

Analysis of Environmental Management and Planning in The Oil and Gas

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Abstract— The actions that have a great likelihood of triggering environmental accidents, like in the petrochemical zone, it is sensible to imagine the environmental management to be a significant variable within the corporation's tactical arrangement. Nonetheless, this is not every time correct. In some circumstances, an alteration in the companies' policy, leaving a responsive situation and supposing a proactive one, only occurs upon the incidence of serious environmental coincidences with strong effect in the television. For the company that was the object of study, these coincidences provided rise to deep fluctuations in its environmental management, terminating in investments of about US\$ 2. 61 billion in environment, healthiness and safety, from 2011 to 2015. This was the highest volume to date invested on these regions by an oil company. This case study seeks to discuss the integration between environmental management and strategic planning in the petrochemical zone over a period of 10 years (from 2005 to 2015) in order to make a contextual analysis of the period before and after the environmental accidents possible.

Keywords: Oil and Gas Sector, Pollution, Management, Petrobras, Planning

I. INTRODUCTION

Meanwhile the end of the 1980s, the main world firms have been giving more devotion to the environmental subject, because of the severity of rules or because of the consciousness and following demand from society for more commitment to the environment. Moreover these lawful and social subjects, financial specialists predict that the environmental anxieties from large societies—which are absorbed in attracting new investors—are going to growth a lot and will be an significant distinctive aspect, persuading investors' choices as well as subsequent in monetary returns. It is stimulating to detect that although only the financial returns in the December 2004-June 2015 period are measured companies' shares involved in the Dow Jones Sustainability Group (DJSG) had an increase of 146% versus 108% of the Dow Jones general (Exam Guide, 2004). A way of demanding to assess the significance of the environmental subject within these large organizations is to assess the collaboration level among the environmental management accepted by the business and its planned planning. The analysis of this interaction becomes even more relevant when the occurrence of serious environmental accidents has a strong repercussion in the media. In 2000, the studied company was responsible for two serious environmental accidents, with a total oil spill of about 5. 3 million liters. The accidents made the company change drastically both the strategic plans and, mainly, the environmental management. Traditionally the petrochemical zone is one of the most harmful activities to the

environment. The World Bank, using the databank of Industrial Pollution Projection System (IPPS), grants the petrochemical sector as extremely hazardous polluting agent for several types of different pollutants [1].

We should also mention the high risks of oil and its end product leaks mainly during pumping and carrying operations. The charter below shows the foremost polluting gases releases from the petrochemical sector among others. According to Table1, we can realize the significance of the petrochemical zone in any debate related to environment preservation. Moreover this, in respective [2], there are quiet some questions that can be discovered such as the combination between strategic planning and environmental management. Subsidizing to this argument, by donating how environmental management has changed in 10-year time, its relation and integration with strategic planning earlier and next to the serious environmental accidents, the imaginable results on the financial act during this period of the largest Brazilian business and one of the 14 large corporations in this sector of the world establish the consequence of this research. So, the aim of this study is to debate the combination of the environmental management with Petrobras-Petroleo Brasileiro S/A strategic plans, as well as measure the alterations that happened afterward the environmental accidents in the 2005-2014 period [3,4].

Sulphur dioxide, SO ₂	Metallurgy of not ferrous; oil refinery and petrochemical industry
Nitrogen dioxide, NO ₂	Oil refiner petrochemical industry and siderurgy
Carbon monoxide, CO and volatile organic composites, COV	Oil refinery petrochemical industry, siderurgy and chemicals

