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NOT ALL GLITTERS IN THE BLACK GOLD: UNCERTAINTIES AND ENVIRONMENTAL THREATS OF THE BRAZILIAN PRE-SALT¹

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1. Introduction

Oil exploration in new circumstances, such as hydraulic fracturing and deepwater exploration of the Pre-salt, are examples of technologies and operations that introduce environmental threats into contemporary societies (LINDOE; BARAM; RENN, 2013, REES; SHARPE, 2011).

Brazilian Pre-salt reserves present a set of characteristics that place the oil industry in an extended situation of risks and uncertainties. The oil is located at a distance of up to 300 km from the coast, at a water depth of 5,000 meters, and below a salt layer that can reach 3,000 meters. The greater the depth, the greater the potential instability of the well and the more complex the response to dealing with emergencies (LEONE, 2012). In addition, the existence of very high pressures and the presence of carbon dioxide (CO₂) and hydrogen sulfide (H₂S), which can further compromise the integrity of materials and equipment, are examples of the peculiarities and novelty of this exploration (COSTA et al., 2016; OLIVEIRA, 2015; PIZARRO et al., 2012; COPPE-UFRJ, 2010; AZEVEDO et al., 2010).

Even the safety procedures adopted to date for areas outside the pre-salt province have not been sufficient. The existence of robust operational safety systems, specific to the offshore sector, has not avoided large incidents that have been recurrent¹ (GOLD; CASSELMAN, 2010; FREITAS et al., 2001). Many studies have empirically supported the unpredictability, cumulativeness, long duration, lack of knowledge, and irreversibility concerning the impacts of the oil spill on marine and coastal ecosystems (PERRONS, 2013; MENDELSSOHN et al., 2012; PLATER, 2011; HAYWORTH et al., 2011; DE-LAUNE; WRIGHT, 2011; PETERSON et al., 2003).

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The exploitation of these reserves has raised criticism among environmental agents regarding potential threats whether from the point of view of climate change or of incidents. Organizations such as Greenpeace have classified the Brazilian Pre-salt as the ninth most polluting initiative on the planet in terms of greenhouse gas emissions (GREENPEACE, 2013). Other organizations such as the Global Renewable Fuels Alliance (GRFA) point out the Pre-salt as one of the ten most dangerous petroleum projects in terms of operational risk (WEARDEN, 2010). At the same time, the Pre-salt was considered by the national executive and legislature, by political parties, social movements, oil companies and by the Brazilian Society for the Advancement of Science (*Sociedade Brasileira pelo Progresso da Ciência* – SBPC), as a strategic undertaking for national development from the economic and technological point of view.

In face of this controversial and unpredictable scenario, this article aims to understand the Pre-salt treatment and confrontation with the environmental threats. To do so, it relies on different conceptual meanings and distinctions about risk and uncertainty, or more specifically about measurable and controllable consequences, and unquantifiable uncertainties. The notion of arena, as a social space of manifestation, interaction and dispute between social and institutional agents, enabled the analysis of the process of definition and decision about the environmental issues of the enterprise. In this sense, the article focuses on two of the main stages of the Pre-salt arena: media and environmental licensing. The results discussed and presented are based on the analysis of: i) texts published in two national newspapers; ii) documents related to the environmental licensing process; iii) observation and records of public hearings. The article asserts that the possible negative environmental consequences of the Pre-salt, even in face of unquantifiable uncertainties, were treated mainly from a perspective of measurable and controllable risks. This treatment did not encourage a consistent public debate on the issue nor any governmental actions about possible unpredictable and uncontrollable consequences that characterize the technological systems, such as those of the Pre-salt.

2. Methodology

Concerning the Pre-salt, we observed the configuration of arenas for debate and decision of the following natures: i) distributive, about the investments of the generated wealth; ii) redistributive, about the definition of the destination of their *royalties* between the states of the federation; as well as the creation of a risk arena – regarding environmental issues at stake and political debates on risk issues (HANNIGAN, 2006; RENN, 1992). All these arenas had political repercussions, evidencing disputes, conflicts and coalitions between social and institutional agents. Despite the relationship between these arenas, this article focused analytically on the Pre-salt risk arena.

