mines which have no interest in joining the logistics system, beginning in 2011 (2.5 Mt), and increasing steadily by 2.5 Mt a year until stabilizing at 10 Mtpy in 2014. Press reports have announced that the current MMX Sudeste mineral reserves are estimated at 185 Mt[153]. Therefore, at the forecast pace, the absorption of the demand from the MMX Sudeste system is ensured until 2024. To guarantee the demand in the subsequent years, the company will need to discover and explore new reserves[154].

The installed production capacity of the main mining companies in the region totals 13Mtpy[155]. New investments are being planned and it is estimated that the production volumes could quadruple within a few years, raising the capacity to 52 Mtpy. In this scenario, the LLX Logística ports would receive around 83% of the new volumes from the region[156], with 58% to Port Sudeste and 26% to the Port Açu. Small mining companies do not possess their own logistics infrastructures and are subject to the power of the large companies which dominate the port and access facilities.

The consolidation of these volumes would be disputed by CSN, VALE, MMX Sudeste and steel companies. VALE can be discarded as it is cheaper for the company to increase its mines than to buy other operating mines. This leaves CSN and MMX in the dispute. CSN currently has more power owing to its share in MRS railway line and the start of the operations of a large ore export port in Itaguaí.

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[151] Serra Azul Mining Companies Association (Amisa)

[152] As well as AVG and the Minerminas, which gave rise to AVX, there was the takeover of Minas Itatiaiuçu by London Mining, of Mineração J. Mendes by Usiminas and of Empresa de Mineração Esperança by the US fund Ferrous Resources. Companies such as Minerita and MBL, one of the few mining companies which are still family-owned, are being pursued intensely and specialists believe that their takeovers are practically inevitable ("Tão Valioso Quanto Ouro" Exame Magazine, Year 42, Ed. 911, pg. 78)

[153] "Tão Valioso Quanto Ouro". Revista Exame, Ano 42 Ed. 911, pg. 78

[154] Provided the announced reserves are entirely extractable

[155] Serra Azul Mining Companies Association (Amisa)

[156] Based on the assumption that current production is equivalent to the installed capacity. Therefore AVX already controls 2.5Mtpy of the current production. Of the expansions from 13Mtpy to 52Mtpy (39 Mtpy) AVX is responsible for 12.5 Mtpy. This figure considers a further 20 Mtpy absorbed from third parties, of which 50% is allocated to the Port Açu and 50% to the Port Sudeste.

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## Land access infrastructure

Distribution of the ore is planned to use one of the sections of MRS Logística railway, which goes from Serra Azul to the town of Itaguaí, in Rio de Janeiro state. Port Sudeste will be one of five ports in the region (together with CSA, Guaíba, Itaguaí, Rio de Janeiro and the future CSA port) which will be served by MRS railway network. Currently, the company provides services to the three latter ports and its infrastructure is good and receives extension investments.

The MRS railway system, which distributes Minas Gerais production to coastal states, works like a ring, in which the empty cars go up the former Barão de Mauá railway and go down loaded on the west stretch, which passes through Itutinga.

Meanwhile, in Rio de Janeiro, the trains crossing the Volta Redonda region, headed for Itaguaí, undergo delays in this area. This is a current bottleneck in the system which shall be eliminated in the first half of 2009, when duplication of the stretch is completed..

With the expansion of the Serra Azul mine, by up to 39 Mtpy, and the Casa de Pedra mine, by 50 Mtpy, the volume of ore to be distributed would rise from the current 100 Mtpy (estimated) to approximately 160 Mtpy.

Lately the MRS railway line has received several enquiries about its capacity to distribute new and large ore volumes, to which it has confirmed its intention to increase the installed capacity of its railway network in order to meet future increases in demand.

The whole network has invested more money per km of network than other operators. It is believed that MRS handled around 130 MT in 2007, of which roughly 75% is iron ore coming through the Ferrovia do Aço railway line. The company has claimed to have the capacity to absorb up to 300 MT, with roughly 200 MT being transported through the same Ferrovia do Aço stretch. A check on whether this claim is accurate would have to be carried out through engineering projects based on distribution simulations via a dynamic system. Currently, the stretch in Brazil with the biggest flow belongs to the Carajás system–Ponta da Madeira, with an average volume of 100 Mtpy and an announced expansion to 130 Mtpy. VALE is reportedly increasing its installed capacity to 240 Mtpy.

