



# Integrating Biodiversity into Environmental and Social Impact Assessments Conducted in Connection with Upstream Projects

Supplement #1 to the "Good Biodiversity Management Practice Guide"

2014





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**THIS DOCUMENT APPLIES TO EXPLORATION & PRODUCTION ACTIVITIES,  
CONSIDERING THE FOLLOWING LIMITATIONS:**

- Should any specific regulations and/or legislation apply, or better knowledge concerning the issues in question be available, the latter will always prevail over the information included in this document.
- Without prejudice to the methodology described in this Guide, other tools may be useful for assessing the impact of Oil & Gas projects. Such tools will be identified in this document whenever required.
- Users are advised to read and consult all reference documents mentioned in this Guide.



## INTRODUCTION

The purpose of this Guide is to provide guidelines for integrating Biodiversity issues into Environment and Social Impact Assessments (ESIA) conducted in connection with Oil & Gas (O&G) projects. However, a review of the methods used is not intended, but a clear definition of the required steps and actions to ensure that Biodiversity issues are suitably integrated into the aforementioned studies.

In this sense, widening of the usual scope of assessment is proposed, with a view to integrating Biodiversity issues into each stage of the Impact Assessment process. This Guide aims to promote a holistic approach to Impact Assessment, through increased focus on ecosystems, as recommended in the United Nations Convention on Biological Diversity (CBD). Accordingly, long-term and cumulative secondary impacts are to be considered, in addition to immediate, primary impacts.

This Guide was prepared based on documents produced within the scope of the Energy & Biodiversity Initiative, particularly “Integrating Biodiversity into Environmental and Social Impact Assessment” and “Good Practice in the Prevention and Mitigation of Primary and Secondary Biodiversity Impacts”, as well as other reference documents, used as required to complement, clarify or provide background information on specific issues, or describe alternative approaches.

Without prejudice to the methodology described in this Guide, other tools may be useful for assessing the impact of Oil & Gas projects. Such tools, which will be identified in this Guide whenever required, include the presented in the Table 1.

Finally, it should be stressed that the G+ System and the corresponding documents – Standard Procedures, Regulatory Guides, Technical Guides, Regulatory Standards – should be considered, directly or indirectly, within the scope of Environmental Impact Assessments. Additional information on how the G+ System relates to integration of Biodiversity issues into these studies is available in the “Good Biodiversity Management Practice Guide” (Galp Energia, 2012).

Table 1 - Reference documents to be considered when assessing impact on Biodiversity

Reference	Summary Description
Environmental-Social-Health Risk and Impact Management Process, Report No. 389, OGP, April 2007	Describes Environmental and Social Impact Assessment systems: Model 1: Strategic Environmental Assessment; Model 2: Environmental Impact Assessment during the pre-project stage; Model 3: Iterative Environmental Impact Assessment during project development.
Refined guidelines on biodiversity considerations in EIA and SEA (Part 1: EIA), prepared in response to decision VI/7-A, July 2005	Suggests an approach to integrating Biodiversity into ESIA (not specific to the Oil & Gas sector), describing stages such as Screening, Scoping, Impact Assessment, the Environmental Assessment Report and Statement, and Monitoring.
BMP Guidelines - for preparing an Environmental Impact Assessment (EIA) report for activities related to hydrocarbon exploration and exploitation offshore Greenland, Danish National Environmental Research Institute, Greenland Institute of Natural Resources and Bureau of Minerals and Petroleum, January 2011	Describes how Environmental Impact Assessments associated with Oil & Gas projects are designed in Denmark.
JNCC guidelines for minimising the risk of disturbance and injury to marine mammals from seismic surveys, Joint Nature Conservation Committee, June 2009	Describes good practice regarding the protection of marine mammals during offshore operations.
Environmental management in oil and gas exploration and production: an overview of issues and management approaches, Joint E&P Forum/UNEP Technical Publication, 1997	Describes the most relevant impacts, as well as management approaches and operating practices and procedures in the Oil & Gas industry.
Biodiversity Conservation Standard and Sustainable Management of Living Natural Resources, Internacional Finance Corporation, World Bank Group, January 1, 2012	Describes the financing standards defined by the World Bank concerning Biodiversity Conservation and Sustainable Management of Living Natural Resources.
CI Policy Paper: Mainstreaming Biodiversity Conservation into Oil and Gas Development, Conservation International	Provides information on risks to Biodiversity resulting from Oil & Gas exploration and production projects, in addition to presenting a series of good practices.



