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Advancing scoping practice in environmental impact assessment: an examination of the Brazilian federal system

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ABSTRACT

Despite availability of guidance on scoping in environmental impact assessment (EIA) in several jurisdictions, there is limited documented evidence about how scoping is actually conducted in practice. We benchmark internationally recommended good practices and develop a conceptual framework to evaluate scoping practice, applying it to the Brazilian federal EIA process. Practices are organized in four categories: provision of initial information, scope determination, stakeholder involvement and process management. Scoping of 10 projects was analyzed through document review and interviews with government officials. Results show that the process: (i) is supported by interagency review but not by public participation, (ii) features limited focus on relevant issues and impacts; and (iii) strongly concentrates on requiring descriptions of baseline conditions. The research found that deficiencies in scoping led to delays in the review phase and did not prevent conflicts during public consultation. Although staff at the federal environmental agency acknowledges those shortcomings, there is no shared understanding about key actions for improvement.

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Environmental impact statement; impact significance; terms of reference; learning; Belo Monte; good practice

1. Introduction

As the initial step in the environmental impact assessment (EIA) of development proposals, good scoping is credited with contributing to better environmental impact studies or statements (EIS) (McGrath & Bond 1997), enhancing effectiveness of the EIA process (Canter & Ross 2014), and promoting integration among different types of impact assessment (Morrison-Saunders et al. 2014). However, what constitutes 'good' scoping is far from being consensual. Snell and Cowell (2006) framed the question as a dilemma between promoting precaution and searching efficiency in decision-making, which translates into prioritizing either participatory or technical approaches in performing scoping.

It is no easy task to prepare an EIS that is simultaneously focused on issues relevant to decision-makers, broad enough to encompass issues relevant to an array of stakeholders, and yet deals with all them with appropriate detail.

Large, multivolume EISs have become common in different countries (Wende 2002; Ross et al. 2006; Landim & Sánchez 2012; Fischer et al. 2016). A number of practitioners and researchers (e.g. Canter & Ross 2014) have suggested that a large and often unfocused amount of information is of little use for decision-makers and the

public, contributing to limited EIA effectiveness. Very large EIS is said to have been a major driver of the United States EIS regulation in 1978 that made scoping an obligatory step and mandated both public and interagency review (Beanlands 2004). A recent example is the EIS for the São Luiz do Tapajós dam in the Amazon, filed in 2014 and containing 14,610 pages and 154 large format maps.

Hansen and Wood (2016), on the other hand, challenge this conventional wisdom quoting surveys of practitioners' opinions in The Netherlands (Runhaar et al. 2013), The Netherlands and United Kingdom (Arts et al. 2012), and Denmark (Lyhne et al. 2017), split about whether or not EISs generally cover 'too many themes' or are 'too broadly scoped.' In Brazil, Landim and Sánchez (2012) found in a sample of EISs over a 25-year time span that the scope of more recent assessments is broader than the scope of older cases. However, the relevant issue is not if EISs are larger than they should be or whether or not they cover the array of potentially significant impact, but to find the 'right' balance between precaution and efficiency (Snell & Cowell 2006), coupled with transparency and openness in scoping decisions.

Barnes et al. (2010) argue that good scoping aims at achieving an effective and efficient EIA process, defining effective as focusing the EIA on issues and concerns that

are relevant to the project assessed, while an efficient scoping 'defines the scope (...) early in the process' (p. 2).

In EIA practice, scoping is defined as an early activity to determine the range or scope of issues to be considered in the assessment and to guide the preparation of an EIS, as required in most countries. A formal scoping step is mandatory in a number of jurisdictions (e.g. Canada, United States, South Africa and Western Australia), not required in others (e.g. Chile), while it is optional in most European Union member states. Scoping practice is usually directed by the government agency responsible for EIA, by issuing terms of reference (ToR), and effected by consultants who prepare the EIS by interpreting guidance (Kågström 2016).

Scoping evolved in EIA practice arguably as a result of learning from experience (Sánchez & Mitchell 2017). First requirements appeared in the United States in 1978, and guidance is currently available in a number of jurisdictions (e.g. EC 2001; DEAT 2002 (South Africa); Environment Agency 2002 (United Kingdom); EPA 2002 (Ireland); Western Australia Environmental Protection Authority 2013). Both textbooks and international guidance on EIA recommend scoping as good practice (Slootweg et al. 2006; Glasson et al. 2005; Lawrence 2013; Sánchez 2013a), a topic usually taught in University courses on impact assessment (Sánchez 2010; Sánchez & Morrison-Saunders 2010; Fischer & Nadeem 2014).

Essentially, the EIA literature suggests that through a well-conducted scoping phase, relevant issues will be scoped in for detailed assessment while minor issues will be scoped out, thus allowing for benefits such as:

- more cost-effective assessments (Ross et al. 2006; Jay et al. 2007) and avoiding excessive resources to be spent on minor impacts (Wood et al. 2006);
- directing data collection to obtain useful and relevant information (Beanlands & Duinker 1983; Sánchez 2013a);
- increasing transparency, because 'all interested parties will be aware of those matters against which the impact of a proposal will be judged' (Morrison-Saunders & Bailey 2000, p. 263);
- inducing project modifications in order to reduce harmful impacts (Wende 2002) 'and as a stimulus for considering each project on its own merits' (Bond & Stewart 2002, p. 139);
- better consideration of cumulative impacts (Cooper & Sheate 2002; Fischer & Philip-Jones 2008);
- better governance and increased effectiveness of the EIA process (Arts et al. 2012; Runharr et al. 2013).

