Processo nº 02007.003499/2019-91

Environmental Impact Study and

Report on Environmental Impact "EIA/RIMA"

Typology: OFFSHORE WIND FARMS

Version: December/2019

GENERAL INSTRUCTIONS

This Term of Reference (TR) aims at determining general technical guidelines and criteria that should underpin the elaboration of the Environmental Impact Study (EIA) and its *Relatório de Impacto Ambiental* (RIMA) (Environmental Impact Report) in order to subsidize the previous environmental licensing process of Brazilian Institute of Environment and Renewable Natural Resource (IBAMA).

The study should be written with a logical organization of information in chapters, with the location of important data in summaries and indexes. Unless the chapter is short, it should provide summaries of the chapters describing its main results. The wording of this summary should be comprehensible to non-specialists, avoiding unnecessary technical language.

The Environmental Impact Study should be presented in pdf format, with files smaller than 80 MB. Visual communication mechanisms such as figures, photographs, maps and graphs should be used. The worksheets attached to the study should be in .ods format and spatial data in .kmz or zipped shapefile format.

The scope of this Term of Reference includes the wind-energy generating units; the submarine grid connector; the offshore substation; the power transmission grid, including its submarine and onshore stretch, as well as the air segment up to the connection with the *Sistema Interligado Nacion*al (SIN) (National Interconnected System), if it fits in accordance with Article 5 of Ordinance MMA n° 421 of October 26, 2011; the onshore substation and the exclusive support areas for the work.

The geographic data of the environmental study should be attached in digital format, with extensions compatible with OpenGis standards, in format .shp or .kmz (for vector data) and geotiff (for orbital images, processing and aerial photos). All data must be georeferenced and standardized with the *Sistema de Referência Geocêntrico para as Américas* - SIRGAS 2000 (Geocentric Reference System for the Americas), with flat or geographical coordinate format, according to the level of coverage.

The raw data and listings prepared during the environmental diagnosis should also be presented in an editable spreadsheet, according to the standard table available at http://www.icmbio.gov.br/sisbio/dados-de-licensment.html.

The following itemization is established for EIA/Rima.

1. INTRODUCTION

This chapter aims to present, in synthesis, the context of the elaboration of the study and its conclusions, in order to introduce the reader to its content.

a) Briefly describe the undertaking/activity and the environment in which it will be develop.

b) Present a brief history on the undertaking and its environmental licensing process.

c) Indicate the objectives of the enterprise and its economic, social and political relevance, in the regional, state, national and international spheres (when applicable).

d) Justify the need for its deployment and operation.

2. IDENTIFICATION

This chapter aims to present the information about the proposer and the technical team responsible for its elaboration.

In this chapter the information to be provided should be restricted to those itemized in this Term of Reference, in order to avoid the inclusion of additional texts of little relevance to the environmental licensing of the enterprise or to avoid the inclusion of information that will be provided in other chapters of the Study.

The legal entity responsible for the undertaking is understood as an entrepreneur.

The company responsible for preparing the study is the legal entity contracted by the entrepreneur to carry out the study.

The team responsible for the elaboration of the study is understood as the set of qualified professionals who participated in the elaboration of the study.

It is imperative to emphasize that the entrepreneur and the professionals who subscribe to the study are responsible for the information presented, subjecting themselves to administrative, civil and criminal sanctions.

2.1. Identify the Entrepreneur

a) Name or company name;

b) Cadastro Nacional de Pessoa Física - CNPJ; (National Register of Legal Entities)

c) Full address;

d) Phone and e-mail;

e) Legal representatives (name, CPF, address, phone and e-mail);

f) Cadastro Técnico Federal - (CTF) (Federal Technical Registry) (not mandatory at this stage).

2.2. Identify the Consultancy Company

a) Name or Company Name;

b) Cadastro Nacional de Pessoa Física - CNPJ; (National Register of Legal Entities)

c) Full address;

d) Phone and e-mail;

e) Federal Technical Registry (CTF) (mandatory);

f) Legal representatives (name, CPF, address, phone and e-mail);

g) Present the names and academic training of the professionals who are part of the multidisciplinary technical team responsible for the elaboration of the study, identifying the team coordinators of the different areas; Registration number in the respective Class Board, when applicable; registration number in the Federal Technical Registry and ARTs, when appropriate.

3. CHARACTERIZATION OF THE UNDERTAKING/ACTIVITY AND ITS ALTERNATIVES

This chapter aims at describing the main motivations and justifications for the development of the proposed undertaking, the characteristics of the project, the main phases and activities envisaged, as well as its estimated timeline. It is understood that the clearer the understanding regarding the activities foreseen for the implementation and operation of the project, the more objective and concise will be the identification and assessment of environmental impacts.

This item should not identify and evaluate positive and negative impacts, nor discuss issues associated with the study of alternative locations and technology that will be addressed below.

3.1 Contextualization of the project in the scope of the country's Electrical Planning and of the international commitments made by Brazil associated with the sector.

This chapter is not expected to analyze the potential negative or positive impacts of the project, but to clarify the connection between the proposed undertaking and the national sectoral planning, emphasizing the justification for its implementation and operation.

a) Briefly describe the connection between the undertaking and the indicatives present in the short- and long-term planning documents of the national electric sector.

b) Briefly describe the connection between the undertaking and the international commitments made by Brazil associated to the electric sector.

3.2. Contextualization of the project in the framework of national and regional marine planning

This chapter is not expected to analyze the potential negative or positive impacts of the project, but to clarify the connection between the proposed project and the national or regional marine planning, when existing.

a) Briefly describe the relationship between the project and the indicators present in the short- and long-term planning documents on the use of the national and regional marine space.

3.3. Contextualization of the project in the context of national and regional environmental planning

The objective of this item is to clarify the relationship of the enterprise with the national, regional, state and municipal environmental planning. Analyses on potential negative or positive impacts are not expected in this chapter, such as analysis of cumulative or synergistic impacts with other

ongoing actions at the regional level, which will be addressed later in the study.

a) Briefly describe the connections between the undertaking and national and regional strategic environmental policies or actions.

3.4. Characterization of the Enterprise/Activities

The characterization of the enterprise and related activities should be based on the preferred technological and local alternative. If there are differences between the preferred alternative and the other location alternatives, only these inequalities should be specified in the form of a comparative table.

a) Describe, as itemized below, the main characteristics of the enterprise.

3.4.1. Generation Units

3.4.1.1. Description of the wind farm

a) Address: (i) the location of the turbines, (ii) the type and technical specification of the wind turbines, (iii) the energy production, (iv) the description of the proposed transmission and cable system, (v) the proposed navigation lighting.

b) Detail: (i) expected power (MW), (ii) total area and percentage of area with intervention during all phases of the project: Planning, Deployment, Operation and Demobilization.

3.4.1.2. General arrangement and flow chart of the process

a) Provide information on the stages of implementation of the project, which should refer to the technical aspects and the necessary infrastructure.

b) Detail: (i) average distance between towers, (ii) height of towers, (iii) minimum and maximum distance from the coast, (iv) location of the marine substation.

c) Characterize the infrastructure (existing and being deployed) and the activities to be carried out in the reference port.

3.4.1.3. Constructive techniques to be used

a) Specify the depth for the installation of the prefabricated foundations of the wind turbines.

b) Indicate the storage and pre-assembly location of the towers, and their respective distances to the installation sites.

c) Grounding system of the structures.

d) Prefabricated foundations

e) Description of the foundation’s rockfill

3.4.2. Collecting grid and submarine transmitter

a) Locate and describe: (i) submarine cables (characteristics, voltage, construction techniques, depth; (ii) submarine cable transition / underground cable.