Table 1: Pollutants proceeding from oil activity and others

II. STRATEGIC PREPARATION AND THE ENVIRONMENTAL MANAGEMENT

For Anthony and Govindarajan (1998), strategic planning contains of the process through which the suites that will be accepted by the corporation are nominated, and the estimated quantity of assets that the company will backup for each platform is decided in the following years. They also noticed out that the strategic planning is systematic; there is a procedure of annual planning, with certain actions and goals. However, the strategic formulation is not systematic. The strategies are always reexamined when accidents and risks appear. strategy can also be understood as a company's "choice and commitment" to its goals and practices. The incorporation of environmental management to strategic planning can be assessed according to the priority of its implementation, preservation and update, moreover the incomes invested on the area [4]. The precise

application of strategic planning shall be skilled of predicting problems and making possible keys before the problem appears. Moreover this, it is essential to screen its execution so that any conduct Deviation is recognized and modified before creating more problems. The strategy shall be flexible enough to adapt itself to outside scenario changes, by keeping it competitive in the market [6]. One of these significant scenario alterations are the growing requirements, both authorized and from the society itself, regarding the environment protection. Amongst other benefits, the precise use of strategic planning makes it probable for all the employees to comprehend how they can subsidize to the achievement of the company as a whole. Nevertheless, when the strategic planning is not properly applied and used, it also grants restrictions as per table below. Amongst other benefits, the precise use of strategic planning makes it probable for all the employees to comprehend how they can subsidize to the achievement of the company as a whole. Nevertheless, when the strategic planning is not properly applied and used, it also grants restrictions as per table below. From the points offered in Table 2, some features can be pointed out. Concerning strategic planning benefits, a long-term idea and its relation with short-term measures are vigorous issues for the integration between strategic planning and environmental management, as a great part of the strategic resolutions, which have effects both in short and long terms, go through an assessment of probable effects on the environment protection, particularly in high-risk actions such as oil and gas. Concerning the limitations, the strategic planning alteration into a bureaucratic action, when combined with environmental management, makes both simply figurative pieces, without any operational efficacy.

Advantages	Limitations
It provides a suitable structure for the elaboration of the annual Budget It provides an executive improvement tool	Strategic planning may end up changing into a bureaucratic activity, divorced from strategic thought
It makes a long-term foresight Possible It aligns the executives with the company's strategy	High executives consume too much time for the elaboration of strategic planning
It helps in the determination of the short-term necessary steps for the accomplishment of the long-term strategies	It can only be used in companies that are able to make reliable projections of the future

Table 2: Strategic planning advantages and limitations reduce this space Table 3(Faulkner et al. 2005). Considering North American companies it has been perceived that businesses that have high environmental risks present a greater combination between environmental subjects and strategic actions than other areas that have a lower risk [7,21]. For big organizations, primarily the high risk areas (the petrochemical zone, for example), the environmental issue has developed progressively more significant, both for the lessening of costs and, particularly, for the enhancement of the organization's public appearance [8]. Large corporations' concern about institutional appearance, remarkably in highly risky actions, has made these

companies use large sums of money on subsidizing, advertising and enterprises with non- governmental organizations, aiming at improving their appearance and validity before society consuming these organizations' trustworthiness [9]. The image topic becomes even more appropriate if we study that, agreeing to Kaplan and Norton (2010), accessible assets book value represents, at the moment, only 10% of the organizations' market charge. Amongst the possessions measured inaccessible, the organization's public appearance is one of the most significant issues. In contrast, the environmental strategies depend powerfully on how the management office outlooks the environmental subjects, either as occasions or threats [10]. When seen as an opportunity of growing its cost, the firm adopts a proactive situation, and the administration office converts more flexible with admiration to the investment of budget assets. When seen only as threats or costs, the company adopts a reactive position, with a trend of following the proven legal rules to evade penalties. Nonetheless, the environmental issue has stopped to be considered only as a lawful necessity and taken place to be measured as another important variable inside the managerial competitiveness; in some firms, it developed an essential and ultimate part of the uppermost hierarchical stages of strategic planning. [11] points out that, when the environmental fineness is not attained, it can be terrible, and the environment, unrecoverable. Otherwise, when the environmental fineness is accomplished and well discovered, this may be improved into income and progress accidents. Additional point upraised by the author is concerning organizations where environmental misfortunes have occurred. In these companies, the environment sector usually shows a high level of well-designed authority. There are some features that make the firms finance on environmental strategy. In Table 3, the key reasons why companies concern and invest on subjects related to environment are registered. Please note that the institutional appearance has more stress. It is exciting to spot that the stimulus for environmental funds, besides appearance development, passes by presentation development at the same level of reputation as the legal burden. This fact may show that a bigger legal burden does not exclude companies' Even though the subjects related to environment have been the middle of several present debates in the world, there is still a long way to go concerning the association between environmental management and strategic planning. Some studies done in the past decade recognized the existence of environmental subjects impact on companies' strategic planning [3]. Nonetheless, 10years later, a study done in the United Kingdom recognized the reality of a certain space between environmental management and the business strategic planning. This space is more important than the space between the making of environmental management and its application. Although there is a persistent tendency to performance improvement [12].