The notion of arena adopted in this analysis refers to: i) a system of relations to influence and direct the formulation and implementation of public policies (FERREIRA, 2012); ii) toward a metaphor to describe the symbolic location of political actions that influence collective decisions (RENN, 1992); iii) a *political establishment* in which agents

direct their demands to those who are responsible for decision-making, hoping to influence the political process (HANNIGAN, 2006).

Considering that the debates on Pre-salt environmental issues were conducted in a variety of settings, including legislative, executive, judiciary, universities, social movements and the media (RENN, 1992), this article focused specifically on the analysis of two of these settings: the media and the environmental licensing process of the enterprise.

Media analysis is justified by its ability to influence the salience of topics and issue on the public agenda (MCCOMBS, 2009; HANNIGAN, 2006). The media has been an important stage in the debate and public understanding of the Pre-salt, including its uncertainties, controversies and risks. Environmental licensing, as an instrument of definition, control and decision about the environmental aspects of the enterprise, gathered a set of social agents, evidencing conflicts of power between different pressure groups, disputes over scientific authority, and expressions of interests and values about models of economic, social and technological development.

Regarding media, the analysis starts from the premise that the greater the media emphasizes a theme and the more continuous the approach, the greater the importance the public tends to assign to it in their agenda (MCCOMBS, 2009). The media, therefore, is one of the agents that intervene in the amplification or attenuation of the perceptions and concerns of the public about a certain fact and event (DI GIULIO, 2012; DI GIULIO *et al.*, 2008; KASPERSON *et al.*, 2005; PIDGEON *et al.*, 2003).

In this sense, as a methodological choice, the study focused on the analysis of the coverage of the newspapers *Folha de S. Paulo* and *O Globo*. In addition to the importance of printing and circulation, both newspapers are based on the two states of the federation with the greatest potential for direct environmental and economic impacts of the Pre-salt exploration, São Paulo and Rio de Janeiro, respectively. In order to identify and analyze the debates conducted and reverberated on this media setting, the study was conducted from January 2007 to May 2014, starting at the announcement of the Pre-salt discoveries to the period of public hearings on environmental licensing.

A total of 70 texts were identified and analyzed. They were distributed in: editorial line, opinion, report and readers' letter. For the consultation in the printed and online catalogues of these newspapers, the following keywords were used: pre-salt – environmental risks; pre-salt – environmental impacts; pre-salt – environment; pre-salt – uncertainties; pre-salt – climate change; pre-salt – accidents; pre-salt – oil spills. The journalistic material accessed was analyzed using the technique of content analysis, whose purposes are the objective, systematic and qualitative description of the manifest content in communication (BARDIN, 1977). To that end, the researchers sought to identify, in the analysis of the journalistic material, approaches to the texts regarding the Pre-salt exploration, such as temporality, centrality of media coverage and treatment of threats and dangers. The set of information that was gathered and analyzed later enabled the establishment of thematic axes related to the media coverage of the Pre-salt environmental threats.

The environmental licensing process of the Pre-salt (Ibama Process no. 02022.002141/2011-03) was analyzed by means of a survey and documentary analysis, and written and audio observations and recording of public hearings, specifically those that

occurred in Paraty-RJ, São Sebastião-SP and Rio de Janeiro-RJ, between 04/25/2014 and 05/06/2014. The analyzed documents were: technical reports, transcripts of public hearings and the Environmental Impact Study and Report (*Estudo e Relatório de Impacto Ambiental – EIA-RIMA*) of the Pre-salt. The content analysis of this material focused on the identification of the main agents involved in the environmental licensing process, their positioning and treatment on the environmental threats associated with the Pre-salt exploration.

3. Theoretical-analytical framework

As early as the 1960s, the anthropologist Mary Douglas argued that there were no logical elements in the assessment techniques and in risk analyses conducted and used by the experts to stipulate the limits of what would or would not be acceptable risks (LUP-
TON, 1999; DOUGLAS, 1966, 1996). Years later, Beck (1992, 2006, 2010) and other authors affiliated with the social theories of risk would argue that definitions of risk are based not only on mathematical possibilities but, especially, on social interests, even and specially if surrounded by positive technical reports. The most recent argument about how the prevalence of probabilistic risk reinforces and is reinforced by an institutional culture that rejects unpredictability and lack of control (JERÓNIMO, 2014) is one of the characteristics of the current debate on science and technology policy. However, as we argue in this article, these discussions were not deeply reflected upon the Brazilian Pre-salt.