In the event of shortages in the transport capacity, MMX would be at a disadvantage, as VALE and CSN together own 43.3% of MRS and would have precedence in the use of the railway network to export their own ore. Currently MRS provides services for MMX and has shown every intention of maintaining this partnership in the long-term..

## Port infrastructure

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In 2006, only the CBPS terminal and TIG, both owned by VALE, exported iron ore through the Port Sudeste region, which together amounted to approximately 67 Mtpy. CSN has also started to export and will begin investing in the capacity of its port, expecting to reach an annual capacity of 21 Mtpy by the end of 2008. Furthermore, according to CSN, its terminal shall have an annual capacity of 70 Mtpy by 2012.

At the Itaguaí Port, the Rio de Janeiro Port Authority(CDRJ) announced a public tender in mid 2007 for the leasing of an area located between the VALE and CSN terminals. This announcement was retracted due to inconsistency problems and should be republished soon. The terminal would have a capacity of 24 Mtpy of solid bulk, 8 of which must be iron ore. It is worth mentioning that the terminal infrastructure is still non-existent, including the dredging of 1.4 Mm³ of sediments to increase the draft.

In brief, the port capacities announced in the region are sufficient to ship the additional volumes of around 100 Mtpy , a volume above that which may be assessed based on the mine expansions announced and estimated.

The port terminal planned by LLX for shipping ore shall be located in a region with a 15 m draft, deep enough for handling iron ore at the Port.

## MMX and LLX Plans

The materialization of the MMX's growth plans in the iron region has run into a logistics problem. The main players of ore exports have their own logistics structure and MMX must free itself from depending on these groups. The feasibility of this plan, in this manner, requires the establishment of the company's own ports. The solidity LLX plan for Port Sudeste is based on the company's certainty in the reality of the plan and their ability to absorb the rail transport capacity. This strategic need to own the logistics systems consolidates the reality of Port Sudeste.

The fact that the ore terminal would be located outside the organized Itaguaí port and therefore, outside the jurisdiction of a port authority represents an advantage to its owner.

In all the scenarios, the lifting price is that agreed with MMX of US$10.5/t, this price is in line with those charged by regional competitors. The following table shows the planned volumes.

**Table 24: Handling of iron ore at the port terminal (Mtpy)**

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|
| Iron ore [Mt] | 5.0 | 10.0 | 15.0 | 20.0 | 25.0 | 25.0 | 25.0 | 25.0 |

| 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 |

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No port infrastructure usage fee shall be charged for handling iron ore at Port Sudeste. These fees are also not charged at the Tubarão and Ponta da Madeira ports.

# 6 Origin and supply of raw materials

This item is not related to this present project, since the LLX Logística plan does not involve the manufacturing of goods, but only the rendering of services.

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# 7 Return and sensitivity analysis of the investment

For each one of the three port complexes that compose the project proposed by LLX Logística, **current prices**, volumes, and gross revenues were estimated by Verax at current prices derived from each one of the businesses. The timeframe explicitly covered by the investment return analysis extends to 2032, by which time the perpetual effect without growth was assumed.

Fixed and variable operating [157] costs, selling, general and administrative expenses (or SG&A [158]), and initial investment and maintenance were included in the financial analysis. The majority of parameters were provided by engineering companies such as Sandwell Engineering Inc., RAM Engenharia and Planave S.A. and specialized consultancy companies such as Logiserv: Logística e Serviços Portuários Ltda and Natrontec, Estudos e Engenharia de Processos Ltda. Some of the values were provided by LLX Logística. Data were not exhaustively analyzed by Verax, which does not assume the responsibility for any shortcomings contained therein. Items of greater impact were checked in order of magnitude, and, when necessary, discussed again with LLX Logística. As highlighted in the Sandwell studies, the estimated capital expenses are subject to variations of 35%, in the conceptual stage.