Some jurisdictions require tailor-made, case by case scoping, while others adopt generic or project-type instructions to guide EIS preparation. The differences between scoping practices across countries reflect different approaches to key issues related to:

- (1) *Preliminary assessment of significance of impacts.* It is a complex activity (Lawrence 2007a, 2007b) with a high degree of uncertainty due not only to the least amount of information available, but also to differences of opinion about potential impacts (Wood 2008).
- (2) *Design process.* In Canada, Mulvihill (2003) distinguished two antagonistic approaches in relation to the issues to be addressed: (1) scoping is restricted to provide a list of issues and impacts and their categorization; (2) scoping is conducted as a design process (or planning activity) that aims to provide detailed methodological guidance for EIS preparation. In the latter approach, deterministic attitudes are discarded in favor of a mutual and creative understanding of EIA (Mulvihill & Jacobs 1998), while data collection and impact analysis (e.g. modelling) are directed toward answering key questions relevant for decision-making instead of presenting an encyclopedic description of the existing environment (Sánchez 2013a).
- (3) *Public involvement.* Beanlands and Duinker (1983) distinguish two complementary perspectives in carrying out EIA scoping: (1) in 'social scoping' public concerns related to the impacts of projects on subjectively valued components of the environment are identified; (2) in 'ecological scoping' technical and scientific knowledge drives impact identification and prediction.

Scoping practice in each jurisdiction is expected to be guided by legal requirements, but Snell and Cowell (2006) remark the profound influence exerted by the beliefs of key participants in the process – i.e. proponents, consultants and regulators. Hansen and Wood (2016) understand that 'practitioners' interpretations shape their behavior' (p. 2) in conducting environmental assessments. Hence, a number of them prefer to avert the risk of project delays by broadening the scope of their assessments.

Authors of both studies mentioned above interviewed practitioners in the United Kingdom, where scoping is optional. In the USA, where scoping is mandatory and regulated, Slotterback (2008) found actual outcomes arising from the scoping of transportation projects, including the identification of 'alternative project types, designs, locations and alignments' (p. 676).

Despite the variations in scoping requirements and practices across jurisdictions, a number of key characteristics should be inherent to scoping (Sadler 1996; Mulvihill 2003; Wood et al. 2006; among others):

- occurs in early stages of EIA;
- involves the key players and should be open to public participation;

- considers project alternatives;
- establishes spatial and temporal boundaries for data collection and impact analysis;
- directs the most important issues to be considered in taking decisions;
- establishes the guidelines for the preparation of an EIS.

In spite of such a wide acknowledgement of its importance, scoping is not a 'popular' research topic in project EIA and the extent to which theoretical recommendations or practical guidance are actually adopted and, more important, whether or not are they conducive to the outcomes pictured in the literature, is largely under-researched.

From this background, we established the following research question: How international best practices of scoping have been employed in EIA processes? While the different roles of regulators and consultants are acknowledged (Kågström 2016), this paper enquires at scoping practices by investigating the internal process at an EIA agency. To answer the question, the practice of scoping is explored in the Brazilian federal EIA system by performing the following research steps: (i) outlining scoping procedures and practices actually used in this particular jurisdiction; (ii) positioning Brazilian federal scoping practice against a set of internationally recommended good practices; (iii) reviewing and evaluating ToR for EIS preparation; (iv) identifying opportunities for advancing scoping practice.

The remainder of this paper is organized in four sections. In Section 2, research methods are described. The results are featured in Section 3 and discussed in Section 4. Conclusions and recommendations are presented in the final section.

2. Methods

This section, presenting the methodological approach used in this research, is organized in three parts. Firstly, the cases selected for review are introduced. Then a conceptual framework to evaluate scoping practice is described. The third part features the methods used for reviewing documents, conducting interviews, and to analyze data.

2.1. Case selection

The EIA registry available at the Brazilian federal environmental agency Ibama (Brazilian Institute of Environment and Renewable Natural Resources) website was consulted in order to depict the universe of projects submitted to the federal process. Information on 317 approved projects was available as of February 2012 (Figure 1).

From this data-set, 10 cases were intentionally selected for study (Table 1, Figure 2), using the following criteria:

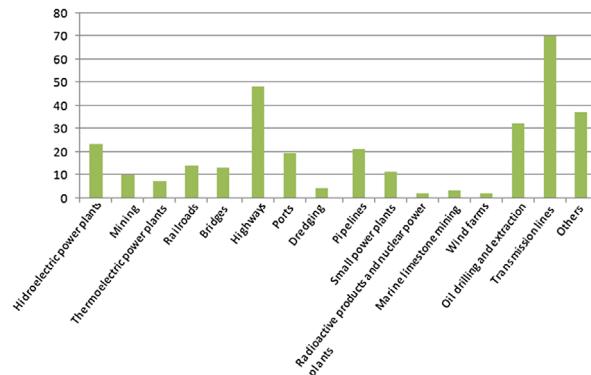


Figure 1. EIA database in Ibama's website.

- (1) EIA with complete records (a number of documents may be unavailable for some projects, especially prior to 2008);
- (2) approved projects, i.e. previous license granted, thus ruling out refused projects or those under assessment as of February 2012;
- (3) EIA carried out through the preparation of an EIS, not a simplified environmental report¹;
- (4) Terms of Reference prepared after 2007²;
- (5) Different project types³.

The choice of 10 cases resulted from the combination of all above criteria, which limited the population of 317 cases to a much smaller group.

2.2. Conceptual framework for evaluating scoping practice

In order to establish a conceptual reference framework for assessing scoping practice, four categories were considered: (1) provision of initial information; (2) scoping determination; (3) stakeholder involvement; and (4) process management. These categories were inspired by the list of issues that influence good scoping established by Barnes et al. (2010) for reviewing scoping of mining and energy projects in Canada.

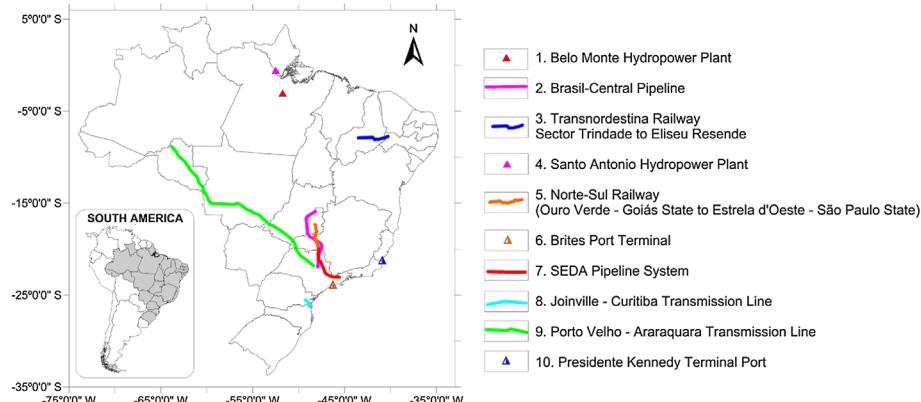
For each category, good practices derived from the literature were compiled to guide the review (Sadler 1996; EC 2001; EPA 2002; UNEP 2002; Slootweg & Kolhoff 2003; Beanlands 2004; Glasson et al. 2005; Snell & Cowell 2006; Wood et al. 2006; Lawrence 2007a, 2007b; Barnes et al. 2010) (Table 2).