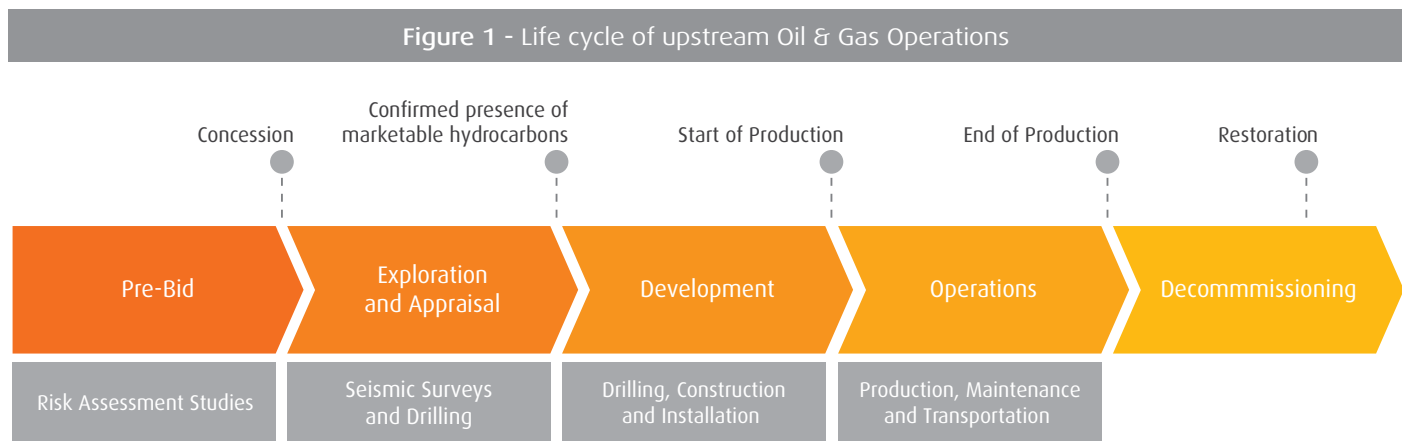


# SCOPE

This document complements the “Good Biodiversity Management Practice Guide” of the Galp Energia Group by focusing specifically on integrating Biodiversity into Environmental and Social Impact Assessments conducted in connection with Upstream O&G projects.

Should any other reference documents (in addition to those identified in this document), specific regulations and/or legislation apply, or better knowledge concerning the issues in question be available, the latter will always prevail over the information included in this document.

This Guide applies to the entire Upstream Oil & Gas Project lifecycle and aims to provide guidance to the technicians responsible for monitoring ESIA studies. In some cases, ESIA studies are conducted by the government (namely, in the United States, where ESIA studies are conducted according to the National Environmental Policy Act – NEPA) rather than the Company involved, in which case the latter will have little or no control over the process.





## BACKGROUND INFORMATION

At its simplest, Environmental and Social Impact Assessment (ESIA) consists of identifying, estimating and evaluating the environmental and social impacts of a given action. Integration of Biodiversity issues not only allows Companies to meet regulatory requirements, but also contributes to improving project design, construction and operations, ultimately minimising impact on Biodiversity.

It might be argued that a standard ESIA already includes Biodiversity issues. However, best practice requires a more explicit and comprehensive integration of Biodiversity issues, based on a valid, transparent Risk Assessment process. In fact, traditional approaches may fail to consider the following issues:

- The significance of seasonality and natural cycles/variability for Biodiversity measurement and monitoring (e.g. project timescales may not allow for long-term surveying of Biodiversity);
- Secondary impacts, i.e. impacts not directly resulting from project activities, but triggered by operations, which may affect areas beyond the project site or concession area, start before project development or persist after decommissioning;
- Resource consumption during the development and operational stages (e.g. water, timber and food requirements likely to affect Biodiversity in areas other than those where activities are undertaken);
- Local, regional and national conservation priorities;
- Different stakeholder perspectives concerning the value of Biodiversity;
- Locations not legally categorised as Protected Areas;
- Non-protected species;
- The meaning of Biodiversity for the quality of life and livelihood of populations.

By integrating Biodiversity into ESIA, Companies will be able to:

- Identify potential risks and impacts on Biodiversity at an early stage;
- Maintain Biodiversity within the area, as far as possible, by avoiding or reducing impacts;
- Improve Biodiversity within a given environment by adequately managing the land and decommissioning the areas involved;
- Obtain support and recognition from the Community for their responsible performance and adequate management practices, thus validating their authorisation to operate and preserving their reputation;
- Gain access to local knowledge (via local Organisations and Communities);
- Establish relationships between the ecological and social aspects of Biodiversity, e.g. preservation of essential resources;
- Reduce current and future liabilities arising in connection with damages to Biodiversity.





# INTEGRATION OF BIODIVERSITY ISSUES INTO ESIA

## 4.1 | INTRODUCTION

A decision was made during the Conference of the Parties to the United Nations Convention on Biological Diversity, held in April 2002, to establish a series of guidelines for incorporating Biodiversity issues into Environmental Impact Assessments. Although this decision was primarily aimed at governments, its main contents are clearly relevant to the O&G industry.