For the base case, which encompasses all the most probable estimates in the VERAX appraisal amongst those presented for each one of the parameters, the IRR (Internal rate of return) of the consolidated business was assessed. Subsequently, for items which most influence results, sensitivity analyses were carried out.

The base currency employed for the projections was the US dollar (US$). The exchange rate considered in the forecasts was 1.75.

## 7.1 Financial forecasts for the business units

OPEX and CAPEX are shown in this item associated to the businesses of each one of the LLX Logística Ports.

The net revenues from each business may be obtained by multiplying the prices and volumes transacted for each product, according to the data provided throughout the demand analysis texts and the forecast volumes.

[157] Operating Expenditures, or operating costs and expenses.
[158] Selling, General and Administrative expenses.

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### 7.1.1 Port Açu

The original project for the Port Açu was developed by RAM Engenharia and made available to Verax by LLX Logística. The information received was used as entry data in order to compose the financial model, with Verax, therefore, not accountable for their validity.

Port Açu plan is composed of 9 revenue-generating business units, listed below in order of relevance[159]:

a. Iron ore –the port will receive 73% of the cargo via the ore pipeline and the rest by railway;

b. Steel products – exports from steelworks in the region, including a new one to be installed at the Industrial Complex of the Port Açu;

c. Coal – to be used in the future steelworks and in the thermoelectric plant to be built at the Industrial Complex, in addition to loads to be distributed to third parties by railway;

d. Leasing of industrial area;

e. Containers – handling of loads produced at the Industrial Complex, and possibly captured from other ports, such as the Vitória Port;

f. Port infrastructure utilization rates;

g. Liquefied natural gas – LNG transportation service for natural gas companies;

h. Offshore support base – loading and unloading terminal of products for platforms in the Campos and Espírito Santo Basins;

i. Granite and dimension stones – distribution of regional production.

#### 7.1.1.1 Operating costs

The operating costs of Port Açu were estimated by Logiserv Logística e Serviços Portuários Ltda. and Natrontec, Estudos e Engenharia de Processos Ltda. The variable costs were considered constant per unit for the whole period for all the products. The fixed costs grow in steps in view of the infrastructure employed.

The table below shows the values used for the two portions, with the fixed portion referring to the maturity value of the business.

[159] Classified by EBITDA margin (EBITDA (*Earnings Before Interests, Taxes, Depreciation and Amortization*), according the business plan provided by LLX Logística.

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**Table 15: Fixed and variable operating costs at the Port Açu (Source: Logiserv and Natrontec , LLX Logística)**

| Operating costs | Fixed Costs [M US$/year] | Variable costs | |
|---|---|---|---|
| Iron ore (ore pipeline) | -19.76 | -0.16 | US$/t |
| Iron ore (railway) | -2.88 | -0.31 | US$/t |
| Steel products | -30.00 | -3.40 | US$/t |
| Coal | -11.88 | -1.25 | US$/t |
| Containers | -19.06 | -17.10 | US$/TEU |
| LNG | -2.48 | -0.65 | US$/m³ |
| Granite and dimension stones | -4.19 | -2.60 | US$/t |
| Offshore support base | -3.03 | | |

Operating costs were not taken into account for industrial area leasing.

#### 7.1.1.2 Selling, general and administrative expenses

For the Port Açu, LLX Logística suggests long-term selling, general and administrative expenses to the value of US$5.7 million for iron-ore related activities and US$9.0 million for other businesses. Furthermore, US$3.2 million were considered for shared services expenses rendered by the holding company. The selling, general and administrative expenses at Port Açu amount to US$17.9 million p.a. when the projects reaches its maturity (values for 2016).

#### 7.1.1.3 Investments

The investments under consideration would entail civil construction works, the installation of plant facilities and equipment, warehousing, berths, dredging, accesses and others. The tables below shows the breakdown of investments for two large groups of assets of the Port Açu: Investments related to iron ore and investments related to other loads.