2.3. Document review and interviews

The following documents were reviewed for each case: (1) terms of reference; (2) minutes of public hearings; (3) memories of meetings with stakeholders; (4) internal and external communication (memos and orders); (5) technical review reports (i.e. the report prepared by Ibama after reviewing the EIS and considered for decision-making); (6) conditions and terms of approval

Table 1. Brief description of selected projects.

Cases	Key project characteristics
1	Belo Monte Hydropower Plant Run-of-river hydropower project located on the Xingu River, Amazon basin, with 24 turbines and an installed power capacity of 11.2 MW, two reservoirs in a total area of 571 km ² . The dam is 1620-m long and 93-m high. A reduced flow river stretch of about 100 km affects riverside communities including indigenous people. Involuntary resettlement affected 5,186 families
2	Brasil-Central Pipeline A natural gas pipeline extending for 813 km and crossing areas of Savannah and Atlantic Forest
3	Transnordestina Railway – (Trindade to Eliseu Resende Section) A 437-km long general freight railway in the semiarid northeast region targeted at transporting ore, grains, and liquid bulk with a forecast of 16 million tons/year
4	Santo Antonio do Rio Jari Hydropower Plant Run-of-river hydropower project located on the Jari River equipped with 6 turbines and an installed power capacity of 300 MW. There are 14 archaeological sites in the reservoir area (31.7 km ²). The dam – 2640-m long and 18-m high – led to the loss of a waterfall. Involuntary resettlement affected 49 families
5	Norte-Sul Railway (Ouro Verde to Estrela d'Oeste Section) A 620-km long general freight railway aimed at serving ore, grains, and ethanol producers with a forecast of 40 million tons/year. There will be need for resettlement of 305 families
6	Brites Port Terminal A container terminal in an estuary nearby a large seaport. Construction includes dredging, access roads and storage yards. A 900-m long pier features three berths for ships of up to 70,000 dwt
7	SEDA Pipeline System A 542-km long multipurpose fuel pipeline (ethanol, gasoil and diesel) in Minas Gerais and São Paulo States
8	Joinville – Curitiba Transmission Line Expansion of two substations and construction of a 230 kV, 100-km long transmission line that will connect them. The project affects an indigenous land
9	Porto Velho - Araraquara Transmission Line Two parallel 2375-km long lines from Santo Antonio hydropower plant in the northern State of Rondônia to São Paulo State, crossing the Central West region. The 600 kV lines are continuous current. A total of 4527 metallic towers at an average distance of 561 m will be built.
10	Presidente Kennedy Terminal Port An iron ore maritime terminal in Espírito Santo State supplied by an ore pipeline from Minas Gerais State. Construction requires dredging to deepen a 7.6-km long channel, construction of dikes, riprap, a 1,850-m long breakwater in 'L' and ore storage yards. The pier is 666-m long and 22-m wide featuring two berths for ships of up to 225,000 dwt. It will affect a maroon community

**Figure 2.** Location of selected projects.**Table 2.** Review categories and good EIA scoping practices.

Category	Good practices
<i>Provision of initial information</i>	1. Summarize project aims, alternatives and key technical characteristics 2. Outline of environmental and social context 3. Identification of relevant government policies and legal requirements 4. Identification of affected communities, relevant government agencies and other stakeholders
<i>Scoping determination</i>	5. Review of alternatives 6. Broad identification of key issues and potential impacts 7. Preliminary assessment of significance of potential impacts 8. Narrowing issues and impacts 9. Definition of study boundaries (study areas, timelines, project components and associated facilities) 10. Involvement of affected communities and the interested public
<i>Stakeholder Involvement</i>	11. Involvement of government agencies 12. Documentation of decisions concerning scoping definition 13. Information sharing among stakeholders 14. Monitoring and review of the scoping process
<i>Process management</i>	15. Capacity building 16. Preparation of guidance documents

Table 3. Criteria for reviewing Terms of Reference.

Main issue in Terms of Reference	Analysis criteria	VALUE
Legal and regulatory requirements	Key laws and regulations related to the project are addressed There are only generic references to these issues in the ToR	3 0
Plans, Programs and Public policies	Selected plans, programs or public policies related to the project are explicitly required to be considered in the EIS	3
Technical and locational alternatives	There is a generic call to consider potentially related plans, programs or policies ToR define the alternatives that should be considered in the EIS	0 3
Priority areas for conservation and wildlife corridors	ToR establishes criteria that should be considered in the EIS for alternatives analysis Priority areas for conservation and wildlife corridors probably affected by the project are addressed	0 3
Protected areas	There is only generic reference to the issue in the ToR	0
Definition of study areas	Protected areas probably affected by the project are addressed There is only generic references to the issue in the ToR The study areas were unequivocally defined The study areas were defined for a majority of topics to be addressed in the baseline The study areas were defined only for some topics to be addressed in the baseline Actual study areas are not defined in the ToR, which only features criteria for delineating study areas There is only generic references to the issue in the ToR	3 0 3 2 1 0 0
Social and environmental baseline	Topics required to be addressed in the baseline are related to the potentially significant impacts The majority of topics required to be addressed in baseline topics is related to the potentially significant impacts, but information on other topics is also required Only a few topics required to be addressed in the baseline are related to the potentially significant impacts; several other topics are also required to be addressed, but their linkages to potentially significant impacts in unclear ToR feature a generic description of topics required to be addressed in the baseline; some topics may be irrelevant to assess the impacts of the project	3 2 1 0
Preliminary identification and characterization of environmental impacts	Impacts related to the project have been identified and described Some impacts related to the project have been identified and described Generic impacts that apply to the class of projects were described Only general guidance for undertaking this task is addressed	3 2 1 0

(previous license). All documents are available in the environmental licensing files at Ibama.