Main factors that motivate investments on environment (%)			
Factors that stimulate investments in environment	Moderate or important	Very important	
Institutional image	46	45	

improvement		
Legal imposition	44	43
Environmental certification	34	40
Performance improvement	44	32
Competitiveness	39	28
Costs reduction	33	16

According to Ingra (2011), the exact integration amongst environmental management and company's strategic planning essentially includes the next points:

- 1) Integration amongst environmental management and managerial goals;
- 2) Integration amongst environmental info and the monetary and administrative info systems;
- 3) Integration of environmental attentions in the entire making process;
- 4) Integration amongst environmental performance and the current performance assessment systems.

The author also stresses the profits of an effective integration, emphasizing the following benefits:

- 1) Enhanced information of the environmental effects produced by the company's actions;
- 2) Charges reduction and competitive compensations rise;
- 3) Official appearance development;
- 4) Identification and lessening of the environmental risks and influences of the yields and procedures.

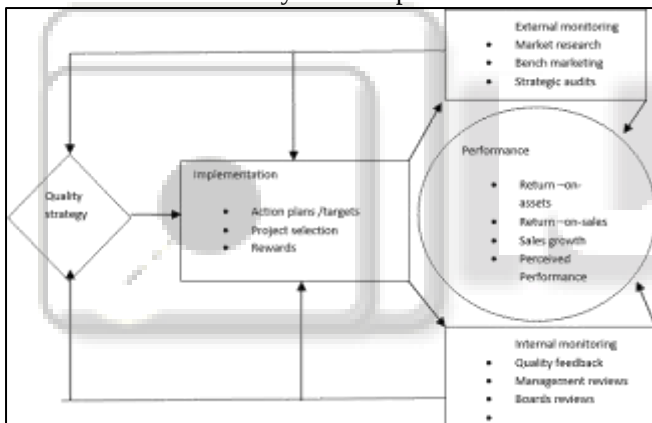


Fig. 1: Conceptual model linking quality strategy and strategic control practices to organizational performance.

Source: Ittner and Larcker (2007).

For Coral et al. (2013), dealing tactically with environmental and communal subjects carries to the company benefits in recognizing new corporate accidents, through the use of its environmental act as a source of competitive advantage; this aids the company to assume an progressively proactive attitude. Tachizawav2012, in his opportunity, says that the presence of environmental management as a part of the strategic planning has been persuading the long-term judgments in various large organizations, such as Xerox, Toyota, Caterpillar, Dow Quimica among others. It is likely to confirm an growing trend for stakeholders to try to recognize, in the long-term, yield accidents and competitiveness growth, as well as to assess the business risks under the economical, environmental and social optics [12]. Specifically regarding performance appraisal, the strategic planning can offer three rudimentary features: strategy application, interior and exterior panels. According to Table1 the operative

application panels comprise the growth of achievement plans and purposes for the selected strategic aims to be attained, moreover the involved implementation agents' duties. Internal and external controls guarantee the follow up of what has been predicted and what has been performed [13]. The same authors also classify the four likely restrictions in the official strategic panel systems registered below (Fig. 1):

- Absence of emphasis in the strategic action plans;
 - Restrictions in presentation measurements;
 - Bureaucracy increase;
 - Strategic panels systems inflexibility.
- Companies' monetary routine currently is also progressively affected by the charges and accidents presented by environmental subjects. In this way, companies' administrators and business experts could use environmental issues in the following aspects, among others:
- Determining environmental liabilities or dangers in likely discussions for new investments acquisitions.
 - Evaluating essential investments for the decrease of risks of environmental accidents.
 - Evaluating and associating the best practices in the market to the main competitors [13]