3.4.3. Offshore sub-station

a) Present location of the marine substation and type of foundation.

b) Display substation characteristics and transformers (if any).

3.4.4. Onshore transmission Line

a) Describe and detail the project, technical data and georeferenced location of all the work and associated infrastructure.

b) Display the Technical Description of the Transmission Line

- Voltage (kV);
- Total line length (km), width and area of the servitude strip;
- Width of service range;
- Transition underground cable / aerial transmission line;
- Estimated number and minimum and maximum tower heights (standard and special structures);
- project premise regarding the elevation of the towers and the types of structures to be used in forest fragments;
- Average distance between towers;
- Minimum distance between cables and ground;
- Type and size of bases;
- Safety electrical distances;
- Grounding system for structures and fences;
- existing substations requiring expansion;
- Position of the entrance/ exit porticos of the new Transmission Line
- Identify other transmission lines that maintain the same servitude strip, as well as their distance;
- Indicate the interferences of the LT in the servitude strips of highways, railways, oil pipelines and pipelines, central pivots and aerodromes;
- Technical requirements for maintaining vegetation under and sideways to cables;
- Prediction of use of coated cabling (for prevention of fauna electrocution).

3.4.5. Ground substation

a) Briefly describe the onshore substation for the power, total area and energized patio, and rainfall drainage system;

b) Indicate interconnection points and location of substations;

c) Show characteristics of substations and transformers (if any).

3.4.6. Construction site and Support Infrastructure

a) Characterize the area(s) for the construction site, including layout and description of its units, mechanical workshops and refueling stations.

b) Provide an estimate road, port and offshore traffic:

- Appropriateness to existing infrastructure; expected quantities of cargo to be transported; transshipment technologies to be used; size and scheme of operations and vessels;
- Description of the expected sea flow of cargo and persons for the different stages of the undertaking;

c) Describe the infrastructure and systems associated with the venture:

- Port storage and pre-assembly base;
- Ships used in the installation of foundations, turbines, cables, substation and rockfill.

3.4.7. Inputs and Utilities

a) Characterize the inputs (solid and hazardous materials) to be handled. In regions of water scarcity, the demand and availability of the resource should be characterized.

3.4.8. Accesses and routes

a) Represent the structures to be installed and the routes, duly identified, of all vessels engaged in the venture, in all its phases.

b) Estimate the frequency of vessels (quantity versus time unit) and their characteristics for each route.

c) Represent the land accesses and routes to be used in the transportation of megastructures, the needs of adaptation of roads and the plans of trafficability and safety.

d) Detail restrictions on the use of the enterprise area and permanent access to:

- Navigation during the installation phase;
- Navigation during the operation phase;
- Fishing, diving, kite surfing and others during the installation phase;

- Fishing, diving, kite surfing and others during the operation phase.

e) Indicate the secure navigation routes.

f) Indicate the navigational signage to be employed.

3.4.9. Workforce

a) Characterize and quantify the workforce, specifying, by stage (installation and operation):

- the level of education and expertise required;
- schedule of hiring and demobilization.

3.4.10. Wastes and effluents

3.4.10.1 Liquid Effluents

a) Characterize and estimate the quantities of liquid effluents generated in the implementation and operation of the undertaking;

b) identify estimated qualitative characteristics for the identified liquid effluents;

c) Present the systems of control and treatment of the liquid effluents to be generated.

3.4.10.2. Solid wastes

a) Identify the sources of generation, quantitative estimates and their respective solid wastes to be generated in the implementation and operation of the undertaking;

b) indicate the packaging and temporary storage points for the solid wastes generated and the final disposal sites;

c) Characterize the control systems and the adopted procedures associated with the sources identified, indicating the forms and final disposal sites of the residues.

3.4.11. Noise, Vibration and Artificial Luminosity

3.4.11.1. Noise and vibration

a) Describe the main sources of noises of the enterprise, for the deployment and operation phases.

3.4.11.2. Luminosity of Artificial Light

a) Display the artificial brightness expected for wind turbines, underwater substation and structures to be installed on the waterfront. Observe the relevant legislation on the subject (e.g. Ordinance N° 11 of 30 January 1995 (D.O.U. of 31/01/95), Law N° 7.034 of 13 February 1997 (D.O.E. of 13/02/97); and CONAMA Resolution N° 10 of 24 October 1996).

3.4.12. Dredging, earthmoving and other Interventions

a) Provide in detail for any dredging, if applicable, according to CONAMA Resolution 454/2012, with:

- Delimitation, in georeferenced polygons, of the areas to be dredged and of the proposed disposal areas;
- bathymetric survey of the areas to be dredged and the proposed disposal areas;
- desired bathymetric dimensions {shares/quotas};
- Volume to be dredged
- Qualitative characterization of sediments;
- Assessment of the possibility of the beneficial use of the dredged material, according to its characterization and classification, as well as the environmental and economic and operational feasibility assessment of the disposal options, according to specific and relevant regulations;
- Characteristics of dredging equipment as well as its methods and techniques for carrying out the activity;
- Estimate of dredging volumes that will be necessary exclusively to insert sand inside the foundation of each turbine, in case of direct foundation use.

3.4.13. Demobilization

a) Present the demobilization plan for the complex.

3.4.14. Exclusion zones of other offshore activities (navigation, fishing, tourism, oil and gas exploration, etc.): enterprise security polygonal.

a) Represent the safety security polygonal of the enterprise, presenting possible navigation routes and options of locational adjustments, in the distribution of the towers and in the protection of cable/mooring {lashing} .

b) Characterize pre-existing activities in the exclusion zones.

3.5. Analysis of legal compatibility

a) Analyze the compatibility of the undertaking with the incident legislation, government plans, programs and zoning proposed or being implemented, as well as possible legal restrictions regarding the implementation and operation of the undertaking or activity.

b) Consider all existing federal, state and municipal legal provisions applicable to the undertaking relating to the use, protection and conservation of environmental resources, use and occupation of land, waste management, hazardous products, air emissions and liquid effluents.

c) Consider technical standards dealing with maximum parameters of negative externalities for noise, water quality and navigation safety.

d) Present manifestation of the representative entities of affected fishermen and preferably the result of public meetings. In cases deemed relevant, IBAMA will promote new meetings or public hearings after study protocol.

e) Analyze the compatibility of the enterprise with the Coastal Management Plan, when existing.

f) Present certificates or permits from the municipal government where the onshore structures (port and jobsite) will be located, with a declaration that the location and type of undertaking or activity are in conformity with the law applicable to land use and occupation.

3.6. Schedule

a) Display estimated physical schedule of all stages of the enterprise.