The contents of ToR were reviewed for eight categories (Table 3), corresponding to the usual headings of ToR in the federal EIA process. The review of ToR aimed at verifying the extent to which they are tailored to the singularities of the project to be assessed, as recommend in the literature, in contrast to generic, one-size-fits-all ToR.

An evaluation scale (DeVellis 2012) ranging 0 to 3 was developed to review each category. The minimum value (0) indicates that the ToR adopted a generic approach applicable to any project, while the maximum value (3) indicates that ToR resulted from the identification of key issues as to direct the EIS to address potentially significant impacts. Values 1 and 2 were assigned only for the three review categories for which intermediate levels apply. A total score was obtained by simple sum of individual scores, to a maximum of 24.

Although the scale is numeric, the evaluation is qualitative and no arithmetic operation is pertinent. A score

is obtained by adding individual scores for the sole purpose of ranking the cases. Intermediate values (1 or 2) are assigned for three out of eight criteria. All scores represent a semantic differential – yes/no for the first five criteria in Table 3 and a descriptive situation for the remaining three criteria. The scores facilitate the aggregation of the results of the review of ToR by highlighting those cases where a larger number of tasks were performed.

Semi-structured interviews were conducted by the first author with 12 senior staff (called 'analysts') at Ibama directly involved and experienced with preparing ToR and reviewing EIS. Interviews were guided by a pre-established script (Table 4), but conducted with flexibility in order to allow for additional information to be obtained and for capturing insights from interviewees. The purpose of the interviews was to register aspects related to scoping practices not obtainable by consulting EIA files and reviewing documents. These aspects are related to identifying the attitudes and actions for scoping definition, views of the analysts in relation to

Table 4. Script for interviews.

<i>Institutional positions for scoping</i>
1. Are there guidelines for preparing ToR? Which are they?
2. What criteria are used to define the contents of the ToR?
3. In your opinion, is the current approach to the preparation of ToR effective for guiding consultants in the preparation of EIS that are focused on issues of interest for environmental decision-making?
4. Are the environmental analysts and coordinators trained for accomplishing the scoping phase?
<i>Perception about the participation of other actors</i>
5. In your opinion, should the scientific community be involved in drafting the ToR?
6. In your opinion, is the participation of affected communities in drafting ToR justified?
<i>Challenges for drafting Terms of Reference</i>
7. What are the difficulties faced in drafting ToR?
8. What are the strengths of the current system of drafting ToR?
9. What are the weaknesses of the current system of drafting ToR?
10. What could be done to improve the process of drafting ToR?

public participation in scoping, and challenges for elaborating ToR.

Information obtained from interviews and review of ToR and other documents was organized for the following items:

- (1) flow of activities in the scoping process;
- (2) the most common structure of the ToR (headings of chapters and sections);
- (3) the association of scoping practices within the four categories described in the literature (Section 2.2): provision of initial information; scoping determination; stakeholder involvement; and process management.

Results will be presented in the next section for these three items.

3. Results

3.1. Flow of activities in Brazilian federal scoping

EIA regulations in Brazil do not provide guidance for scoping, apart from mentioning 'additional instructions' to EIS preparation in article 6 of Conama Resolution 1/86. As a consequence, there is no standard approach to scoping (Lima & Magrini 2010) and significant differences exist between the federal and state approaches and among states.

Procedural guidance was issued for federal EIA in 2008 (*Instrução Normativa Ibama 184*, Figure 3, hereafter IN 184). These steps were generally adopted previously, but not as a mandatory routine. Essentially, the project proponent submits a ToR proposal or draft to Ibama, whose officers (analysts) call a scoping meeting with the proponent and its consultant. The draft, as amended

after the scoping meeting, as needed, is sent for comments to other federal agencies (e.g. Cultural Heritage, Indian Affairs) and for state environmental agencies. A site visit by analysts can be conducted and a final ToR is issued. There is no requirement for public participation.

In addition to the procedures established in IN 184, four practices were mentioned by interviewees. They are listed in Table 5, which also relates those practices to the four categories of good practices (Table 2). The scoping procedures and practices employed in each reviewed case are also shown in Table 5.

The additional practices were applied to one case – Belo Monte dam, where effective sharing of information among stakeholders during scoping – as perceived by the interviewees – allowed for broad involvement of other federal and state agencies.

With respect to the procedures required by IN 184, we can highlight that:

- only the requirement 'Proponent provides information on technical features of the project and its social and environmental context' was applied to all cases;
- Except for the requirement 'Information sharing among stakeholders involved in EIA', applied in only two cases, all other were employed in most cases. The complete absence of information dissemination practices among stakeholders triggered complaints of other agencies who claimed lack of basic information to issue their feedbacks on the ToR;
- The cases where mandatory procedures were not adopted may reflect failures in driving the scoping process, although the possibility that such

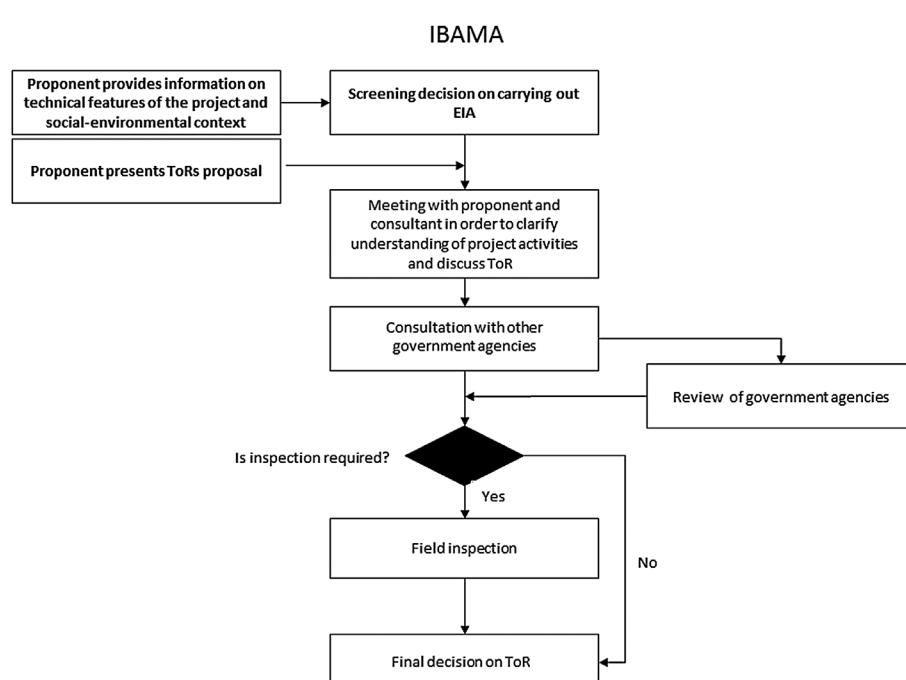


Figure 3. Scoping flow chart in Brazilian federal EIA.