The similar authors stress some foremost features that have to be measured in the association amongst tacticals This means that, idea characterizes how the scheduling and environmental management:

- 1) Credentials of significant coming environmental issues;
- 2) Founding of probable scenarios and their opportunities of action;
- 3) Valuation of corporation's risks for each of the established scenarios;
- 4) established scenarios;
- 5) Ccalculation of probable financial influences for the most likely scenarios;
- 6) Pregress procedures to lessen possible influences and predictable dangers.

According to Corporate Environmental Performance 2000 Review, quoted by [14], the investors and the other memberships of the monetary community disclose the necessity for more information linked to environmental subjects. Among them, we can highlight the following: The accepted environmental strategy, Enhancements in the long-term environmental strategy, projects and monetary investments concentrated on environmental subjects, observation of the legal features connected to environment and inherent to the company's action. Concerning the possible mismatch amongst the growing severity of the environmental rules and the companies' competitiveness, Porter and Linde study that the application of a right environ-mental management structure to obey with these regulations suggests in the rearrangement of the production process over the search of constant innovations. This results mostly in a more effective use of inputs in the making procedure (energy, manpower and raw materials) and also in a related cost budget, proximately improving the charge benefit ratio of the investments on the environment, and subsequently, growing output and competitiveness. One of the reasons the authors pointed out to clarify this relationship originates from the fact that the large

organizations, which have a well competence in the making process primarily because of up-to-date equipment usage, current, in general, better pointers connected to environmental pollution. Some scholarships confirmed that there is a direct and positive association amongst the firm's environmental performance and monetary act as well as between environmental innovation and competitiveness.

III. CASE STUDY

Targeting at completing better parts concerning the level that the study offers to touch, the case study has been measured as the most suitable study procedure. The select of this methodology originates from the fact that a case study is more suitable when probing for responses to "how" and "why" demands, when the scholar has little control over the actions and when the emphasis is on current phenomena inserted in any situation of real life [16]. According to the equal author, in general, a singular case study is justified, for instance, where the study helps to a revealing purpose regarding a definite element. The core of a case study, the foremost tendency in all types of case study, is that it tries to illuminate a assessment or a group of assessments: the cause why they have been occupied, how they have been occupied and which results have been gotten. The following three types of study data gathering were used: Bibliographical assessment where books, periodicals, Articles, dissertations, theses and internet were asked. We inspected for the present idea on the core features related to strategic scheduling, environmental. Management, environmental accidents and a probable association amongst them. Documentary study where the next sources were used: monetary statements, strategic plans, yearly reports, communal balance sheet, as well as other information distributed by the corporation regarding the period under assessment. Monetary statements were used to confirm the investments made on environment, as well as the coincidences potential effects upon the company's economical and monetary act. We confirmed in the strategic plans how quotations connected to the environmental variable were offered in the strategic situation, more precisely in the company's idea and undertaking notions. To attain this study objectives the following descriptions were used: vision is what the company goals to stay or develop. Undertaking is the goal or the motive for an organization's being [15]. company understands itself and assignment displays the path to be endlessly straggled in the long-term, moreover demonstrating how an organization wishes to be perceived by people. In this trend, it is possible to study that the way the idea and the assignment are offered constitutes a related way to sign the company's objects and promises before society as a whole and exactly regarding the environmental issue. The key objection of confirming the strategic plans was to emphasize the frequency that expressions related to environment were shown in the strategic plans, as well as to state the being or not of any association between the incidence of these words and the growth in investments on environment before and after environmental accidents occurred.