4. TECHNOLOGICAL AND LOCATION ALTERNATIVES

Whereas there is still no Marine Spatial Planning in Brazil, the international experience of countries that have numerous wind farms installed in their marine areas, and the respective technical criteria adopted by them for the allocation of projects, in order to control and mitigate environmental impacts and conflicts of use recurring for this type of enterprise (mainly those related to tourism activities, impacts on the landscape, shorebirds, coral occurrences, increased environmental sensitivity of shallow areas and by the creation of exclusion fishing areas, among others) it is recommended that the sites alternatives to be proposed keep a minimum distance of 25 km from the coast line. This criterion is the minimum spatial distance reference for which most offshore wind projects currently installed in the world are in line with. This coastal distance criterion may vary along the coast line due to the characteristics of the insertion area of each project.

a) Identify and qualify the sites and technological alternatives studied for the implementation of the enterprise, taking into account the technical, economic and environmental aspects.

b) Evaluate site alternatives of the enterprise in order to avoid the main associated negative impacts, based on the activity-restrictive or environmentally sensitive areas.

c) Propose a preferential alternative, resulting from the comparison of three viable alternatives, through a classification based on the relative level of interference of each one with the environmental variables relating to the physical, biotic and socioeconomic environment that were preexistent to

the enterprise, according to the Identification Map of Preexisting Multiple Uses.

d) Justify the reasons that subsidized the choice when compared to the other alternatives and in the light of the established technologies and international trends, comparing them with the hypothesis of not implementing the project.

e) In order to define the parameters relating to the minimum distance from the coast and the exclusion zones around the generation units, internationally recognized parameters should be used as justification for the chosen location alternative.

For the proposition of the location alternatives, the entrepreneur must:

- Define the economic and operational viability of the Project from the port area of reference for installation of the enterprise, justifying all technical criteria adopted for the delimitation of the total offshore extension, which should be in line with best practices in use in international experience;
- Perform a survey of the characteristics of the seabed considered potentially viable for receiving of the project. The area should be investigated to its full extent for the purposes of general characterization of the type of sea bottom and its respective sensitivity to the aspects of the project. The degree of detail and methodologies to be adopted for this investigation should at least be able to indicate the existing sea bottom type(s) pattern(s) and its variation in space;
- Identify if there is total or partial overlap of the study polygonal with marine conservation unit.
- Based on the sea bottom map of the general area identified as operationally feasible for receiving the project, the location alternatives should be evaluated and provided for.
    - Apart from the potential enterprise allocation polygon, based on the variables listed above and on the Identification Map of Preexisting Multiple Uses, only those which have no pre-existing non-viable hypotheses should be accepted as location alternatives.

The following guidelines for building the Identification Map of Pre-Existing Multiple Uses should be adopted:

- employ geoprocessing techniques in the integrated evaluation of the different themes;
- provide the criteria for determining the relative weights of each theme;
- Consider at least the following layers of information in their composition:
    - Priority areas for biodiversity conservation (Ordinance MMA nº 463/2018);
    - Reefs formations;
    - the avifauna: migratory routes;

- marine mammals: IN IBAMA/ICMBio 02/2011;
- Turtles: IN IBAMA/ICMBio 01/2011;
- Potentially conflicting activities: fishing, tourism, water sports, shipping routes, oil and gas exploration, etc;
- Noise modelling, shading and stroboscopic effect of wind turbines;
- Modelling of visual impact on the coast and potential or consolidated offshore tourist attractions;
- Port and fishing navigation routes currently operating within the study polygonal, identifying the port ventures and the fishing colonies that can be reached by the exclusion navigation zones after the implementation of the undertaking;
- Marine mineral ploughs granted, for prospecting or operation, in the polygonal of the study.

5. AREA OF STUDY (AS)

This chapter aims to delimit geospatially the production of primary and secondary data to support the pre-existing diagnosis to the enterprise as well as for the technical justification of the prognosis that will or will not attest the social-environmental viability of the enterprise.

The environmental diagnosis should be focused on the Area of Study, and not only on the area of direct influence of the proposed alternatives. The AS will be delimited as already explained in item 4 above, in order to provide a technical basis for the choice of alternatives locations, considering the multiple uses of the marine environment and the pre-existing environmental sensitivity map.

After the assessment of environmental impacts, the geospatial delimitation of the areas of influence of each potential impact should be carried out. The delimitation of the AS should, therefore, be consistent with the conclusions of geospatial delimitation of the area of influence of the potential impacts of the undertaking.

Additionally, the AS should be representative for data collection and diagnosis of the physical, biotic and socioeconomic environment.

6. DIAGNOSTIC

The objectives of this chapter are:

a) Present environmental diagnosis of the Study Area with a complete description and analysis of the environmental resources and their

interactions, as they exist, in order to characterize the environmental situation of the area, before the implementation of the project.

b) Describe and use, for the elaboration of the diagnostic, a scientifically proven and compatible methodology based on survey, organization, consolidation and analysis of the pre-existing data, as well as through procedures that facilitate the collection, consolidation and analyses of primary data.

The diagnostic should portray the current environmental quality of the Area of Study, indicating the characteristics of the various factors that make up the environmental system, in order to allow the full understanding of the dynamics of the area before the implementation of the enterprise, considering the interactions between the physical, biotic and social economic environments

Data and information surveys may be carried out from secondary data, if these have been produced within the technical requirements of this TR, by other undertakings in the region. It is important to emphasize, however, that even if the Study Area is relatively known, the study should present detailed primary DAA data of the proposed alternative sites.

Requirements for primary and secondary data presented in this Chapter are that: (i) are recent; (ii) are representative of the Study Area; (iii) present appropriate methodology, as described below in each item; (iv) inform the time of the year in which they were collected.

6.1. Physical Environment

Consider, in the diagnosis of the physical environment, the subsoil, the waters, the air and the climate, highlighting the mineral resources, the topography, the types and aptitudes of the soil, the bodies of water, the hydrological regime, the marine currents and the atmospheric currents.

6.1.1. Climatology and Meteorology

a) Characterize regional and local weather conditions under various time scales, considering the occurrence of extreme events. Provide information on temperature, precipitation, evaporation, relative humidity, sunstroke, atmospheric pressure and wind regime parameters (direction and intensity).

b) Present the data analyzed in the form of maps, tables and graphs, with annual and monthly historical averages, highlighting extreme events. Include recent and historical series of data.

c) Present, for the wind regime, for the study area and for each season of the year identified in the seasonal, or quarter analysis in the absence of identified seasons, monthly Wind Roses and seasonal periods; maps with

grid of intensity and direction or wind fields of the Climatological Norms of medium, maximum and minimum; and directional histograms of the region's winds.

6.1.2. Oceanography

a) Provide information on temperature, salinity, density, water bodies, currents, waves and tidal regime parameters.

b) Perform analysis of averages, minimum and maximum and the aspects inherent to intra and interannual variations of the study area;

c) Evaluate the correlations between phenomena and parameters analyzed at different scales, seeking a complete understanding of the Oceanographic system of the study area;

d) Include recent and historical series of oceanographic station data located in the area of study;

e) Display the analyzed data in the form of maps, tables and graphs.

6.1.3. Identification of extreme phenomena (Weather and Oceanography)

a) Characterize extreme meteorological and oceanographic phenomena such as winds, currents, waves and weather tide. Assess the events identified as relevant to meteorology and oceanography in the AS for their extreme occurrences.

b) Display a table or list of extreme events containing the following information: Event identification; Event frequency; Region within the AS, where it occurs most frequently; Minimum and maximum intensity of events; and possible adverse consequences of events for the enterprise.

6.1.4. Noises and Vibrations

a) Characterize the noise indices in the area of direct influence of the enterprise.

b) Computing simulation of noise, by phase of the enterprise, considering its underwater propagation and attenuation.

c) Characterize noise levels of the surface and bottom sea and (resulting from the implementation of the project), aiming at acoustic comfort and the preservation of the community's health, when isolated residences are detected, places of stay or communities that may be impacted.

d) Characterize the shading and stroboscopic effect of wind turbines, aiming at preserving the health of the community, when detected the occurrence of isolated residences, places of permanence or communities that may be impacted.