Table 5. Scoping procedures and practices used in the reviewed cases.

Category of good practice	Scoping procedures and practices*	Reviewed cases									
		1	2	3	4	5	6	7	8	9	10
<i>Provisional of initial information</i>	Proponent provides information on technical features of the project and social–environmental context										
	Proponent explains the project to the Ibama team (initial meeting)										
	Conducting a site inspection										
	Technical forum on sectorial policies related to the project										
<i>Scoping determination</i>	Definition of studies to be carried out for preparing ToRs by the proponent										
<i>Stakeholders involvement</i>	Broad identification of issues and impacts										
	Meetings with affected communities and the interested public										
	Involvement of environmental agencies of the affected states and interested federal agencies										
<i>Process Management</i>	Involvement of the scientific community										
	Information sharing among stakeholders involved in EIA										
	Documentation of Terms of Reference										

Note: *In the column 'Scoping procedures and practices', blank lines represent the procedures required by IN 184 and shaded lines correspond to practices not required.

procedures have been performed, but not documented, should not be ruled out.

With regard to the four practices applied only in Belo Monte, we can highlight that:

- *Technical forum on sectorial policies related to the project*: the Brazilian energy 'matrix' (i.e. current balance between supply and demand and plans to meet future growth) was discussed as a means to address several issues raised by the project (e.g. project need and purpose). The forum with stakeholders was promoted by Eletrobras (the state owned company leading the pool of investors) and the Federal University of Pará.
- *Broad identification of issues and impacts*: In Belo Monte dam, a highly controversial project (Bermann 2012; Hanna et al. 2014), scoping was informed by a broad identification of issues and potential impacts, and workshops with affected stakeholders. However, the scope of issues was not narrowed by any preliminary significance assessment. Although Belo Monte scoping is the only case in the sample featuring public participation,

the review of files did not provide any evidence of its actual influence on the scoping outcome, i.e. the ToR;

- *Meetings with affected communities, the interested public and involvement of the scientific community*: the opinion of interviewees was favorable to the participation of affected communities and other stakeholders, but split about consulting the scientific community (Figures 4 and 5). Eight respondents consider that participation and public hearings are an opportunity to identify potential impacts that otherwise might go unnoticed. For seven of them, the participation of scientists is desirable when there are technical uncertainties related to the project.

3.2. Qualification of the contents of terms of reference

The review of ToR, conducted according to the criteria described in Table 3, resulted in the scores as presented in Table 6. The highest score (6) is far below the maximum (24). The following considerations are made:

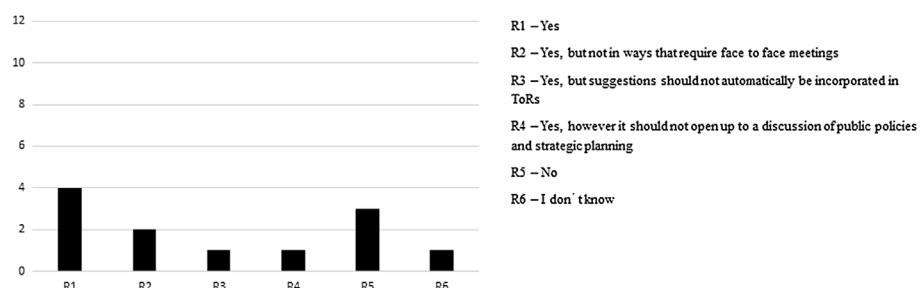


Figure 4. Number of answers to the question: 'In your opinion is the participation of affected communities in drafting Terms of Reference justified?'.

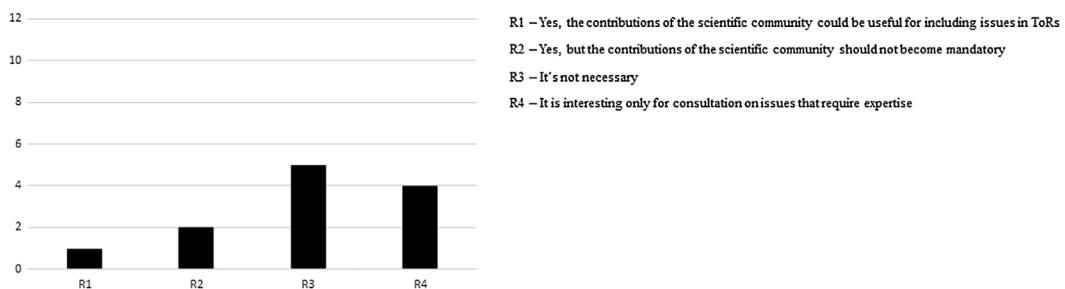


Figure 5. Number of answers to the question: 'In your opinion should the scientific community be involved in drafting the Terms of Reference?'.

- ToR scoring '0' presented only general guidelines not directing consultants to focus the EIS on selected relevant issues;
- In general, ToR merely lists topics to be included in the baseline description and reinforce the need to use both primary and secondary data;
- The best scores (cases 1, 4, 6 and 7 – respectively Belo Monte and Santo Antonio power plants, Brites port terminal and Seda pipeline) were obtained by ToR that explicitly considered the context of the project and the affected environment.

In summary, the majority of ToR were not tailor-made to address project-specific issues and focused essentially in providing guidance for baseline surveys.