From a sociological perspective, Beck (2006) points out at least two opposing meanings for the term risk: the idea of a physical attribute with certain objective probabilities of causing harm, which can be estimated by quantitative calculations of levels of acceptability that would enable the establishment of standards; and the idea of artificially manufactured non-quantifiable uncertainties caused by scientific and technological development (GID-
DENS, 1999). If in the first sense, the notion of risk refers to a world governed entirely by the laws of probability, where everything is measurable and calculable, a perspective adopted predominantly in studies related to the objectivist/materialist approach and to a pragmatic perspective of the study on reality (LIEBER, ROMANO-LIEBER, 2002; GUIVANT, 1998) in the second sense, the term refers to uncertainties that are not quantifiable, that is, those “risks that cannot be measured.” The author uses mainly this second meaning when he refers to the “risk society,” recognizing the specificities of contemporary threats as fabricated uncertainties and the product of human actions and decisions (BECK, 1992). By drawing attention to the negotiating processes that define risk, Beck’s perspective enables the understanding of how the symbolic and normative dimensions of what is perceived to be risk are mediated by social interaction and institutions, as well as to ponder how the standards proposed by the scientific literature that serve to define the risk are also the object of social construction (BOSCO; DI GIULIO, 2015; DI GIULIO, 2012).

Other authors highlight the conceptual distinction between risk and uncertainty (MARTINS, 2012; BUTTON, 2010; JERÓNIMO, 2006; 2010; RENN, 2008). Jeróni-
mo (2010), for example, argues that the wider diffusion of the concept of risk seems to have overshadowed the differences with other notions, such as uncertainty, ignorance and indeterminacy. In this same perspective, Button (2010) argues that the notion of

uncertainty has been relegated to a black box, whereas risk discourse has been seen in part as an attempt to overcome or lessen uncertainties about future threats of all kinds (BUTTON, 2010).

The notion of risk, for these and other authors, refers to a situation in which the probabilities of the future are known, whereas uncertainty is understood as a situation in which such possibilities are not known (MARTINS, 2012, JERÓNIMO, 2006). Under uncertainty, individual or collective decisions would take place in a context characterized by a lack of knowledge about the likelihood and/or consequence of a dangerous event (RENN, 2008). Uncertainty would involve from systematic or random error in modeling (based on extrapolations of research results from animal studies to humans or from large-dosage to small dosage studies, with statistical inference applications), boundary system (uncertainties stem from constrained models and the need to focus on a limited amount of variables and parameters) to ignorance or lack of knowledge (RENN, 2008). Uncertainty is, thus, called epistemic when it results from incomplete, insufficient or non-existent knowledge; and random, when associated with ambiguous and indeterminate situations (JERÓNIMO, 2006; GANOULIS, 1994).

By pointing out the prevalence of the concept of risk to the detriment of the concept of uncertainty, authors such as Leach et al. (2005) and Jerónimo (2014, 2010) argue that the reference to probabilistic risk reinforces and is reinforced by an institutional culture that refuses unpredictability and lack of control. The probabilistic character would provide the image of supremacy of the scientific control over the random and the contingencies.

As the scientific literature shows, the understanding of risk limited to calculability has political implications and also reflects the possibilities of analysis addressed to an event or a new technology. By using quantitative and probabilistic scientific methods, these analyses seek to estimate (characterize sources, measure intensity, frequency and duration of exposure, and characterize the relations between cause and effect) and manage the risks, disregarding that the risk estimate, by itself, is not an objective scientific process, since facts and values often merge when one deals with issues that can have serious consequences (JASANOFF, 2003, 1993). In general, the approaches used to assess and manage risk, in this perspective of scientific control over randomness and contingencies, and that rely on relative frequencies as a means to estimate probabilities – excluding unexpected events and ignoring social and political costs associated with risk – assume a mirrored relationship between observations and reality, failing to recognize that the causes of harm and the magnitude of the consequences are mediated through experience and interaction, and depend on social definitions of what constitutes causes and undesirable effects (JAEGER et al., 2001).