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**Table 26: Investments for the Açu Port– LLX Minas-Rio (Iron Ore)**
**(Source: RAM Engenharia, LLX Logística)**

| Investment item | US$ M |
|---|---|
| **Minas-Rio** | **900** |
| 1.1 Engineering | 28.5 |
| 1.2 Construction management | 61.5 |
| 1.3 Civil construction | 151.5 |
| 1.4 Electrical/Mechanical system | 18 |
| 1.5 Pre-operational expenses | 6 |
| 1.6 Environmental | 42 |
| 1.7 Dredging | 126 |
| 1.8 Access bridge and pier | 160.5 |
| 1.9 Breakwater | 99 |
| 1.10 Port equipment | 207 |

**Table 27: Açu Port Investments– Other loads**

**(Source: RAM Engenharia, LLX Logística)**

| Investment item | US$ M |
|---|---|
| **Port Açu** | **699** |
| 1.1 Surveys, designs and technology | 40 |
| 1.2 Management | 41 |
| 1.3 Civil Construction | 478 |
| 1.4 Assembly and installations | 86 |
| 1.5 Pre-operational expenses | 2 |
| 1.6 Environment | 12 |
| 1.7 Insurance | 4 |
| 1.8 Machinery and equipment | 21 |
| 1.9 Land | 15 |

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### 7.1.2 Port Brasil

The original project for Port Brasil was developed by Sandwell Engineering Inc., and provided to Verax by LLX Logística. The information received was used as entry data for the preparation of the financial model, with Verax not being accountable for its validity.

Port Brasil is composed of 7 revenue-generating business units, listed below in order of relevance[160]:

a. Container – to absorb part of the demand from the Santos Port;

b. Agricultural bulk – to compete with Santos and Paranaguá for soybean and sugar exports;

c. Ethanol– located in the largest productive state, to attract ethanol via highway, railway and perhaps via an alcohol pipeline;

d. Iron ore – ore exports from Corumbá-MS, owned by MMX and also by third parties;

e. Port infrastructure utilization rates;

f. Fertilizer – to capture growing volumes that will exceed the capacity of the Santos and Paranaguá Ports;

g. Industrial area leasing.

#### 7.1.2.1 Operating costs

The operating costs of Port Brasil were estimated by Logiserv: Logística e Serviços Portuários Ltda.

The variable costs were considered constant per unit for the whole period for all the products. The fixed costs grow in steps in view of the infrastructure employed.

The table below shows the values for the two portions, and the fixed portion refers to the maturity value of the business.

[160] Ranked by EBITDA margin according to the LLX Logística business plan

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**Table 28: Fixed and variable costs at Port Brasil in 2016 (Source: Logiserv)**

| Operating costs | Fixed costs [M US$/year] | Variable costs | |
|---|---|---|---|
| Containers | -103.29 | -11.08 | US$/TEU |
| Agricultural bulk | -42.54 | -.025 | US$/t |
| Ethanol | -11.08 | -0.31 | US$/m³ |
| Iron ore | -14.43 | -0.76 | US$/t |
| Fertilizers | -11.97 | -0.44 | US$/t |

#### 7.1.2.2 Selling, general and administrative expenses

For Port Brasil, LLX Logística provided long-term selling, general and administrative expenses to the value of US$43.5 million. Furthermore, it considered the allocation of US$3.8 million referring to expenses related to shared services rendered by the holding company, amounting to US$ 47.3 million for the port as a whole (values for 2016).

#### 7.1.2.3 Investments

Investments in Port Brasil include civil construction works, the installation of facilities, unloading systems, transshipment equipment, load handling equipment, warehousing, highway and railway works, berths, dredging, access facilities and others. The division into two phases refers to the start-up and subsequent expansion. The table below shows a summarized list of investments determined by Sandwell Engineering Inc..

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**Table 29: Port Brasil Investments**

**(Source: Sandwell)**

| Investment item | US$ M |
|---|---|
| **Port Brasil** | **1.951** |
| 1.1 Surveys, designs and technology | 43 |
| 1.2 Management | 94 |
| 1.3 Civil Construction | 764 |
| 1.4 Assembly and installations | 947 |
| 1.5 Pre-operational expenses | 12 |
| 1.6 Environment | 26 |
| 1.7 Insurance | 17 |
| 1.8 Machinery and equipment | 16 |
| 1.9 Land | 32 |

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### 7.1.3 Port Sudeste

The original project for Port Sudeste was developed by Planave S.A. and provided to Verax by LLX Logística. The information received was used as entry data for the preparation of the financial model, and so Verax is not accountable for its validity.