From Table 6 for the four categories actually present in the sample, it is observed that:

- *Legal and regulatory requirements*: Even for the ToR that scored highly in this issue, legal requirements were described, but not unfolded in terms of issues to be addressed in the EIS;
- *Definition of study areas*: eight ToR did not address the geographical areas where surveys or studies should be conducted, but presumed 'areas of influence' established beforehand, not as a result of impact analysis, showing the dominant understanding in Brazilian EIA practice that equals the limits of the areas that are supposed to be affected by the project with the study area, where data will be collected.
- *Social and environmental baseline*: the three cases that scored present the most detailed ToR, but yet revealed a generic approach featuring a list of study topics that could be applied to any similar

project in any environmental setting. In the seven ToR which scored '0', there is no evident or stated relationship between the required surveys and specific relevant issues and impacts of the project.

- *Identification and characterization of environmental impacts*: In four cases, scoping is not grounded in a preliminary identification and characterization of potential impacts in order to direct the EIS toward significant issues.

The interviews show a heterogeneous perception of the officers who lead the scoping process about the most appropriate approach for defining ToR (Figure 6). While part of the respondents claim that ToR should be based on the early identification of the most significant issues, others believe that all issues and potential impacts should be exhaustively considered. Some respondents consider that identifying impacts is a core activity of EIS preparation, to be conducted later, hence not pertaining to the scoping phase. Only in the case of Belo Monte, the practice of identifying issues and impacts was adopted in the preparation of the ToR.

Responses to the question about the effectiveness of the current approach to scoping (Figure 7) confirm divergent staff opinions. Five out of twelve respondents believe the approach is not effective, while six analysts, who believe that the approach is effective, think that it is nevertheless in need of improvement, essentially by preventing unnecessary information to be featured in the baseline and directing it to provide information to be used to assess the specific impacts of the project.

Perceptions about the main difficulties in the scoping process are also heterogeneous (Figure 8). Out of 14 problems spontaneously mentioned by respondents, only two, the inexperience of analysts and the absence

Table 6. Scores resulting from the review of Terms of Reference.

Main issue in Terms of Reference	Reviewed cases									
	1	2	3	4	5	6	7	8	9	10
Legal and regulatory requirements	0	3	0	0	3	3	3	0	0	3
Plans, Programs and Public policies	0	0	0	0	0	0	0	0	0	0
Technical and locational alternatives	0	0	0	0	0	0	0	0	0	0
Priority areas for conservation and wildlife corridors	0	0	0	0	0	0	0	0	0	0
Protected areas	0	0	0	0	0	0	0	0	0	0
Definition of study areas	2	0	0	1	0	0	0	0	0	0
Social and environmental baseline	2	0	0	1	0	1	0	0	0	0
Identification and characterization of environmental impacts	2	1	0	1	0	1	1	0	1	0
Total	6	4	0	3	3	5	4	0	1	3



Figure 6. Number of answers to the question: 'Which criteria are used to define the contents of the Terms of Reference?'

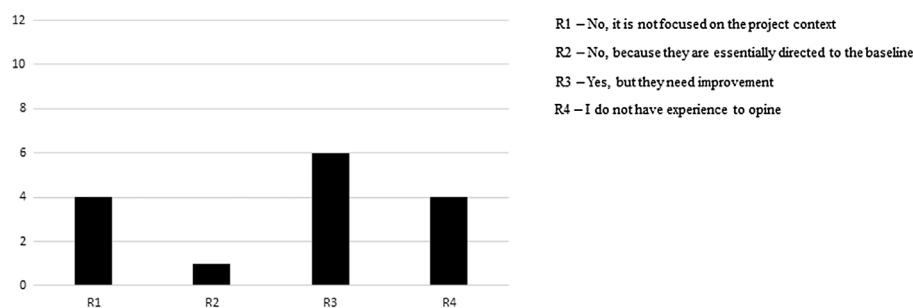


Figure 7. Number of answers to the question: 'In your opinion, is the current approach to the preparation of Terms of Reference effective for guiding consultants in the preparation of EIS focused on issues of interest for environmental decision-making?'

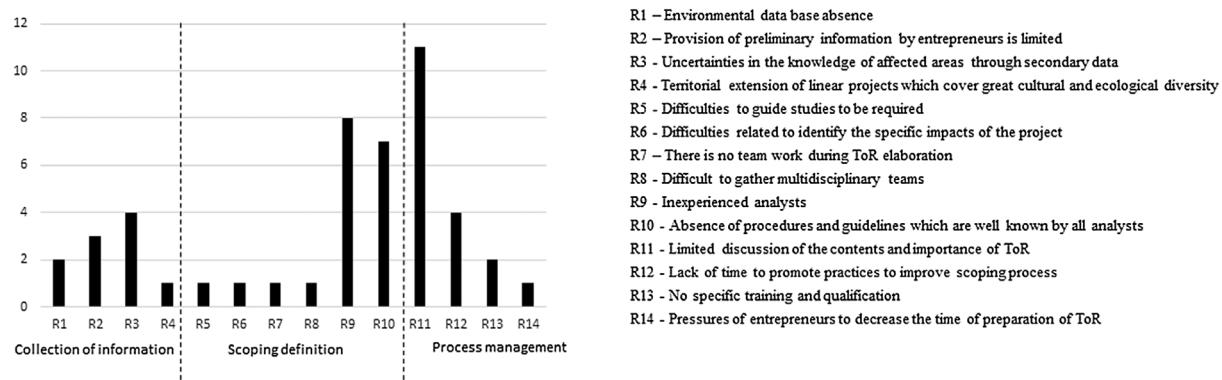


Figure 8. Number of answers to the question: 'What are the difficulties faced in drafting Terms of Reference?'

of policies and institutional guidelines, appeared in most interviews. According to some respondents, inexperience and quick staff turnover in the environmental agency hinder the build-up of knowledge and experience to adequately perform scoping.

3.3. Comparing Brazilian federal scoping process to the best international practices

Considering the practices listed in Table 2 and the above results, Table 7 shows how far Ibama's practices are from recommended approaches. Gaps are apparent for identification of alternatives to be assessed, selection of key issues, and scoping out of less relevant questions as well as availability of technical guidance.