Assuming that there is an empirical impossibility to control and anticipate all situations likely to cause accidents in oil exploration and production in deepwaters (PERROW, 2011; BECK, 1992) and that the impacts of such undesirable events can be characterized by their unpredictability, cumulativeness, long duration, unfamiliarity and irreversibility, the discussion about the concept of uncertainty and its differentiation in relation to the notion of risk is of fundamental importance for the interpretation and understanding of the treatment of Brazilian Pre-salt threats.

4. Pre-salt risks and uncertainties in print media and environmental licensing

4.1 Pre-Salt threats in the newspapers

The analysis of the journalistic material shows that the exploration of the Pre-salt was portrayed by both newspapers as a potential for greater and more frequent incidents⁴ due to the technical, geographic and geological characteristics and complexities involved in this exploration. The threats associated with the Pre-salt were more widely covered two years after the announcement of its discovery between April 2010 and the end of 2012, culminating in the debate and decision on the regulatory framework for the Pre-salt and the occurrence of three incidents of offshore activity: British Petroleum in the Gulf of Mexico in April 2010, Chevron in the Frade Field in Campos Basin in November 2011, and Petrobras in the Carioca Field in Santos Basin in January 2012. As observed by other researchers (MASUDA and GARVIM, 2006; HANNIGAN, 2006), large-scale incidents, such as the one in the Gulf of Mexico, have reinstated or given greater prominence to such hazards and threats.

If these incidents were central to the Pre-salt being discussed as a source of possible threats and incidents, the analysis of the texts shows that COP 15 Climate Change Conference in Copenhagen, in 2009, had a significant impact in order to frame the Pre-salt exploration as a climate threat by the two Brazilian newspapers. The exploration of the Pre-salt was then characterized as capable of “staining the Brazilian energy matrix,” according to Fábio Feldmann, executive secretary of the *Fórum Paulista de Mudanças Climáticas* (Forum on Climate Change of São Paulo) in a news story by *O Globo* in September 2009 (*O GLOBO*, Caderno Economia p. 25, 09/02/2009).

In the analyses of the approaches to the texts and the treatment given to the threats and environmental hazards of the Pre-Salt, we established five thematic axes used by the media to portray and explore the subject: 1) absence and/or limitation of research and technologies for prevention of incidents in the country; 2) political-institutional and organizational gaps and limits to deal with incidents; 3) benefits of renewable energies, especially ethanol, in face of the threat of possible incidents and other problems generated by fossil fuels; 4) disputes over the regulatory model and distribution of royalties of the Pre-salt, between producing and non-producing states; and 5) Pre-salt as a problem and/or solution to the problem of climate change.

However, even with this plurality of approach and framing, in almost all the analyzed texts of both newspapers, the threats of the Pre-salt have been understood as risks that can be managed and faced with: i) the improvement of instruments and mechanisms of control and governance; ii) scientific and technological augmentation aimed at prevention and containment of the impacts caused by these activities; iii) greater access to other companies, in addition to Petrobras, in the Pre-salt exploration.

While acknowledging the existence of threats, the editors of both newspapers argued that such dangers should not serve as arguments for the non-exploitation of these reserves. The indicated path would mainly go through actions of increment and improvement of the security instruments, as expressed in the following passages:

The oil spill, or accident, cannot be used as a pretext to paralyze the activity of the oil industry (...). There is a possibility of rewriting standards and procedures, before the country advances in pre-salt exploration [free translation] (O GLOBO, Editorial, 11/22/2011).

It is natural that people are apprehensive regarding the security of the Brazilian enterprise due to the BP case. The country needs to know what are the emergency plans and environmental safeguards provided by Petrobras and the responsible bodies [free translation] (EDITORIAL: SEGURANÇA NO PRÉ-SAL – FOLHA DE S. PAULO – 07/18/2010).