The other forms, particularly the social balance sheet, were used to balance and/or correct

information gotten during the interviews; (c) Field study: The study was lead after semi-structured consultations with each of the responsible leaders for Health, Safety, Security and Environment (HSSE), Strategic planning and National Communication areas

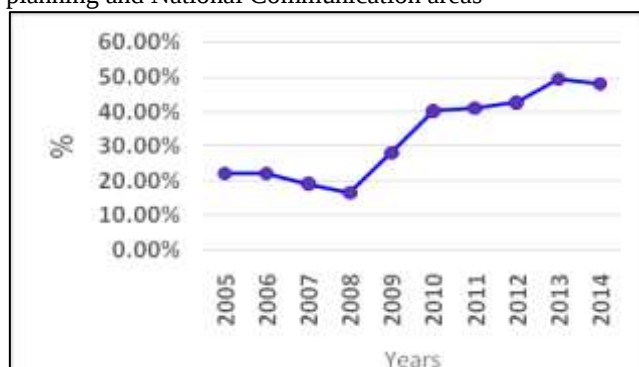


Fig. 2: Relation between Petrobras' Net Revenue and Brazilian GDP

Referring to the company's organization chart the interviewee for Nationwide Communication reports to the Institutional Communication Director who reports to the corporation's Chief Executive Officer. The interviewee for Planned Planning reports directly to the CEO and the HSSE leader talk to reports to the Services Director who reports to the CEO. It is significant to remark that the authors themselves submitted the survey in the researched business's buildings, therefore producing a rate of 100% of devolutions. The semi-structured interviews were used since they bargain a broader field of interrogatives, deriving from novel theories that ensue as the interviewees response the questions [17]. A survey was used training at specifying the planned preparation and the environmental management as well as approving senior running's insight concerning the incorporation of both. The interviews founded on the questionnaire request were made between May 2005 and June 2005. The questionnaire had 23 questions and most of them were exposed. For all the interviewees' replies the likelihood of prejudice and how this could alter the analysis was measured. Within, when it was essential and likely, all the answers were related to the info in the monetary statements, strategic tactics and other documents. Briefly, the study examines is separated into three plain bases or investigation fields: (1) the strategic plans in resulted or elaborated in the periods 2001-2010, 2010-2020, and 2015-2025; (2) the monetary statements correctly audited; and (3) the business's awareness through the Use of semi-structured interviews using a question nairegiven directly by the researchers. Note that insider or confidential information was not measured for study. Petrobras, which was formed in 1953, is a mixed-capital company, with government control over 41% of the shares, the rest of the shares being spread among Brazilian (23. 5%) and foreign (36. 5%) investors. The company actions, together with its subsidiaries, in the examination, making, refinery, transportation and distribution areas. Currently, it has 95 fabrication platforms, roughly 16,000 boring wells; 900 are deep-sea wells with an assessed production of 1. 7 million barrels of oil a day; 16 refineries have a principal processing volume of about 1. 9 million barrels a day and pipelines of 30,318 km. The company acts in roughly 15 countries such as The United

States, Mexico, China, Bolivia, Nigeria, Argentina Its reputation to the Brazilian economy can be proved over the analysis of the proportion ratio amongst its net revenue and Brazilian Gross Domestic Product (GDP) in the period under analysis as per Fig. 2. In a ranking of the 50 biggest and most important oil companies, the company was graded as the 14th biggest oil firm in the world by the expert publication Petroleum Intelligence Weekly—PIW, according to 2004 data. Considering only the open capital companies with shares negotiated in the stock market, Petrobras was on the 8th position in 2014, according to the PIW ranking. Oliveira (2013) points out two significant instants that ended Petrobras pursue for a novel and better relationship with its stakeholders and society as a entire: (1) the end of government domination in oil exploration (2008); and (2) the incidence of oil spills (2010). Nevertheless, according to the author, single the second one effectively influenced upon the development of a new attitude towards environmental management.