6.1.5. Geology, geomorphology and pedology

a) Characterize and map the geological and geomorphological units present in the area of study based on the interpretation of satellite images, aerial photographs and field observations.

b) Carry out mapping and characterize the soil classes, taking as reference the Classification System of the Empresa Brasileira de Pesquisa Agropecuária – EMBRAPA (Brazilian Agricultural Research Company). (i) For the DAA a survey should be carried out looking for a description of the soil types identified at a level appropriate to the installation of the development, particle size, permeability, density, among other characteristics should be analyzed. (ii) On a smaller scale (the rest of the area of study) the characterization of the continental fraction can be performed from secondary data or from semi-detailed surveys and recognition. (iii) Parameters evaluated in the laboratory should take into account variables that are primarily related to the context of environmental conservation, focusing on the measurement of parameters related to the maintenance and conservation of biotic and abiotic environments.

c) Identify and map areas prone to geotechnical instabilities or susceptibility to erosion.

d) Perform, for the DAA, planialtimetric/bathymetric survey in a scale appropriate for definition and identification of the main formations in the continental and underwater areas.

e) Identify and map the existence of possible third-party areas requested from the Agência Nacional de Mineração - (ANM) (National Mining Agency) at DAA, indicating the type of exploration.

6.1.6. Water quality

a) Characterize physical, chemical and microbiological quality and classify surface waters according to CONAMA Resolution n° 357/2005 and subsequent amendments. Identify the time, date and tide (where applicable) at the time of sampling and determine salinity, pH, temperature and dissolved oxygen at each sampling. Where the local depth permits, samples should be taken from the surface, mid-water and bottom. The characterization of the water quality should include, at least, the substances potentially present in the area of study, according to current uses, in addition to substances related to the implementation and operation of the project, in accordance with CONAMA Resolution n° 357/2005 and amendments.

b) Identify the main polluting sources, specific and diffuse, and release points and/or disposition, on the ground, of domestic and industrial effluents in water resources in the study area.

6.1.7. Coastal hydrodynamics and sediment transport

a) Characterize the coastal hydrodynamics of the study area. In the absence or scarcity of information, primary data should be obtained by including the minimum measurement period of one month.

b) Work the data in an integrated way, describing the inter-relations between tides, waves and currents, also relating to meteorological data, in order to describe the patterns of hydrodynamic behavior active in the area of study of the enterprise according to the times of the year.

c) Characterize sediment transport processes along the coast, defining potential regions of accretion and coastal erosion.

d) Include, in the characterization, the historical survey of the geomorphological evolution of the coast line, relating it with the regimes of waves and currents.

e) Use, for coastal hydrodynamics and sediment transport processes, in addition to observational methods, the computational modeling tool.

f) The modeling shall be able to predict the likely interference of the wind farm in the marine and coastal environment on the patterns of hydrodynamic circulation, wave propagation and sediment transport in the DIA, also presenting the results of bathymetric changes in the coast line morphology due to such structures.

g) Use the modelling under various scenarios (winter – stormy conditions, summer, spring and neap tide period).

h) Present the model's characteristics and the history application, describing the modelled domain, input data and its origins, calibration and validation procedures, round times, modelled scenarios, post-processing techniques and other characteristics that are considered important.

i) Consider the following criteria during modelling assessment:

• adequacy of the numeric model to the problem;

• methodological strategy;

• quality and adequacy of input data

• quality and suitability of post-processing techniques;

• references, criteria and arguments considered in the interpretation of the results;

• interaction of the diagnoses obtained through modelling with those obtained through other methods.

6.1.8. Marine sediments

a) Characterize the sediment surface layer of the study area according to the guidelines of CONAMA Resolution nº 454/2012. The possible exclusion of parameters from the characterization should be justified based on recent secondary data which are representatives of the study area.

If dredging is expected, in addition to characterization of the surface sediment of the study area, the sediment characterization of the area to be dredged and the area of disposal of the dredged material should be provided, which is to be considered part of the DAA of the undertaking. A dredging plan shall be submitted in accordance with the above-mentioned resolution.

The results should be analyzed in conjunction with the results of the components of the biotic environment, especially the benthonic community, and the socioeconomic environment.

If sediment is expected to be thrown into the sea, alternatives of sites for the definition of an Oceanic Disposal Polygon - ODP should be evaluated. The same premises and guidelines for the study of alternative sites (Item 4) should be used for the definition disposal site(s) through the applicable criteria suggested in that item, with minimal evaluation of the hydrodynamics and trends of launched sediment spreading, with support of numerical modelling tools; physico-chemical properties of the sediment, sea bottom types, proximities with CU's presence of fishing areas and other economic and recreational uses, as well as other sensitive receptors existing in the area of study.

In case of disposal of sediments at sea, in a place that already has license, a copy of the existing environmental permit should be submitted.

On the map of the study area, in addition to the location of the sampling points, the area to be dredged and the disposition area of the dredged material should be represented.

6.2. Biotic Environment

The purpose of this chapter is to characterize the conditions of the environment prior to the installation of the undertaking, making it possible to compare it with the situation later on and, in relation to the most vulnerable groups, with control areas, aiming at identifying and measuring possible impacts. It also aims to identify relevant environmental issues and sensitive aspects inherent to each taxon that may be affected by the implementation of the venture. Where possible, multi-purpose campaigns

should be conducted to reduce vessel movement and associated risks, such as accidental collision of marine mammals and turtles.

a) Base the diagnosis of the biotic environment on primary data (except as indicated or when recent secondary data (up to five years) are available), obtained in sampling mesh and seasonality as specified below for each taxon.

b) Obtain, prior to the realization of the campaigns, Autorização para Captura, Coleta e Transporte de Material Biológico (ABio) (Authorization for Capture, Collection and Transport of Biological Material), according to procedures defined in the normative Instruction Ibama nº 8/2017, including presentation of the respective Work Plan.

c) Observe the guidelines and recommendations of the National Action Plans corresponding to the evaluated taxa.

d) Characterize the flora and fauna of the project's study areas, describing the types of habitats found (including anthropogenic areas). Habitat types should be mapped, with indication of size in percentage and absolute terms.

e) Highlight the species most vulnerable to the enterprise, the ones which are indicators of environmental quality, those of scientific and economic value, the rare ones and those threatened of extinction. If the place of occurrence of these species corresponds to a specific area, it should be shown on a map.

f) Identify species of permanent, migratory or seasonal occurrence, indicating the time regime of occurrence of each species.

g) Identify the presence of invasive species and geospatialize the area of occurrence of these species in the AS.

h) Identify existing Conservation Units in the Study Area, describing their location, damping zone, creation objectives, history, existence of management board and permitted uses according to the corresponding category (set forth in Law 9,985/2000) and the Management Plan.

i) Identify, map and characterize the use and occupation of the soil, informing about the existence of areas of permanent preservation, agricultural use, access, etc.

6.2.1. Terrestrial Fauna

a) Present, by means of bibliographic review, the list of fauna species (annual fish, herpetofauna, avifauna and mastofauna) occurring in the AS, indicating the species listed in the official list of endangered fauna (including state lists) endemic, rare, of economic and hunting importance, potentially invasive, migratory ones with potential distribution in the AS and those that,

due to the behavior, has greater impact potential with the structures of the enterprise to be installed

b) Present, based on the identification of attractive bird ecosystem and migratory routes, an assessment of sensitive areas, in order to support the definition of preferential routes and proposal to install signaling along the aerial LT, as well as to measure the impact on this group.