The analyzed newspapers also highlighted the need for investments in science and technology to deal with the threats of the Pre-salt. The Director of Technology and Innovation of COPPE/UFRJ (2007-2013) and one of the main spokespersons of the university in this demand was interviewed by *Folha de S. Paulo* and referenced in more than one occasion in *O Globo* texts. The following excerpts express the opinion of this academic about the centrality of science in facing the threats of the Pre-salt:

We, alongside the ANP, are seeking to make an arrangement so that we can support the inspection independently, without the oil companies. We have articles on the reliability of equipment, on how to minimize the probability of failure, satellite detection of oil spills. [free translation] (Interview with Segen Estefan, *Folha de S. Paulo*, caderno Mercado, 03/18/2012) *Stefan thinks the yellow light in the industry is on now. There will be a new technological race to avoid accidents and to control damages.* [free translation] (Mirian Leitão's piece, in *O Globo* referring to the BP Accident in the Gulf of Mexico, *Economia*, 05/25/2010).

In the case of *O Globo*, specifically in editorials and in other texts, the prevailing perspective was that the threats of the Pre-salt would be better faced within the exploratory concession model, with a greater participation of foreign oil companies, and not within the sharing model, which establishes greater participation of Petrobras in all the exploratory blocks.

For both newspapers, the perspective of the environmental threats of the Pre-salt prevailed, mainly on the notion of measurable and controllable risks. Only four texts, of the total analyzed, problematized the threats to the Pre-salt exploration as unquantifiable uncertainties, highlighting the impossibility of measuring, predicting and controlling unwanted events and their impacts. The former senator and former Minister of the Environment Marina Silva, when addressing the Pre-salt issue, referred to the BP incident in Gulf of Mexico, and stated in her article in *Folha de S. Paulo* that “it is impossible to quantify the damage and adequately restore the ecosystems” (*Folha de S. Paulo*, Opinião, 05/17/2010). In another section of the same text, the author also highlighted the limits of technological systems aimed at preventing incidents in *offshore* oil exploration. Just as Marina Silva, Professor José Goldemberg of the University of São Paulo, in another news story in *Folha de S. Paulo*, highlighted the lack of knowledge about the new exploratory

conditions of the Pre-salt to relativize the arguments that better technologies would guarantee higher levels of security in the operations.

Both texts challenge the view that scientific and technological advancement would inevitably reduce uncertainties (JASANOFF, 2003) and solve problems caused by prior technologies in an endless circular or spiral chain (MARTINS, 2012). According to Porto (2007), these perspectives, which have been named “Ideology of Technological Optimism” (PORTO, 2007; STRAND, 2001), can be understood as a kind of fetish of productive economic development that historically influenced the liberal economic view.

Two other texts that have referenced the uncertainties, specifically the epistemic ones, discussed and criticized Petrobras’ proposal to minimize CO₂ emissions in the production of the Pre-salt through carbon capture and sequestration (CCS). Such technology for minimizing emissions from the Pre-salt was called into question by both newspapers as “an uncertain technique, which lacks studies and is unfeasible on a large scale,” or as a “rhetorical bet since the technology is still experimental,” as expressed by Sérgio Leitão, Greenpeace Brazil campaign director at *O Globo*. On the other hand, the Pre-salt itself was presented as part of the solution to the climate problem, as part of the resources allocated to the Social Fund could be applied in mitigation and adaptation projects to climate changes.

4.2. Pre-salt threats in environmental licensing

The analysis of the environmental licensing process reveals the positions and questions of different social and institutional agents regarding the environmental aspects of the enterprise. These positions and questions were revealed both through protocol documents and through participation and manifestation in public hearings. The main agents involved in this licensing, in addition to members of Petrobras, environmental consulting and IBA-MA were: representatives of the state and Federal Public Ministry, environmental NGOs, researchers, representatives of associations and unions of fishermen and mariculturists, members of traditional communities, representatives of the Brazilian Navy, municipal secretaries, and representatives of terrestrial and marine conservation units.

The analysis of the collected material enables the identification of a set of remarks of these agents in relation to the licensing and the study of the environmental impact of the Pre-salt, mainly around: i) disagreements in relation to the definition of the area of influence of the enterprise; ii) overlapping the activities of the Pre-salt with the fishing practice; iii) disagreements on the evaluation and magnitude of environmental and social impacts; iv) doubts and disagreements regarding the distribution of royalties and environmental compensation.