A. Strategic plans

In Petrobras, the entire planning, according to the conference with the strategic planning manager, starts by the elaboration of a corporate panel, that is, a map on which there are, besides the corporate strategy, pointers, goals and strategic initiatives. For the strategies perationalization, the strategic expansion panels of the businesses zones and unions, elaborated in accordance with this corporate panel, are studied. The interviewee points out that, furthermore to the objectives and pointers measured in the corporate panel, others are also established at the numerous company levels in order to best mix, connect and follow the application of the strategies cleared in the company's global strategic plan. Within the 10-year study period, Petrobras divulged and applied three tactical plans (2000-2010), 2010-2020, and 2015-2025). These tactics are reexamined and issued every 5 years and always hold a 10- year period. In the comparative study of Petrobras' tactical strategies (Table 4), it is probable to confirm that the integration of a long term policy with the environmental management executed by the firm is seeming as more operative only after 2010, with the outline of Program of Excellence in Environmental Management and Operational Security (PEGASO). This platform involved US\$ 2. 6 billion investments from 2000 to 2004, according to the monetary statements, having projects that anticipated from systems review, installations building and expansion, to automation of the company's core pipeline net. Nine centers of environmental protection were also applied next to the zones where the company acts. According to Table 4, it is also probable to confirm that the environmental subject only jumps to be obvious in the company's task, though timidly, in the 2010-2020 strategy; only in the plan decided in 2014, stating to the 2015-2025 period, the environmental subject is named both in the company's assignment and idea. The alterations happened in the tactical planning are in contract with the responses given by the strategic planning manager. Giving to the interviewee, the integration between environmental management and tactical planning only successfully occurs after the accidents in 2000, when the company alterations from a reactive to a proactive attitude (Table 5). After the

latest strategic plan, the firm also ran to distribute its corporate goals in a Balance Scorecard(BSC) format. In this BSC, within the internal procedure perspective, only two goals of discount of leaks and SOx emissions are obtainable. Though still timid, the element the environmental goals were available as part of the corporate aims can specify, at first, a progress in the indication of the integration among environmental management and strategic planning.

DESCRIPTION	Mission	Vision
2000/2010	Guarantee the supply of oil, gas and derivatives to the national market, through the activities defined in the constitution and Law 2. 004,in a profitable way and lower costs to society, contributing to the development of the country	Not published
2010/2020	Act in a profitable way in the oil and gas industry activities, and in the related businesses, in the national and international markets, supplying quality products and services, respecting the environment, considering shareholders' interests and contributing to the development of the country.	Petrobras will be an international energy company and a leader in South America, focusing on services and free to act as an international corporation
2015/2025	Act in a safe and profitable way, with social and environmental responsibility,in the oil, gas and energy industry activities, in the national and international markets, supplying products and services that meet its customers' needs and contributing to the development of Brazil and countries where it acts	Petrobras will be anenergy-integrated company strongly present in the international market and a leader in South America, focusing on profitability and social and environmental responsibility

Comparison between the strategic plans

ANO	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
IMPO	2	2	2	2	2	4	5	5	5	5

RTA [^]									
NCIA									

Importance of environmental management inside the strategic planning

B. Accounting statements and other documents

Concluded the financial statements, data attained certified, besides the measurement of investments on environment (Fig. 6), the assessment of the company's financial act in the analyzed period, whether it was negatively inclined by the accidents or not. Petrobras' economic enactment can be assessed, in general, with the analysis of the performance of three significant erformance meters powerfully used by the financial market that are: revenue, net return and future dividends (Fig. 3). As we can see in the pointers development during the 10-year period (Fig. 3), while the economic and financial presentation was not meaningfully affected by the environ-mental accidents occurred in 2000, we can note that the share market replied directly with a discount of share value in 2010, recovering itself over the period under analysis (Fig. 4). This detail may display that, at first, the market did not guess great economic consequences on the accidents that had occurred; nevertheless, it is also likely to study that the market is sensitive to the environmental subjects. Performance cuts in 2008, 2011 and 2012, in success (Fig. 3) and stake value (Fig. 4), resulting from the negative difference of global oil price in these years. In 1998, further this fact, it was the finish of the oil control in Brazil. It is also stimulating to declare a strong growth in expenses on supporting and marketing running from 2000, as we can see in Fig. 5. At first, this fact reveals that the business was concerned about dropping the probable negative effects formed by the accidents on its institutional vision. The environmental sponsorships, according to the national communication manager, re-ceived more assets in relation to the total sponsorships in the period.