6.2.2. Aquatic Biota

a) Characterize, in detail, the locations for the installation of the underwater structures (foundations, anchors, cables, among others) with respect to the biological communities that will be directly impacted. This characterization should make use of primary data such as ROV images and side scan sonar data (side scan), to conclusively indicate the presence, or not, of coral reefs (including deep-water corals) and banks of algae or mollusks in the affected area. The information must be gathered in a detailed map, in a scale suitable for visualization, with indications of bathymetry and facies analyses, in which are represented the underwater structures to be installed. The maps should highlight the distance that wind turbines and other underwater structures will present from the identified formations or possible interactions, if any.

6.2.2.1. Benthic Community

This topic aims to characterize the nature of habitats and communities, as well as their degree of sensitivity to the potential impacts of the enterprise. In addition to supporting the definition of the design layout and mitigating measures, it will establish the baseline for future monitoring of impacts on the group in the area directly affected.

a) Define sampling mesh according to the spatial heterogeneity of the Area of Study.

b) Carry out a sample in triplicate (three sub-samples in each sampling unit) for the soft soil benthonic community.

c) Include seasonality, with at least two campaigns, one of which in summer.

d) Characterize the nature and ecological status of habitats, ecological parameters (abundance, richness and biomass), structure and composition of communities, time variability, geographical distribution, remarkable species and species particularly sensitive to sediment resuspension.

e) Characterize the Benthonic community of consolidated bottom considering the percentage of coverage of fouling organisms and zoning.

f) Identify and geospatialize habitats available for potential invasive species or their presence.

g) Select and determine the ecological quality index of the benthic compartment (e.g. M-AMBI).

6.2.2.2. Coral reefs, Reef Formations and/or Coralline Communities

This topic aims to identify rich, vulnerable and poorly resilient habitats, such as corals and algal banks, for which the venture should avoid interference. It is recommended, as a reference, the use of the National Plan of Action for the Conservation of Coral Environments.

a) Identify, describe and geospatialize the coral reefs' areas of occurrence (including deep-water corals) and banks of algae or mollusks.

6.2.2.3 Ichthyofauna

This topic aims to characterize the nature of habitats and communities, the degree of sensitivity to potential impacts and establish the baseline for monitoring the impacts on the group in the area of Direct Influence, based on ecological metrics, and the Area of indirect influence, based on fisheries statistics. It is recommended the use, as reference, of the National Action Plans for the conservation of sharks and Rays.

a) Propose sampling mesh considering Study Area and Control Area.

b) Include the seasonality, with at least two campaigns.

c) Characterize structure and composition of communities, use of habitats, trophic relationships, ecological parameters (abundance, richness and biomass), seasonal and interannual variability (fisheries statistics).

d) Identify species particularly sensitive to noise and relate to the corresponding modelling of noise emissions in the different phases of the enterprise.

e) Identify, geospatialize and describe the places of concentration of juveniles and adults, nurseries, migratory routes, areas and periods of reproduction and spawning of fish resources, as well as the important species for maintaining stocks.

6.2.2.4. Marine Turtles

This topic aims to identify the overlap of the areas affected by the venture with areas sensitive to the taxon, aiming at the adoption of preventive and mitigating measures. It is recommended the use, as reference, of the "Marine Turtle Licensing Guide" (ICMBio, 2017), National Action Plan for the conservation of sea turtles (ICMBio, 2011) and Normative Instruction IBAMA/ICMBio n 01/2011)

a) Identify, characterize and map sensitive areas for each species occurring in the AS: spawning, nurseries, food and migration routes, relating them to installation activities, in particular the support vessel traffic and noise emission (perform modelling) and operation, in particular wind turbine and substation lighting, the generation of electromagnetic fields and the provision of food and resources near offshore structures (reef effect).

6.2.2.5. Avifauna

This topic aims to characterize the nature of habitats and communities, the degree of sensitivity to potential impacts and, in addition to support the definition of the layout of the project as well as mitigating measures, establish the baseline for monitoring the impacts on the group in the Study Area, based on ecological metrics. It is recommended the use, as a reference, of the National Action Plans for the conservation of Albatrosses and Petrels, Seabirds and Migratory Shorebirds.

a) Propose sampling mesh covering the Area of Study for seabirds and waders, and Marine Control area.

b) Take account of seasonality, with at least four campaigns.

b') If reliable data on migratory routes on a local scale do not exist, monthly campaigns should be conducted over one year.

c) Map coastal environments of marked importance to the wader avifauna, informing the type of use by the birds.

d) Perform observations from fixed points aiming to characterize the distribution, richness and abundance of the wader avifauna and its temporal variations.

e) Make observations from the coast, aiming to characterize the dynamics of the avifauna between land and sea.

f) Perform observations in transects (aerial or boat) aiming to characterize, in detail, the distribution, wealth, abundance and its temporal variations.

g) Identify and geospatialize breeding sites, concentration and nesting of seabirds.

h) Characterize the movement patterns of the birds in order to support the definition of the layout of the wind turbines and the provision of corridors and the use of airspace in the different altitude bands, in order to identify species and/or groups most susceptible to collision in the turbine blades weeping area.

i) *Use modelling to estimate the risk of avian collisions (see Masden EA & Cook ASCP. 2016. DOI: 10.1016/j.eiar.2015.09.001; Band B. 2012. Using a collision Risks for Offshore Wind Farms Report by Britih Trust of Ornitoloy, Bureau Waardenburg. By, and University os st. Andrewa.pp 62).*

j) Use radar, if migratory phenomena are identified, in order to quantify day and night movements.

6.2.2.6. Chiropterans

This topic aims to identify the occurrence of taxon in the Study Area, aiming at the adoption of preventive and mitigating measures.

a) Use secondary data for community characterization.

b) Where species with potential use of offshore space have been identified, campaigns in the AS and the coastal area should be conduct during periods which they are likely to occur, aiming at identifying and geopatializing the use of marine habitats and migratory corridors, as well as characterizing the use of habitats and ecological parameters (abundance and richness).

6.2.2.7. Marine Mammals

This topic aims to characterize the nature of habitats and communities, the degree of sensitivity of populations facing noise and barrier effect caused by turbines, underwater works and vessels, and modifications of trophic resources. Thus, it should subsidize the definition of the layout of the project and mitigating measures. It is recommended the use, as a reference, of the National Action Plans for the conservation of Small Cetaceans, Large Cetaceans and Pinnipeds, Sirens, Porpoise and the Normative Instruction IBAMA/ICMBio nº 02/2011.

a) Propose sampling mesh contemplating the Area of Study.

b) Take account of seasonality, with at least four campaigns.

c) Use observation methods by transects and passive acoustics.

d) Identify spatially and temporally areas of concentration, reproduction, feeding and migration routes of marine mammals by species.

e) Describe the structure of populations using indicators (diversity, distribution and abundance), statistically characterizing eventual space-time variability.

f) Identify potentially sensitive species according to their hearing perception spectra and noise emission modelling, by frequency.