However, other issues have not gained the same spotlight, particularly regarding the non-functionality of the offshore technology system in a new exploratory context. The analysis showed that the safety of the equipment in the extreme conditions of the Pre-salt, for example, was not problematized by the agents involved in this setting of the arena.

Also, we did not observe, in the environmental licensing process, any questions and an in-depth debate regarding the uncertainties in the exploration of the Pre-salt as-

sociated with the use of CO₂ capture, injection and storage technology (CCS), proposed by Petrobras to mitigate CO₂ emissions from the exploration and production of these fieldsⁱⁱⁱ. Petrobras itself recognized such uncertainties on other occasions. During their participation in a debate at the Institute of Advanced Studies at the University of São Paulo in 2009, a member of the company's Exploration Board acknowledged that there was no effective method to monitor the CO₂ to be injected into the Pre-salt wells yet. They also acknowledged that the effects of a possible CO₂ saturation on the operation and integrity of exploration equipment were unknown.

We think that for the Pre-salt the seismic method used to monitor the CO₂ will not work because the CO₂ goes directly into miscibility with the oil and, thus, it is gone, so it is not possible to map it (...). The problem is that when you do this (CO₂ injection) it is not for free. [free translation] (Pronouncement of the member of the Petrobras Exploration Board, IEA-USP, September 2009).

In the analysis of the collected material, we observed resistance and refusal on the part of the social agents present in the Public Hearings, mainly the members of the Public Ministry and of environmental organizations, in the in-depth discussion of the main components of the Pre-salt technological system. The following excerpts from the pronouncements of a public prosecutor and an environmentalist leader present at a Public Hearing are illustrative:

If it (public audience) were effectively followed as it should be we would have no valve explanations, Christmas Trees and I do not know how many more things because I do not think anyone here is interested in knowing how oil comes out of the pipe and how oil flows everywhere else. (Applause) [free translation] (Public Hearing Minute, São Sebastião, SP, 04/28/2014, pages 2010-2020).

But the people here did not come to hear this. We really wanted to know the real impact on municipalities, communities, and people. And what steps will be taken in this regard. So, a classically technical exposition in fact does not address our concerns, because no one wants to know these exact technical concepts. [free translation] (Public Hearing Minute, São Sebastião, SP, 04/28/2014, pages 4236-4244).

If, on one hand, there is greater pressure and demand for transparency and participation in risk assessments and in scientific and technological development (JASANOFF, 2003; RENN, 2008), the material analyzed reveals the difficulties of social agents to engage in the highly technical and complex discussions. It also reveals other factors that hindered a more in-depth discussion among social agents in the licensing process. Petrobras, for example, did not expose the uncertainties and any possible lack of knowledge (unfamiliarity) about the Pre-salt in environmental licensing. At the same time, not all the information regarding the technological systems was made available in the scope of

licensing, as explained in the pronouncement of one of the managers of the company in the Public Hearing:

We have to remember that much of this information is considered to be business competitive advantage. So, they really are not made public [free translation] (Public Hearing Minutes, Rio de Janeiro, RJ, 05/06/2014, pages 3180-3189).

On the other hand, on the perspective of the licensing body, regarding the IBA-MA case and from the perspective of its general coordinator of the Oil and Gas area, the environmental body at the time of the environmental licensing generally assumes that the technological system to be used would work correctly, as evidenced in their pronouncement at the Public Hearing held in the city of Rio de Janeiro.

Licensing does embody a presumption of competence, of course (...) in fact, licensing is something that starts from the presumption that what is being placed there works [free translation] (Public Hearing Minutes, Rio de Janeiro, RJ, 05/06/2014, pages 3210-3222).

As the analysis of the licensing process evidences, the uncertainties about possible incidents were not explored and made visible in the environmental licensing. Accident risk assessment, for example, was not questioned by the participating social agents. A quantitative approach to risk was prioritized from data and cases that do not apply to Pre-salt conditions. In the evaluation presented at the EIA-RIMA, for example, data of the frequency of offshore sector incidents that did not show incidents in scenarios similar to Pre-salt were used, specifically regarding their geological, physicochemical conditions and water depth. In addition, the time coverage of the quantified incidents in the bases adopted did not include events that occurred recently, such as the BP accident in the Gulf of Mexico (ANÁLISE DE GERENCIAMENTO DE RISCO, EIA-RIMA DO PRÉ-SAL ETAPA 2, p. 55, 2014).