C. Environmental management

Petrobras' environmental management can be divided into two separate moments: beforehand and after the environmental accidents that occurred in 2010. According to the manager that was responsible for the HSSE segment, until the incidence of the environmental accidents in 2010, the subjects connected to the environmental management were not measured as significant as other firm areas such as, for example, assembly and funding. When requested about the significance of the firm's environmental manage-ment in the 2005-2014 period connected to the tactical planning, the interviewee gave the next responses (1 means less or not significant, and 5, extremely important): According to Table5and as corrected by the interviewee, Petrobras had an absolutely reactive approach with respect to environment until 2010, assuming an successfully proactive approach after 2011; essentially, this development completely started in 2010 with high funds on environment and security and with the application of PEGASO. The process of explanation of the environmental management and its significance within the company were also radically modified after 2000 with the creation of two significant

committees linked to environmental subjects. According to the



Fig. 3: Net revenue, net profit and dividends

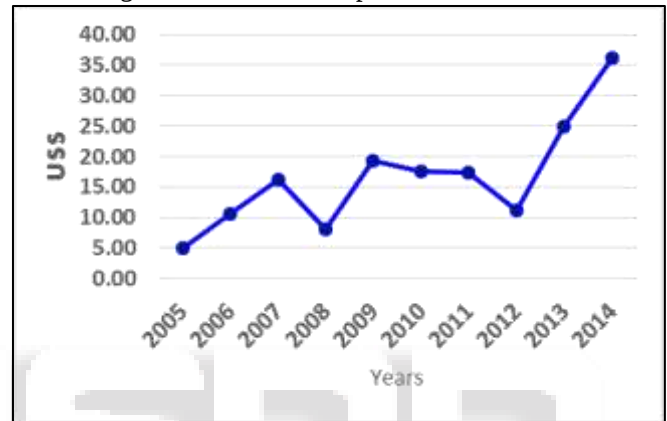


Fig. 4: Petrobras' stocks rates.

HSSE manager's reply to the question "please, define the environmental rule elaboration process", the firm has two teams connected to environmental management since 2010: the Environment Team, since 2011, measured as tactical and directly subordinated to the Administration Board, and the HSSE Management Committee, since 2010, measured as more active than tactical. The reason for making an Environment Team directly subordinated to the Administration Council may sign to the entire company that environmental management ran to have a higher level of bearing than before. Regarding the next team, the objective was to better mix all the company's zones around environmental subjects. It was also jagged out that the business areas became in charge for the environmental results; this fact, beginning in 2010, caused variations in the managerial approach, and these areas started to take the environmental issue more into consideration in their verdicts. This alteration in the executive approach can be complete in Fig. 6. It can be seen that funds on environment cut in the 2 years earlier the environmental accidents, 2008 and 2009 and in 2010, there is an sudden optimistic variation, from US\$ 100,000.

000 to around US\$ 310,000. 000, particularly according to the application of PEGASO. This program completed savings on several areas, particularly the following: pipelines integrity (29%), procedure security(18%)and systems mechanization (14%) ([18,19]. The investment feedbacks (Fig. 6) and the PEGASO application were abrupt. Based on Fig. 7, it is likely to

contrast the performance of the leaks that occurred in 2010, the year the platform was applied, to the next years. While a sudden reduction from 2010 to 2011 and from this year to 2002 is witnessed, it can be understood that there is a trend near an increase after 2012.

IV. CONCLUSIONS

Based on the obtained data and seeing the environmental approach after the firm thing of the situation study, it is likely to determine that over the analyzed 10-year period, from 1995 to 2004, environmental subject was not a precedence. Therefore, the company did not present highly proactive approach through that period. Its approach radically altered only after the severe accidents happened in 2000 while high funds were made in Health, Safety, Security and Environment (HSSE). In this way, it is likely to divide the examined period into two separate phases: one before and the other after these accidents. Over the examined 10-year period (2005-2014), Petro-bras' environmental management ran to have a proactive approach, more combined with tactical preparation, only after the accidents that occurred in 2010. Therein, it is possible to divide this period into two distinct phases: and after these environmental accidents. Till the year 2010, no accident involving the firm had been so widely publicized by the press like the one that happened in 2010. The changes in the environmental approach squeezed from the tactical tactics to the company's