The revenue of Port Sudeste is entirely fully derived from iron ore exports, from both MMX Mineração e Metálicos and third parties, originating from the Serra Azul-MG region.

#### 7.1.3.1 Operating costs

The operating costs for Port Sudeste were estimated by Logiserv: Logística e Serviços Portuários Ltda .

The fixed and variable costs were considered constant per unit for the whole period, as shown below.

**Table 30: Fixed and variable operating costs at Port Sudeste (Source: Logiserv )**

| Operating costs | Fixed costs [M US$/year] | Variable costs | |
|---|---|---|---|
| Iron ore | -14.43 | -0.76 | US$/t |

#### 7.1.3.2 Selling, general and administrative expenses

For Port Sudeste, LLX Logística considers that long-term selling, general and administrative expenses account for 5.6% of the net revenue until 2013, and 5.0% as from 2014, when the volume handled reaches 20 Mtpy. This represents approximately US$12.5 million as from 2015, when the maximum handling is reached. Between US$0.6 and US$1.2 million/year were added referring to the absorption of part of the expenses related to shared services rendered by the holding company[161].

#### 7.1.3.3 Investments

The investments suggested for Port Sudeste envisage civil construction works, the installation of plant facilities and equipment, accesses, dredging and others. The table below shows a summarized list of investments.

[161] US$ 1.0 million in 2016.

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**Table 31: Port Sudeste Investments**

**(Source: Planave)**

| Investment item | US$ M |
|---|---|
| **Port Sudeste** | **381** |
| 1.1 Surveys, designs and technology | 21 |
| 1.2 Management | 19 |
| 1.3 Civil Construction | 167 |
| 1.4 Assembly and installations | 6 |
| 1.5 Pre-operational expenses | 3 |
| 1.6 Environment | 6 |
| 1.7 Insurance | 3 |
| 1.8 Machinery and equipment | 102 |
| 1.9 Land | 54 |

## 7.2 Financial projections of the project

### 7.2.1 Tax considerations

The taxes on revenues considered in the financial model are Service Tax (ISS), with a 2% tax rate for the Açu and Port Brasils and 5% for Port Sudeste, and PIS and COFINS with a total tax rate of 9.25%. It is worth pointing out that the model took into account that the handling of the company's own ore will not be levied by PIS/COFINS, as per information provided by LLX Logística..

The income taxes considered are IR (income tax) and CSLL (social contribution on net income), at a combined rate of 34%. In the project valuation model we considered the use of JSCP (Interest on Own Capital), which caused the effective taxation on project dividends to be lower than the full rate mentioned above. Deferred income tax was also used since the project will have a few pre-operational years of accounting losses before generating profits.

**PIS/COFINS credits on investments and expenses**

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Laws 10.637/02 and 10.833/03 established the non-cumulative payment of PIS/PASEP and COFINS, increasing the rates to 1,65% and 7,6% respectively and allowing for the discount from the calculation basis of credits relative to the following items relevant to the projects under analysis:

1. Values incurred for goods and services used as supplies in service provision and in the production or manufacture of goods or products intended for sale;

2. The value of considerations of commercial lease operations;

3. The value of depreciation charges for equipment and other goods incorporated into the fixed asset, purchased for usage in the production of goods intended for sale or service provision (including taxes paid on imported services and equipment);

4. Electrical energy and thermal energy consumed at the company's establishments.

Amounts for labor paid to individuals are not eligible for credit.

Therefore in our forecasts we assumed credits corresponding to 15% of the operational costs (OPEX) and of the SG&A expenses, and 100% of the costs with depreciation, entered as reducing costs and expenses.

Any credit not used in a given period can be used in subsequent periods.