Regarding the uncertainties related to the potential impacts of the project, the analysis of the material shows that these were also suppressed from the document of the Environmental Impact Study and The Pre-salt Report. The impacts of a large oil spill, for example, were characterized as temporary, reversible and of low magnitude (EIA-RIMA, 2014, p. 58). The existence of empirical studies highlighting the irreversibility, synergism, persistence and cumulativeness of the impacts of large oil spills on marine and coastal ecosystems was not explored by the social agents in the scope of the environmental licensing process.

However, differently from what happened with the incident risk assessment of the platforms and pipelines, we observed specific questions, by members of NGOs and the Public Ministry, regarding the classification of environmental impacts proposed in the EIA-RIMA. These criticisms, however, referred specifically to the social impacts, especially on tourism and the infrastructure of coastal municipalities.

5. Conclusion

By specifically analyzing two of the main settings of the Pre-salt arena we may argue that in both the understanding of risks, threats and hazards associated with this type of offshore exploration limited to measurement and calculability prevailed.

The analysis of the journalistic texts shows a temporal behavior of the Brazilian press in dealing with the Pre-salt, evidencing that its threats gained greater visibility within a specific period and in a context associated with the regulatory framework and the occurrence of an incident. At the same time, the analyses show a media coverage focused on the perspective that risks can be managed and faced through the improvement of instruments of control and governance, scientific and technological augmentation and greater participation of other oil companies, without the hegemony of the Brazilian company Petrobras. The analysis also demonstrates the existence of social factors (interests, values and perspectives) that have been repeatedly mobilized and used in the evaluation of the environmental threats of the Pre-salt. Understanding that media plays a crucial role in organizing and disseminating knowledge about political and economic decisions, risks and uncertainties, although this has not been the focus of the study, it is possible to argue that the Pre-salt media treatment reverberated in the almost complete absence of a more in-depth public debate on the unpredictable and uncontrollable consequences of the new technology.

The analysis of the Pre-salt environmental licensing shows the absence of criticism and questioning on the part of the agents directly involved in the process of the methodological aspects adopted in the risk assessment and the uncertainties regarding the use of new technologies under extreme conditions in unexplored fields.

Another element can be highlighted in the analysis of the collected material: the Pre-salt licensing, with all its specificity, was treated by the country's main environmental agency, IBAMA, as a conventional offshore exploration project. It was not possible to identify a specific treatment and depth on the functionality of technological systems in a new exploratory environment that was unprecedented, at the time, worldwide. In this understanding, possible threats were supposedly quantified and probabilized and the potential impacts treated from mitigation measures, which could be controlled and reversed. We assumed, therefore, that the functionality of the system and the interactions between its parts could occur in an orderly and predictable way and it would be possible to control the potential of instability produced by the interaction of the system's internal states and of the Pre-salt physical-chemical-geological environment.

What implications did the treatment of the risks associated with the Pre-salt limited to measurement and calculability elicit? It is possible, at least, to list two important implications, which, due to their complexities and interactions, require further studies and future reflections. The first one stands at a political-economic perspective, since there was a political reinforcement of the viability of the project, particularly seen as strategic for the national development at the time, with reverberations in the energy sector, including a revitalization of oil (ABRAMOVAY, 2012), possible loss of biofuels venue (GIESBRECHT et al., 2015) and possible delays in the transition from the current

energy matrix to a sustainable one, based on renewable sources. The second stands at a socio-political perspective, since the treatment given to threats and dangers did not encourage a consistent public debate on the issue nor any governmental actions about possible unpredictable and uncontrollable consequences that characterize the technological systems, as represented by the Pre-salt.

Finally, from the theoretical-methodological perspective, through the arena approach, this article confirms the relevance of multi-agent analyses that are, at the same time, analytically open to the internal pluralities of the agents and their positions in the political game and in the societal configuration.