6.2.3. Terrestrial Vegetation

This topic aims to characterize the vegetal formations potentially impacted by the implantation of the onshore segment of the transmission line and support structures.

a) Identify and characterize, from primary and secondary data, the forest remnants, including floristic aspects, with a view to determining the successive stage of vegetation. The qualitative and quantitative survey should include arboreal and shrub species and should be only qualitative for sub-shrub, herbaceous, epiphytes and lianas.

b) Identify and list flora species, highlighting endemic, rupicolous, rare, endangered, vulnerable, of significant ecological, economic, medicinal, food and ornamental values. Consider the Ordinance MMA nº 443/2014 and regional lists of endangered flora, when existing.

c) Provide for a Plant Germplasm Rescue Program for species of conservation interest, taking into account the phenology of the species occurring in the area, obtained from secondary data, aiming at planning the collection of viable biological material (seeds, seedlings and germplasm) for the purpose of forest recovery; and

d) Estimate possible areas of vegetation suppression in the DAA. The actual quantity will be required at a later stage within the Forest Inventory.

e) Elaborate a map of current vegetation, with indication of the stages of succession.

6.3. Socioeconomic Environment

a) Consider, in the diagnosis of the socioeconomic environment, the use and occupation of the soil, the uses and availability of water and the socioeconomics, highlighting the relationships of dependence among the local society, the environmental resources and the potential future use of these resources.

b) Characterize and analyze the current socioeconomic and environmental condition of the study area, enabling the correct identification and evaluation of the social and environmental impacts that may be caused by the planning, implementation and operation of the undertaking, directly or indirectly.

c) Identify and analyze the intensity of migratory flows informing regional origin, length of stay in the municipality, possible causes of migration, specifying propositions of location, work and access.

d) Propose methodology for the Socio-Environmental Participatory Diagnosis – (SEPD) before its execution, focusing on the fishing colonies that navigate and develop their current activities in the study area.

6.3.1. Population Dynamics

6.3.1.1 Population

a) Identify the social user groups of the marine coastal area, mainly artisanal fishermen, collectors/pickers of mollusks and crustaceans, divers, or communities and social groups that depend directly or indirectly on marine areas for their livelihood. Identify if there are organizational and representative structures of the community groups and list them.

6.3.1.2. Basic and Services Infrastructure

a) Characterize the condition, services and infrastructure existing in the coastal region of the municipality of the study area, as well as the demands regarding services of: (i) leisure; (ii) sewage collection and treatment; (iii) water consumption; (iv) marketing of fishery and shellfish products.

6.3.2. Economic Dynamics

a) Present the following indicators: economically active population, municipal unemployment rate and unemployment rates.

6.3.2.1. Productive Activities

a) Present map with occupation of the marine space, for the various productive activities including the proposed location for the enterprise.

b) Present the characterization of the fishing activity, considering the fishing activities and routes carried out in the area of study, both of industrial and artisanal nature.

c) The artisanal fishery should be characterized by a focus on the fishing communities using the study area as a fishing area or for transit from the community to their respective fishing areas, presenting: (i) number of fisherman; (ii) fishing gear used and its target species; (iii) characterization and quantification of the fleet of each community; (iv) mapping of the fishing areas of each community and their transit routes; (v) characterization and location of the points of landing of fish used by the community, as well as the infrastructure used by the fishery framework community (fuel supply points; ice; sale and maintenance of nets and other fishing gear used, such as line hook, etc.) (vi) estimated annual production by target species, period and by fishing gear in each community.

d) Characterize, if any, not shipped fishing, in shipwrecks and artificial reefs, providing: (i) time of year; (ii) frequency; (iii) methods used; (iv) target

species; (v) contribution to whole local production; (vi) possible use conflicts of the shipwreck.

e) Map and characterize aquaculture activities, when appropriate.

f) Map and characterize activity of shellfish collection, if any, informing: (i) time of year; (ii) target species; (iii) areas of use; (iv) characteristics of the involved social groups.

g) Map and characterize the activity of diving and/or amateur fishing, informing the existence of underwater fishing.

h) Characterize the tourist activity/potential, if any, presenting: (i) economic indicators related to its exploitation (jobs, income or other relevant indicators); (ii) time of year; (iii) tourist attractions; (iv) presence of water sports; (v) floating population and occupancy rate by season; (vi) research on the perception of interference in the local landscape and the positive and negative aspects of the enterprise; (vii) government programs of promotion, initiatives or private sector articulations; (viii) available infrastructure; (ix) proposal of activities compatible with the enterprise that can be developed.

6.3.2.2. Municipal collection

a) Present tax collection data of the municipalities of the study area, updated to at least the fiscal year before the study protocol, and characterized by sector of the local economy.

6.3.3. Territorial Dynamism

a) Characterize the landscape through descriptive and historical analysis of the occupation in the last 50 years, in the municipalities of the Study Area.

b) Identify and map the population agglomerations and public facilities (schools, health centers, among others) intercepted or located in the vicinity of supporting land routes and structures, which will be used by the undertaking in the deployment phase.

c) Identify and map the land use in the onshore coastline perpendicular to the marine polygonal of the Study Area, discriminating the localities with housing, tourism, leisure, areas of urban commercial use, port polygons and/or private terminals, and other uses for the local territorial dynamics.

6.3.4. Socio-cultural dynamics

6.3.4.1. Historical, Cultural and Archeological Heritage

a) Identify the historical, archaeological and/or cultural sites of interest in the Study Area, also considering those that are in the process of landmark designation in the federal, state and municipal scope.

6.3.4.2. Traditional Communities

a) Present a mapping with the location of indigenous communities, quilombolas[1] communities and other traditional communities, as defined by Decree No 6040 of February 7, 2007, containing the distances between the identified locations and DAA.

6.4. Integrated Analysis of Environmental Diagnosis

a) Highlight, in a synthetic way, the sensitive environmental issues of the region that have been identified in the sector diagnoses, such as: existence of migratory routes or areas vital for the reproduction or feeding of fauna, existence of ecological corridors or fragments of vegetation of great value for the preservation of biodiversity, presence of contaminated sediments, sensitivity of the type of sea bottom, existence of traditional communities, fishing areas, among others.

b) Perform an analysis containing the relations and interactions between the physical, biotic and socioeconomic environments raised, emphasizing the sensitive environmental issues. This item should, therefore, not consist of a grouping of information collected in each environment.

c) Employ geoprocessing techniques in the integrated evaluation of the different environmental themes, in order to produce an Environmental Weakness Map for the Study Area, based on the Identification Map of Preexisting Multiple Uses, plus relevant diagnostic data. Such a map should support the assessment of project feasibility, definition of the layout and proposition of preventive and mitigating measures.

d) Present the criteria for determining the relative importance of each theme, focusing on the social and environmental aspects.

e) Consider, at least, the following layers of information in the composition of the Weakness Map (in addition to the relevant layers of the Pre-Existing Multiple Uses Identification Map):

- Benthic Community: rich, vulnerable and poorly resilient habitats;
- ichthyofauna: breeding, spawning, nursery, shelter and food areas;
- avifauna: areas for feeding, breeding, nesting, migratory routes and occupation of airspace at risk;
- Marine mammals: areas for feeding, breeding and migratory routes;
- chelonians: areas for feeding, breeding, nesting and migratory routes.

[1] T.N.Quilombolas is an afro-Brazillian that live in a Quilombo which were settled by fugitive slaves in Brazil.

- Fishing: areas for fishing, shellfish collection, aquaculture, shipwreck, fish landing points.
- Multiple uses: delimitation of the areas used to practice water sports, tourism, tourist attractions.

7. ENTITIES INVOLVED, WHEN IT FITS

7.1. Secretaria de Vigilância em Saúde (Department of Health Surveillance)

When the activity or the enterprise is located in the Legal Amazon or in an area defined by the Ministry of Health as being at risk or endemic to malaria, IBAMA should consult the SVA about TR minutes.