**Tax-deductible loss**

In the event of the Project presenting a financial loss in a given year, it was assumed that the amount of loss may be used as credit for deduction from the base calculation for income tax and social security tax in subsequent years when there is a taxable profit, as per the applicable legislation.

This credit may be carried over indefinitely and its use is limited to 30% of the taxable profit generated in the financial year (regulated by Decree no. 3.000, of March 1999).

### 7.2.2 Internal rate of return

When calculating the IRR (Internal rate of return), the expected cash flows to the shareholder were considered. The values were weighted by the interest of each business in the portfolio to be offered to the market. Table 32 shows the share capital interests in the businesses which make up the LLX S/A portfolio. The interests are important to assess the project returns given different returns of each business.

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**Table 32: Partners and interest in the portfolio of companies offered**

| Company | Partner | Interest [%] | |
|---|---|---|---|
| | | Partner | LLX |
| Port Açu- Ore | Anglo American | 49% | 51% |
| Port Açu– Other | Centennial | 30% | 70% |
| Port Brasil | Centennial | 30% | 70% |
| Port Sudeste | Centennial | 30% | 70% |

Return rates are subject to all the parameters previously mentioned, such as volumes, revenues, prices, costs, investments, taxes and other characteristics.

### 7.2.3 Sensitivity analysis

The sensitivity analysis of the project IRR in relation to the variations in the main parameters is provided below. Every financial evaluation of return is calculated for June 2008. At that time sunk costs were already incurred and not considered. The main parameters were based on the criteria of greatest impact on results. The selected parameters are the following:

a) Prices. Including all the products handled at the ports;

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b) Volumes. Including volumes of handled products, except for: pusher tugs, support vessels and utilities at Port Açu and leasing at Port Brasil. All the activities not taken into account offer marginal results to the project;

c) Investments. Including initial investments and investments for asset renewal;

d) Costs and expenses. These include all fixed and variable costs, as well as all the selling, general and administrative expenses. These do not include variations in depreciation costs.

The results of the percentage variations within the parameters outlined above for the company as a whole are presented in the two tables below.

**Table 33: IRR Sensitivity analysis in relation to variations in prices and volumes: all the companies**

| IRR [% p.a] | | Price variation | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 15% | 10% | 5% | 0% | -5% | -10% | -15% |
| Volume variation | 15% | 45.0% | 43.2% | 41.4% | 39.6% | 37.8% | 35.9% | 34.0% |
| | 10% | 43.3% | 41.6% | 39.9% | 38.1% | 36.3% | 34.5% | 32.6% |
| | 5% | 41.6% | 39.9% | 38.3% | 36.5% | 34.8% | 33.0% | 31.2% |
| | 0% | 39.9% | 38.3% | 36.6% | 34.9% | 33.2% | 31.5% | 29.8% |
| | -5% | 38.1% | 36.5% | 34.9% | 33.3% | 31.7% | 30.0% | 28.3% |
| | -10% | 36.3% | 34.8% | 33.2% | 31.7% | 30.1% | 28.5% | 26.8% |
| | -15% | 34.4% | 33.0% | 31.5% | 30.0% | 28.5% | 26.9% | 25.3% |

| IRR [% p.a] | | Costs and expenses variation | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 15% | 10% | 5% | 0% | -5% | -10% | -15% |
| Capex variation (Develpment and Susteining) | 15% | 26.3% | 26.8% | 27.3% | 27.7% | 28.2% | 28.7% | 29.1% |
| | 10% | 28.2% | 28.7% | 29.2% | 29.7% | 30.2% | 30.7% | 31.2% |
| | 5% | 30.4% | 30.9% | 31.5% | 32.1% | 32.6% | 33.2% | 33.7% |
| | 0% | 33.1% | 33.7% | 34.3% | 34.9% | 35.6% | 36.2% | 36.8% |
| | -5% | 36.5% | 37.2% | 37.9% | 38.6% | 39.3% | 40.0% | 40.7% |
| | -10% | 41.0% | 41.8% | 42.7% | 43.5% | 44.3% | 45.2% | 46.0% |
| | -15% | 47.4% | 48.4% | 49.4% | 50.4% | 51.5% | 52.5% | 53.5% |

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# 8 Annex: Developers of the Study

## Verax Consultoria

Verax is a consulting firm specialized in business management. It has been operating in various industries (agribusiness, pharmaceutics, logistics, ports, etc.) for which it develops analyses aimed at the senior management decision-making process. It frequently assists clients in the creation of new businesses, including appraisals, business plans and all the related analyses.