Notes

- i As the *Deepwater Horizon* incidents in the Gulf of Mexico in 2010; of the *Exxon Valdez Ship* in 1989; and PETROBRAS on platforms P36 in 2001, and *Enchova* in 1984 and 1988, both in the Campos Basin.
- ii Despite differences between the terms “incident,” “disaster,” and “catastrophe,” (SERRA, 2005), there was no rigorous care with such terms in the journalistic coverage; they were used in an interchangeable manner to name the same situation. Henceforth, “incident” will be used to designate these different situations.
- iii According to Medina (2012), the information acquired in the drilled wells, in the Pre-salt, indicates reservoirs with levels of carbon dioxide above the national average.

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NOT ALL GLITTERS IN THE BLACK GOLD: UNCERTAINTIES AND ENVIRONMENTAL THREATS OF THE BRAZILIAN PRE-SALT

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Abstract: Technologies used for offshore oil exploration, in increasingly remote and extreme environments, potentiate new environmental threats in contemporary societies. In this context and from a theoretical-analytical perspective associated with Environmental Sociology, based on qualitative research results developed between 2013 and 2016, this article aims to comprehend the treatment of Pre-salt environmental threats in Brazil, a sociotechnical enterprise considered as strategic for national development from the governmental point of view. The researchers argue that the possible environmental consequences, even in face of unquantifiable uncertainties, were addressed, mainly from a perspective of measurable and controllable risks, in two of the main stages of the Pre-salt environmental arena: media and environmental licensing process. This treatment did not encourage a consistent public debate on the issue nor any governmental actions about possible unpredictable and uncontrollable consequences that characterize the technological systems, as represented by the Pre-salt.

Keywords: risks and uncertainties, environmental sociology, offshore oil exploration, Pre-salt.

Resumo: As tecnologias empregadas para exploração petrolífera *offshore*, em ambientes cada vez mais remotos e extremos, potencializam novas ameaças ambientais nas sociedades contemporâneas. Neste contexto e dentro de uma perspectiva teórico-analítica afiliada à Sociologia Ambiental, a partir de resultados de pesquisa qualitativa desenvolvida entre 2013 e 2016, esse artigo busca compreender o tratamento das ameaças ambientais do Pré-sal, no Brasil, um empreendimento sociotécnico que, do ponto de vista governamental, foi encarado como estratégico para o desenvolvimento nacional. Argumentamos que as possíveis consequências ambientais, mesmo diante de incertezas não quantificáveis, foram tratadas em dois dos principais palcos da arena ambiental do Pré-sal - mídia e processo de licenciamento ambiental - principalmente a partir de uma perspectiva de riscos mensuráveis e controláveis. Esse tratamento não possibilitou um aprofundamento no debate público e

nas ações governamentais acerca de possíveis consequências imprevisíveis e incontroláveis que caracterizam os sistemas tecnológicos, como os representados pelo Pré-sal.

Palavras-chave: riscos e incertezas, sociologia ambiental, exploração petrolífera offshore, Pré-sal.

Resumen: Las tecnologías empleadas para la explotación petrolera, en sitios cada vez más remotos, potencian nuevas amenazas en las sociedades contemporáneas. Desde una perspectiva analítica de la Sociología Ambiental y de los resultados de investigación cualitativa, desarrollada entre 2013 y 2016, este artículo busca entender el tratamiento de las amenazas ambientales del Pré-sal, una iniciativa socio-técnica que desde el punto de vista del gobierno federal fue percibida como estratégica para el desarrollo nacional. Se argumenta que sus posibles consecuencias negativas, incluso incertidumbre no cuantificable, fueron tratadas en dos palcos principales de la arena ambiental del Pré-sal - los medios de comunicación y el proceso de licenciamiento ambiental - sobre todo desde el punto de vista de los riesgos cuantificables y controlables. Ese tratamiento no permitió una profundización en el debate público y en las acciones gubernamentales, sobre las posibles consecuencias imprevisibles e incontrolables de dichos sistemas tecnológicos.

Palabras clave: riesgos e incertidumbres, sociología ambiental, explotación petrolífera, Pré-sal.