7.2. Fundação Nacional do Índio - Funai (Nacional Indian Foundation)

Where the activity or undertaking subject to the environmental licensing is located on indigenous land or presents elements that may have a direct social and environmental impact on indigenous land, IBAMA should consult FUNAI about TR minutes.

7.3. Palmares Cultural Foundation

Where the activity or undertaking subject to the environmental permit is located on quilombola land or has elements which may have a direct social and environmental impact on the quilombola land, IBAMA should consult the Palmares Foundation about TR minutes.

7.4. Instituto do Patrimônio Histórico e Artístico Nacional - Iphan (National Historic and Artistic Heritage Institute)

When the area of direct influence of the activity or the undertaking submitted to the environmental licensing is located in area where it was found the occurrence of the cautious cultural goods referred to in Section II of the art Caput. 2° of the Interministerial Ordinance n° 60/2015, IBAMA should consult the IPHAN on TR minutes.

7.5. Instituto Chico Mendes da Conservação da Biodiversidade - ICMBio (Chico Mendes Institute for Biodiversity Conservation)

When the activity or undertaking affects a specific Federal Conservation Unit (CU) or its buffer zone (BZ). The specific studies should be geospatialized and include identification, the characterization and assessment of the environmental impacts of the undertaking or activity relating to the main objectives and attributes of each one of the affected conservation units and their BZ; including the speleological studies within the units, as well as the respective proposals for control and mitigation measures.

ICMBio should be consulted, as provided in CONAMA Resolution nº 428/2010 and Joint Regulatory Instruction nº 8/2019/ICMBio/IBAMA.

7.6. State or Municipal CU Management Bodies

When the specific activity or undertaking affects the state or municipal Conservation Unit (CU) or its damping zone, the specific studies on the CU should be geospatialized and include the identification, the characterization and the assessment of the environmental impacts of the undertaking or activity relating to the main objectives and attributes of each affected conservation units and their BZ; including the speleological studies within the units, as well as the respective proposals for control and mitigation measures.

8. ANALYSIS OF THE ENVIRONMENTAL IMPACTS

a) Identify, describe and systematically evaluate the environmental impacts generated in the planning, installation, operation phases (normal and abnormal associated with operational deviations, incidents, accidents, etc.) and deactivation of the undertaking or activity, considering the project, its alternatives, the horizons of time of impact and indicating the methods, techniques and criteria adopted for its identification, quantification and interpretation. The following are some examples of environmental aspects that are normally evaluated in projects of this type. Related to each of them, there are some effects that must be studied in order to subsidize the listing of the main impacts of each environmental aspect:

Aspect	Effect
Movement of vessels	Effects on turtles and marine mammals, effects on fishing activities.
Noise and Vibrations	Behavioral and physiological effects on different groups of fauna, effects on coastal populations.
Increase in the turbidity	Effects on planktonic community and trophic chains, recreational activities.
Changes in seabed and coastline	Effect on benthonic community, trophic chains, erosion of beaches and damage to buildings.
Creation of artificial substrate	Effect on species composition.
Introduction and dispersion of alien and invasive species	Effects on native populations.
Artificial light	Effects on birds, chiropters and sea turtles.
Creation of electromagnetic fields	Effects on migration and movement of fish (mainly elasmobranchs), turtles and marine mammals.

Generation of use restriction area	Interference in the trophic chains, fishing activities, tourist, navigation and other uses.
Presence of structures and/or movement of blades	Effects on avifauna and chiropractic (mortality, barrier effect, fragmentation, habitat suppression and displacement), tourist activities and coastal communities.
Shadow and stroboscopic effect	Effects on coastal populations.
Generation of jobs and taxes	Effects on local communities.
Energy Generation	Effect on availability and energy security.
Residues Generation	Effect on water quality and live organisms.

It should be noted that the suggested environmental aspects are exemplifying, and do not exhaust the range of options to be considered, and the entrepreneur is responsible for the verification of the aspects, depending on the specificities of the project and the area of study.

If dredging is necessary, mathematical modelling of the dispersion of the turbidity plume to be generated at the dredging sites and the disposal of the dredged sediment should be performed in view of the potential for generating impacts, with their respective magnitudes.

b) Analyze the environmental impacts of the project and its alternatives, by means of identification, prediction of the magnitude and interpretation of the importance of the likely relevant impacts, by specifying: positive and negative impacts (beneficial and adverse), direct and indirect, immediate and medium to long term, temporary and permanent; their degree of reversibility; their cumulative and synergistic properties; the distribution of social burdens and benefits.

c) Describe the expected effects of the envisaged mitigating measures on negative impacts, mentioning those that could not be avoided, and the expected degree of change.

d) Identify measures to avoid, minimize and /or remedy, always in this order of priority, depending on the mitigation hierarchy and the effectiveness of the measure, at least for significant impacts, in order to make them acceptable. Identify the leverage measures for major positive impacts.

e) propose compensatory measures for the remaining negative impacts (those where it is not possible to implement measures to avoid, minimize and/or remedy in order to make their importance acceptable).

f) Present tables for the different stages (planning, installation, operation and deactivation), showing the generating activities, environmental aspects, environmental factors affected, a summary description of each environmental impact and the proposed preventive, mitigating or compensatory measure.

g) From the quantitative or qualitative indicators of magnitude chosen for each impact, to subsidize the classification of item “b” above, propose the maximum parameters of occurrence acceptable for each negative impact, as decision-making beacons to be considered when concluding on the socio-environmental viability of the enterprise.

8.1. Environmental Compensation, envisaged by Sistema Nacional de Unidades de Conservação - SNUC (National System of Conservation Units)

a) Present and justify the following indices for the purposes of calculating the GI-Impact Degree to meet the obligations of the Environmental Compensation, as set out in the Annex of Decree 6.848/2009:

i) Magnitude Index (MI);

ii) Biodiversity Index (BI);

iii) Coverage Index (CI);

iv) Temporality Index (TI);

v) Disturbance Index of Priority Areas (DIPA) and

vi) Influence on Conservation Unit (ICU).

9. AREA OF ENVIRONMENTAL INFLUENCE

a) Define the boundaries of the geographical area to be directly or indirectly affected by the impacts, called the influence area of the project, considering, in all cases, the river basin in which it is located.

b) Identify, characterize, georeference and map the determinants for the delimitation of the influence areas.

c) Consider the data obtained and the impact analysis when defining the areas of influence.

d) Present in the format .kmz the limits of the areas of influence, preferably by (physical/biotic/socioeconomic) means.

e) Distinguish the areas of influence as follows:

9.1. Directly Affected Area (ADA)

Area where the activity will be carried out or where the structures of the enterprise are located, including the ancillary structures. This area is not defined from the impacts.

9.2. Direct Influence Area (AID)

Area subject to direct, actual or potential impacts during all phases of the undertaking/activity. Its delimitation should be based on the scope of the direct impacts of the undertaking on the socioeconomic, physical and biological characteristics of the systems to be studied and the particularities of the undertaking/activity, including complementary works such as water abstraction, access roads and encampments.

9.3. Area of Indirect Influence (IIA)

Area subject to indirect, actual or potential impacts during all phases of the undertaking/activity. Its delimitation should be based on the scope of the indirect impacts of the undertaking/activity on the socioeconomic, physical and biological characteristics of the systems to be studied and the particularities of characteristics of the systems to be studied and the particularities of the undertaking/activity, including complementary works such as water abstraction, access roads and encampments.