In the logistics and infrastructure area, Verax has stood out in the development of projects which range from the identification of opportunities to the preliminary project of logistics systems, including ports.

The company has already developed over 30 projects the marine/port industry, including activities regarding the organization, strategy, market, computerized simulations of operations, equipment optimum configuration and layout, among others. In these projects, Verax has already been involved with ports focused on various products, among them, agricultural bulks, ore, coal, containers, steel products, pig iron, ethanol, oil and gas, offshore support services etc.

### Emerson Colin

Emerson Colin has a doctorate and a master's degree in industrial engineering from the Universidade de São Paulo (USP). He also graduated in mechanical engineering from the Universidade Braz Cubas (UBC).

Before joining Verax, Mr. Colin was a consultant for McKinsey & Company. Over the past 10 years, Emerson has worked on over 50 projects for large companies involving strategic decisions in the agribusiness, pharmaceutics, logistics, metal and telecommunications industries, among others. His experience includes projects for logistics systems, the organization of logistics companies, feasibility analyses of ports and terminals, the optimization of transportation systems and the pricing of port services, among others.

Emerson has written various articles published in top academic magazines, such as "Gestão & Produção" and "Computers & Operations Research". He is also the author of the book "Pesquisa Operacional: 170 aplicações" published in 2007.

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**Marcos Pinto**

Marcos Pinto has a doctorate in naval and ocean engineering from USP/MIT (São Paulo University/Massachusetts Institute of Technology), besides a master's degree and graduate degree in engineering.

In addition to being a partner of Verax, Marcos has been professor of the Naval Engineering Department of USP since 1992. He was a consultant for McKinsey & Company in various areas, such as ports, mining, oil, agribusiness and health, among other industries. He was headed dozens of projects in the marine and port areas including preliminary port projects, technical-financial appraisals of ports and terminals, restructuring and growth strategies for ports and terminals, strategy for the Brazilian naval industry etc.

Marcos has various publications in Brazil and abroad related to the maritime and oil areas, and over the past years he has been working at the Naval Management Studies Center of the Universidade de São Paulo.

## RAM Engenharia

RAM Engenharia Ltda. is an engineering company dedicated to the development of studies, planning, feasibility, development plans, business plans, designs and industrial and transport project management. Since its inception in 1985, the company has developed several projects in its area of expertise.

Over these 21 years of operating in the engineering market, the company has stood out in the execution of large-scale projects, mainly in the port and industrial facilities area, in Brazil and abroad, participating both in planning and in project management.

Projects developed by RAM include:

Consórcio Carioca / Andrade Gutierrez – Executive Project of the Port Terminal of Sepetiba of CSA;

- CSA – Conceptual and Basic Projects of Port Terminal of Sepetiba – RJ;
- VALE – Basic Project of Pier III, for vessels up to 250,000 dwt for iron ore exports and onshore facilities at Ponta da Madeira Port– MA;
- VALE – Basic Project of three new terminals at Tubarão Port- ES, composed of: Oil byproducts terminal for vessels up to 40,000 dwt; Grains Exports Terminal, with loading capacity of 3,000 t/h for Cape Size vessels and Terminal for Containers and Fertilizers Imports, for panamax vessels.

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## Planave SA

Planave S/A, in operation since 1969, is a multi-disciplinary company with 450 employees divided by their area of expertise, in both consultancy and project implementation. The company has carried out hundreds of projects in the transportation and infrastructure areas, including ports, navigation, waterways, as well urban, industrial, oil and energy developments. Its know-how in these fields of engineering has been continuously renewed by its broad field experience.

Planave is a benchmark in port engineering and took part in the projects both during the study phase and in the project management inspection. It has worked on projects in Brazil, Argentina, Paraguay, Uruguay, and Africa, in Mozambique and Cape Verde.