Although a number of practices have been employed, scoping keeps limited association with most

internationally recommended good practices for granting success to scoping (Table 2). The following deserves note:

- **Provision of initial information:** Information on project specifications and its social and environmental context is generally provided at an early stage, the identification of stakeholders and affected communities is limited and was evidenced only for Belo Monte case.
- **Scoping determination:** The scope of alternatives to be assessed is totally absent of Ibama's practice; the broad identification of issues as a basis for preliminary assessment of significance and further prioritization was not employed, except in one case.
- **Stakeholder involvement:** As for external participation, practices that provide opportunities of

Table 7. Brazilian federal scoping practices compared to the best international practices.

Category	International best practices	Equivalent practices adopted	Number of cases
<i>Provision of initial information</i>	1. Project aims, alternatives and technical characteristics	Preliminary survey of information on the specifications of the project and its social and environmental context	10
	2. Outline of environmental and social context	Plans, programs and public policies	none
	3. Relevant government policies and legal requirements	Identification of stakeholders	1
<i>Scoping determination</i>	4. Identification of affected communities, relevant government agencies and other stakeholders		
	5. Review of alternatives	Identification of alternatives	none
	6. Broad identification of key issues and potential impacts	Broad identification of issues and impacts	1
	7. Preliminary assessment of impact significance	Preliminary assessment of impact significance	none
	8. Narrowing issues and impacts	Scoping out of impacts and issues	none
	9. Definition of study boundaries (study areas, timelines, project components and associated facilities)	Definition of study areas	2
<i>Stakeholder Involvement</i>	10. Involvement of affected communities and the interested public	Involvement of affected communities and the interested public	1
	11. Involvement of government agencies	Involvement of other government agencies	8
<i>Process management</i>	12. Documentation of decisions concerning scoping definition	Documentation	9
	13. Information sharing among stakeholders	Information sharing between the parties	1
	14. Monitoring and review of the scoping process	Guidelines, monitoring and review of the process	none
	15. Capacity building		
	16. Preparation of guidance documents		

Notes: [1] Columns 'Category' and 'International best practices' from Table 2, column 'Ibama's scoping practices' from Tables 5 and 6; [2] Column 'Number of cases' refer to the number of times a practice adopted by Ibama was considered as equivalent to the recommended best practice.

participation for the affected communities were not used in nine cases, implying that local concerns and perceptions about the impacts of the project were not considered. On the other hand, the involvement of other agencies is incorporated into the scoping routines.

- *Process management*: except for document management, other process management practices are practically non-existent.

4. Discussion

A number of shortcomings of EIA scoping in Brazil, documented in previous research, were also identified here, such as: generic ToR that can be used for an undertaking in any kind of environmental context (Ministério Público da União 2004; World Bank 2008), lack of public participation (Zhouri 2008; Sánchez 2013b) and flaws in the scoping process and ToR contents reflecting in poor identification of significant impacts and consequent loss of efficiency of the EIA process (Lima & Magrini 2010) and associated long time frames.

The research also documented that delays in the review phase, as well as conflicts that arose during public consultation can be at least partly attributed to deficiencies in scoping:

- In case 2 (gas pipeline), it was necessary to supplement the EIS by considering new routing

alternatives, as reviews by both Ibama and the environmental agencies of the States crossed by the pipeline raised several concerns about impacts that could be avoided if other alignments were considered;

- In case 3 (railway), the EIS was initially refused and a fully revised EIS was filed later, thus delaying the review process and project approval;
- In case 6 (port terminal), Ibama requested supplemental information after the public hearing demonstrated that issues of concern to local communities were not scoped in the EIS;
- In case 8 (transmission line), deficient interagency communication and poor management of information about project location resulted in the Department of Indian Affairs ('Funai') being lately warned of the project's interference in indigenous land, thus delaying its review and advice.

For the 10 reviewed cases, average time lag between issuance of ToR and approval (granting of the previous license) was 20.9 months, ranging from 14 to 27. The longest period was observed for the 813-km long gas pipeline which had its routing challenged by State environmental agencies during the review.⁴ The 20-month long review period for the port terminal was largely due to the need to provide detailed additional baseline information. Considering that long review times is the top criticism of the Brazilian licensing process as seen by proponents and business associations (World Bank 2008;

Fonseca et al. 2017), the research showed that careful scoping could contribute to prevent delayed reviews.

As highlighted by Lawrence (2007a, 2007b), undertaking preliminary assessment of significance of impacts is a complex activity. In the only case where this was attempted, the ad hoc approach did not lead to systematic decisions being made, prioritizing key impacts (Fischer & Phylip-Jones 2008). Therefore, it is necessary to develop and validate approaches and procedures, appropriate to each jurisdiction that can accommodate the plural and subjective nature of significance judgments while ruling out arbitrary (Erlich & Ross 2015) determination of significance.

Public involvement is absent or at best limited in the reviewed cases and in Brazilian practice in general, where ToR reflect essentially the vision of public officials and the proponent. Local knowledge and the concerns of affected communities are usually not considered, nor the opinion of scientists. Using Morgan's (2012) scheme, current approach to scoping is similar to the early years of EIA implementation in pioneering countries such as the USA, emphasizing technical aspects under a rationalist planning approach.

The recognition that determination of significance of impacts is influenced by individual and social values and judgments (Beanlands & Duinker 1983; Weston 2000; Wood 2008) is one of the pillars of public participation in scoping through a more collaborative process (Hughes 1998; Weston 2000; Morgan 2012), in spite of the often adversarial nature of EIA. According to Fischer and Phylip-Jones (2008), where scoping answers to stakeholder and public inputs, it can lead to increasing acceptance of the project, what means adding confidence in the EIA process for taking decisions.

'Social scoping' as termed by Beanlands and Duinker (1983), obviously does not rule out or substitute a technical rationale for determining significance, as exemplified by Ortega et al. (2016), who proposed a GIS-based methodology for assessing territorial impacts for tailoring scoping in linear transport infrastructure projects. In at least one project of this kind reviewed in this study, the proponent had to revise the EIS and find alternative routings in order to avoid or reduce harmful impacts.

The shortcomings of social scoping are also documented by Hanna et al. (2014), who found severe limitations on the consideration of social impacts in the assessment of major infrastructure projects in Brazil – especially as related to indigenous people, maroons, and other traditional communities – due to the lack of consultation with these communities in the early stages of preparation of environmental studies.