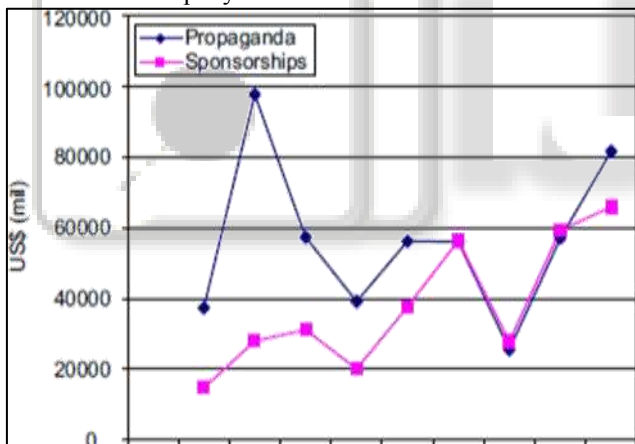


Fig. 5: Expenditures on marketing and sponsorships business zones, affecting a tough growth in environmental investments. Regarding the tactical plans, it is likely to observe more sign of environmental subjects, both in the company's idea (2010/2020 plan), and in its idea and assignment (2015/2025 plan). It is a actuality that these approach variations had an instant optimistic result on the decrease of the level of informed tumbles, but it is also likely to confirm a growth of leaks starting from 2002. Another significant point that approves these variations was the creation of two teams connected to environmental management: The Environment Group (since 2011), directly connected to the Administration Council, and the HSSE Management Committee (since 2010), responsible for the combination of all the firm zones around environmental subjects. Since related or lasting economic and financial results were not experimental in the financial statements or in the business's stake value, it is sensible to accomplish that

the probable negative results of the accidents on the institutional vision were the key issues that required the company to make instant and fundamental changes in its environmental approach. This fact can be detected in the growth of investments on environment, advertising and funding in the 2 years that surveyed the accidents. Lastly, it should be emphasized that, even considering the tough optimistic growth of the company regarding its environmental management after the accidents in 2010, the 4-year term (2010-2014) may not be sufficient to settle absolutely if the events taken by the firm were conjectural—only with the meaning of giving an immedi-ate reply to society—or structural—effectively intensive on a perpetual integration between the firm's tactical planning and environmental management.

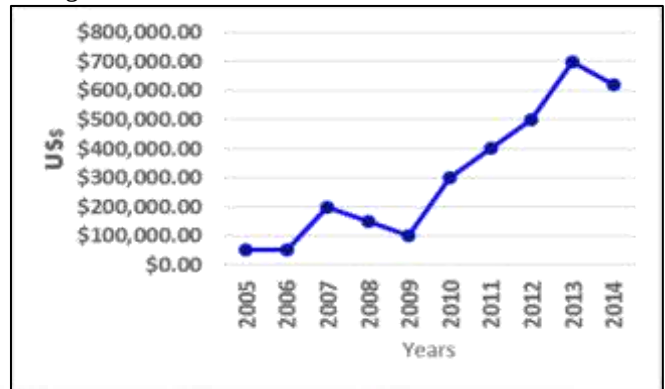


Fig. 6: Investments on environment.

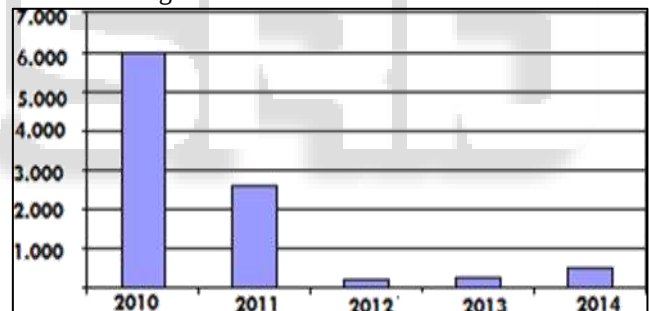


Fig. 7: Petrobras' leakages after PEGASO

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