10. ENVIRONMENTAL RISK ANALYSIS

The consequences of the malfunction of the undertaking may be more significant than the impacts caused during the normal operation of the undertaking. That way, the Environmental Risk Analysis is foreseen, aiming to identify the main risks of the venture to the environment and the external community. Therefore, the identification of risks to workers and property is not the focus of this study.

The environmental risks can be of the natural type (storms, lightning, floods, slides, flooring, among others), acute technological (explosions, leaks, among others), or chronic technological (treatment plant malfunction, among others).

The Environmental Risk Analysis should include the following stages:

- Display the location of the development and its units on a map with appropriate resolution and scale.
- Present brief and objective description of the area of influence, using maps whenever possible, highlighting: (i) meteoceanographic data, (ii) water bodies, (iii) populated areas surrounding the development, (iv) environmentally sensitive or protected areas, (v) economic and/or extractive activities, among others, that may be affected in the event of an accident of the undertaking.

<u>Installation Stage</u>

- Describe the activities involving the handling of dangerous products, such as: oil storage, machinery fueling, vessels fueling, removal of oily waste, among others, correlating with the areas indicated in the layout of the project.

- List hazardous products handled and their respective UN classification. The list should include, inter alia, fuels, goods and waste, where relevant. The *Fichas de Informação de Segurança de Produto Químico* – FISPQs (Chemical Product Safety Data Sheets) of identified hazardous products should be forwarded in a digital attachment.

- Describe other activities developed during the installation of the enterprise that may present risks to the environment or the external community.
- Present Preliminary Hazard Analysis (PHA) in spreadsheet format, covering both intrinsic equipment, instrument and material failures, as well as operational errors. The PHA shall identify hazards, causes and effects (consequences).
- Classify each hazard into frequency and severity categories according to the following model.

Table 1 - Frequency categories of occurrence of identified hazards

Category	Denomination	Description
A	Remote	It is not expected to occur.
B	Unlikely	Expected to occur up to one time.
C	Likely	Expected to occur a few times.
D	Frequent	Expected to occur several times.

Table 2 - Severity categories of identified hazards

Category	Denomination	Description
A	Low	Contamination near the leak source, volume less than 200 liters (one drum), natural degradation or local manual cleaning of the substrate (absorbing material). Nuisance to members of the outside community.
B	Medium	Contamination spreads, but remains inside the facility or in its vicinity, volume from 200 to 1000 liters, natural degradation or local manual cleaning (absorbent material). Minor injuries to members of the external community.
C	High	Contamination spreads away from the source of the leak, reaching areas external to the installation, volumes of thousand to 8 thousand liters, need to carry out containment operation and mechanical and manual retrieval and/or cleaning of the affected areas. Moderate damage to members of the outside community.
D	Catastrophic	Contamination spreads, reaching extensive area (bay, estuary, another municipality), volumes above 8 thousand liters, need to carry out containment operation and mechanical and manual gathering and cleaning of the affected areas. It causes death or serious injury to members of the external community.

- Elaborate matrix establishing the relationship between frequency and severity, in order to identify the level of risk, according to the model below.

		Frequency			
		A	B	C	D
Severity	D	3	4	4	4
	C	2	3	4	4
	B	1	2	3	4
	A	1	1	2	3

Severity	Frequency	Risk
A - Low	A - Remote	1 - Low
B - Medium	B - Unlikely	2 - Moderate
C - High	C - Likely	3 - Serious
D - Catastrophic	D - Frequent	4 - Critic

Figure 1 – Risk matrix

- Present spreadsheet containing the identified hazards, their classification as to frequency, consequence and level of risk, as well as the preventive and/or mitigating actions, which should be detailed in the Risk Management Program.
- Present conclusion considering the tolerability of the risks detected due to the socio-environmental sensitivity of the enterprise area.

Operation Phase

- Describe the main activities related to the operation phase, indicating in the layout of the undertaking the locations where the actions will be carried out.
- Present a history of environmental accidents in the last 20 years in similar enterprises. For each accident involving spillage of dangerous product, report the total volume spilled, total volume collected, affected areas, and response actions taken, if such information is available.
- Describe operations involving the handling of dangerous products such as: oil storage, machinery refuel, vessels refuel, removal of oily waste, among others, correlating with the areas indicated in the layout.
- Describe other activities developed during the operation of the enterprise that may present risks to the environment or the external community.
- Present Preliminary Hazard Analysis (PHA) in spreadsheet format, covering intrinsic equipment, instrument and material failures, as well as operational errors. In the PHA should be identified hazards, causes and effects (consequences).
- Sort each hazard into frequency and severity categories according to the tables and figures presented for the installation phase.
- Present spreadsheet containing the identified hazards, their classification as to frequency, consequence and level of risk, as well as the preventive and/or mitigating actions, which should be detailed in the Risk Management Program.

- Present conclusion considering the tolerability of the risks detected due to the socio-environmental sensitivity of the enterprise area.
- List the dangerous products handled and their respective UN classification. The list should include, inter alia, fuels, goods and waste, where relevant. *The Fichas de Informação de Segurança de Produto Químico* - FISPQs (Chemical Product Safety Data Sheets) of identified hazardous products shall be enclosed in digital media only.

10.1 Environmental Risk Management and Emergency Care

Based on the identified risks, the proposal of the Risk Management Program - RMP should be presented, including the installation and operation phase of the venture. The RMP should contain, for each stage, a description of the activities involving the identified risks (e.g., machinery fueling procedures), preventive measures to avoid accident (e.g., measures to prevent the fuel from leaking during refueling) and Emergency Plan, with response structure to meet the identified accidental scenarios. If the undertaking is viable, the RMP should be detailed at a later stage.

11. ENVIRONMENTAL MANAGEMENT PLAN

a) Present, from the impact analysis, in a conceptually way, the plans, programs and measures to be adopted in all phases of the enterprise to avoid, mitigate or compensate the adverse impacts and leverage the beneficial impacts, indicating the factors and parameters to be considered.

b) Propose monitoring and follow-up programs (positive and negative impacts), using predefined indicators, with the aim of verifying the effectiveness of the measures and the occurrence of the impact, as well as establishing the actions to be taken.

12. CONCLUSION

a) Characterize the future environmental quality of the area of influence by comparing the different situations of adoption of the project and its alternatives, as well as the hypothesis of its non-realization and consider the proposition or existence of other undertakings in the region.

b) Indicate clearly, objectively and impartially, focusing on significant environmental impacts, whether, from the studies and implementation of the programs and measures by the entrepreneur, the undertaking/activity has environmental viability or not.

The conclusion should not consider actions and measures of third parties for the purpose of attesting the environmental viability of the undertaking/activity.

13. REFERENCES

a) List the references used to carry out the studies, according to the current norms of *Associação Brasileira de Normas Técnicas* – ABNT (Brazilian Technical Standards Association).

14. GLOSSARY

a) List the technical terms used in the study with their respective meanings.

15. ENVIRONMENTAL IMPACT REPORT – RIMA

a) Present the Rima objectively and appropriately for an easy understanding. The information should be translated into accessible language, illustrated by maps, charts, graphs and other visual communication techniques, so that the advantages and disadvantages of the project can be understood, as well as all the environmental consequences of its implementation. Its minimum content is determined in art. 9º of Resolution CONAMA 01/1986.