The conflictual characteristic of the Brazilian environmental licensing process (Hochstetler 2011; Carvalho & Espindula 2014) and frequent litigation (World Bank 2008) can be partly attributed to insufficient public involvement in the early phases of the EIA process. In one case (6 - port terminal), Ibama requested supplemental information after the public hearing demonstrated

that issues of concern to local communities were not scoped in the EIS, as the ToR were not prepared with public consultation.

Evaluation of ToR showed the absence of activities aimed at identifying relevant impacts, conducting to ToR focused on exhaustive baseline surveys. As highlighted by Ross et al. (2006), narrowing the range of the most significant issues is one of the most complex tasks of EIA and there is a tendency of adding questions rather than eliminating them, as observed by Snell and Cowell (2006) in the UK. The trend in Brazil – and possibly elsewhere – has been to enlarge the scope of issues to be dealt with in EIA (Landim & Sánchez 2012), a trend which only reinforces the need to scope out less relevant issues.

Difficulties in carrying out this task may have different causes, including inexperience and lack of guidance (Zhang et al. 2013), fear of increased delays in obtaining project approval if the EIS needs to be supplemented due to a too narrow scope (Hansen & Wood 2016), but also insecurity facing possible law suits if public officials choose to narrow the scope to a limited number of potentially significant issues (Snell & Cowell 2006). The results of interviews conducted in this research support these findings which are further corroborated by the Brazilian Environmental Crimes Act, as public servants can be criminally prosecuted if attorneys believe they may have somehow facilitated the issuance of a license.

Preparation of guidance and some degree of standardization of the scoping process could reduce such risks, besides improving the outcomes of the process by producing tailor-made and focused ToR. Lack of tailored guidance is mentioned as a barrier for good practice of EIA scoping and for reaching good achievements (Toro et al. 2010; Zhang et al. 2013). Yet, the interviews revealed divergent understanding of Ibama's staff about the strengths of the current process and the extent of reform needed. Hence, although there is agreement on the potential benefits of guidance development, the discussion about which change is desirable is not mature.

5. Conclusions

Evidence collected in this research showed that Brazilian federal scoping is conducted in the absence of written rules or guidance, thus varying internally in the federal environmental agency Ibama. A highly precautionary approach is dominant, requiring EIS to feature long and descriptive baselines which do not necessarily support impact analysis and mitigation design. Current practice departs from several internationally recommended good practices, including the core 'technical' tasks of scoping determination as well as public involvement. The provision of initial information on the proposal to be assessed, the involvement of other agencies, and process documentation are the most frequent scoping practices adopted in the reviewed cases.

The research also documented that delays in the review phase, as well as conflicts that arose during public consultation, can be at least partly attributed to deficiencies in scoping. Extensive supplemental surveys and the need to develop new alternatives are major reasons for the average review time for the 10 projects have reached 20.9 months.

Out of the 10 reviewed cases, the most extensive use of internationally recommended practices was observed in scoping of the controversial Belo Monte dam. Facing national and international criticism, the ToR for this project required more time to be prepared and additional care in sharing information with stakeholders and including concerns of scientific community.

The benefits of good scoping suggested by the literature (briefly: increasing cost-effectiveness of EIA, provision of relevant information, increased transparency, better consideration of alternatives and cumulative impacts and better governance) were generally not observed in this research. However, we found evidence *a contrario* that deficient scoping can: (i) increase EIS review time, and consequently reduce cost-effectiveness of the EIA process; (ii) provide room for citizens' challenge of EIS findings; (iii) increase the risk of neglecting important issues and consequent absence of mitigation.

Staff at the federal environmental agency is aware of most shortcomings, but does not have a shared understanding about desirable changes. Findings from this research can be used as an opportunity for improving practice and strengthening scoping process. Similar shortcomings identified in other jurisdictions (Snell & Cowell 2006; Wood et al. 2006; Toro et al. 2010; Zhang et al. 2013; Canter & Ross 2014) and corresponding remedy are:

- *generic ToR that do not direct the EIS to the most relevant impacts*: encourage practices that facilitate the early identification of relevant issues and translate into tailor-made instructions for project assessment, such as conducting a site inspection and promoting technical forums or work meetings with agencies, local governments, and others in order to review relevant sectoral and regional policies related to the project;
- *absent or insufficient public participation*: establishing appropriate procedures and time frames to involve affected communities and other interested parties in the scoping process to collaboratively capture and integrate concerns of affected communities and scientists community in order to better balance technical and local values in the impact environment;
- *poor process management*: employing practices that capture lessons learned and value learning by evaluating past cases, promoting better information sharing among staff and stakeholders and increasing inputs for featuring, guiding, monitoring, and reviewing scoping process.

In order to advance scoping practices in EIA, processes improvements can be supported both by professional experience and research (Sánchez & Mitchell 2017). Research is needed to shed light on the relationship between scoping practice, the quality of environmental impact statements, and effectiveness of the EIA process. Furthermore, with pressures to streamline the EIA process, more empirical evidence is necessary to better understand to what extend can good scoping contribute to reduce unnecessary delays and possibly to more efficient EIA.

Notes

1. As in other countries, an EIS is required for undertakings with a potential to cause significant impacts, while a shorter or 'simplified' report may be required for other project.
2. In order to study recent and approved cases, considering that the time lag between issuance of ToR and project approval is often in exceedance of 18 months, and aiming at meeting the criterium of different project types, it was necessary to go as far as December 2007 as the date of issuance of ToR. As a matter of fact, after choosing the 10 projects, it was found that the average time lag between issuance of ToR and approval was 20.9 months.
3. These criteria were adopted because there is flexibility among different divisions within Ibama to adapt internal procedures to specific features of types of projects. Actually, preparation of ToR, review of EIS and follow-up are carried out internally by staff organized in five divisions, corresponding to classes, or types, of projects. Hence, it was sought to select at least one case in each division in order to check possible variability in scoping practice. As the absence of scoping guidance was known in advance, this approach to the intentional selection of cases aimed at identifying possible specific practices in one division. One exception, however, was the exclusion of the oil and gas division, which mostly deals with offshore exploration and production.
4. In federal environmental licensing, States are consulted. State environmental agencies prepare non binding reviews with recommendations.

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