The company's management is composed of:

- Rodrigo Meirelles Sigaud (chief executive officer);

- Gilberto Betonte – Administrative-Financial Officer;

- Ikeciel Kiperman – Executive Officer;

- Harald Manfred Gübitz – Executive Officer;

## Sandwell

Sandwell is a multi-disciplinary engineering company with more than 75 years of experience in complex international projects, performing over 200 projects throughout Latin America and over 25,000 all over the world.

Sandwell is the world leader in the development of maritime-port facilities. In Brazil, its projects include port facilities, ocean and coastal works, mining infrastructure, facilities for the transportation of bulks and containers, equipment and railway infrastructure, modeling and simulation of operations, logistics planning and industrial processing plants.

In Brazil, its major clients are Amazônia Mineração, VALE, MBR, Rio Tinto Brasil, CSN, Votorantim, Usiminas, Gerdau and CST.

The company's worldwide client portfolio includes over 200 large companies, governments and consortiums, among them, ABB, Aker Kvaerner, Alstom, Andritz Inc., Bechtel, Bombardier, BHP Biliton, Black & Veatch, ChevrinTexaco, ExxonMobil, General Motors, Gerdau Ameristeel, the Government of Canada, the Government of British Columbia, Inco, Iron Ore Company of Canada, Minera Escondida, Molson Canada, Nippon Steel Corporation, P&O Ports, Petro-Canada, Polysius AG, Rio Tinto Iron Ore, Saudi Aramco, Saudi Iron & Steel Company, Shell Global, Siemens, SNC-

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Lavalin, TransCanada Pipelines Limited, Vancouver Port Authority, Washington Marine Group, Westshore Terminals, Yilin Industries Group.

Sandwell has offices in Vancouver, Calgary, Montreal, Burlington, Perth (Australia), Atlanta, Houston, Lima, Mumbai and Jakarta, in addition to offices in the cities of Belo Horizonte and Rio de Janeiro.

## Natrontec – Estudos e Engenharia de Processos Ltda.

Founded in 1990 by senior professionals, the company offers the vast experience of its partners in providing engineering consultancy services, covering the areas of Business Appraisal, Projects and *Lato Sensu* Consultancy. It has over 30 years of experience in the Mining and Ore Processing industry, Oil and Gas, Chemical and Metalworks, Environmental Studies and Management and Project Management. In addition to its own staff, Natrontec also maintains, a permanent team of associate consultants to meet the needs of its multi-disciplinary teams and its partnership agreements with Brazilian and international companies, aiming at the joint performance of complementary services.

Universities and research centers are also usual partners of Natrontec. Its major customers include: VALE, RTZ Group, Anglo American, AngloGold, Grupo Petrobras, BNDES, EBX Group, El Paso, Rio Polímeros, Suzano Petroquímica Group and state governments.

## Logiserv

Logiserv is a consultancy firm specialized in logistics, located in Vitória –ES. Its main performance areas are the following:

- Cargo market study and technical and economic feasibility studies for projects in the port and transportation sector, warehousing and ancillary services from/to port segments;
- Preparation of zone plans for port activities;
- Analysis of alternative port operations logistics for cargo resulting from foreign trade and cabotage;
- Technical advisory services in marine transport-related activities;

Company partners include Messrs. José Ferro da Cunha Lima and José Luiz Canejo.

José Ferro is electrician engineer who graduated at UERJ, in 1971 and completed a post-graduate qualification in Business Logistics from USP, in 2000. With vast experience in Port and Railway Logistics, Projects, Marketing and Operational Planning,

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José Ferro developed his career at VALE and ENEFER, and is also a lecturer at UVV FAESA Universities.

José Luiz Canejo is an engineer who graduated from UERJ in 1979, with 28 years of experience in Port Logistics, and vast international experience. He held executive positions at VALE, Cooper T. Smith, Servport and Petrobras. Currently, he is and Executive Officer of Brazcargo - Operadora Portuária Ltda. and of Logiserv Consultoria e Serviços Portuários, besides working as University lecturer.

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