The aforementioned decision stressed the need for the term “Environment”, as defined in national legislations and procedures, to fully encompass the concept of Biodiversity, as defined in the Convention, so that plants, animals and microorganisms are considered at the genetic, species/community and habitat/ecosystem levels, as well as in terms of ecosystem structure and function. In fact, this definition must also be considered within the scope of Company policies and procedures, and form the basis for ESIA conducted in connection with O&G projects.

Additionally, the timescale and spatial scale of impacts should be determined, as well as ecological variables and Biodiversity values, both tangible and intangible, that might be affected by the project. Moreover, mitigation measures and the degree of stakeholder participation in the decision-making process should also be defined.

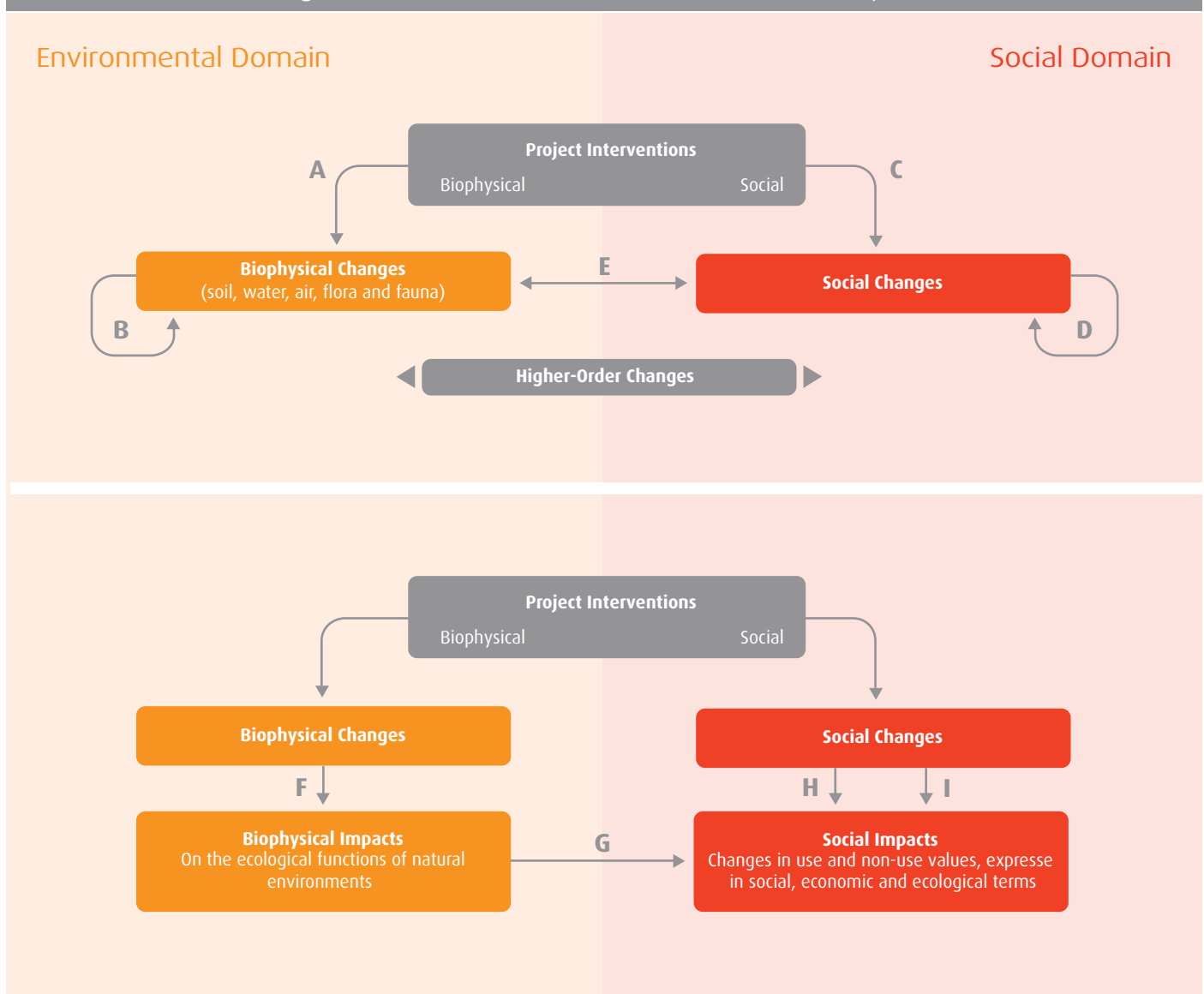
In this sense, Biodiversity issues can be integrated into each ESIA stage, based on adequate Risk Assessment procedures, by:

- Adopting an approach focused on ecosystems, as proposed in the CBD;
- Ensuring that secondary and/or cumulative impacts are considered;
- Analysing and responding to interactions between environmental and social aspects (see Figure 2 – Interactions between environmental and social aspects);
- Considering different impact levels (i.e. genetic, species and ecosystem) and adopting adequate preventive and mitigation measures.

Given the main goals of the CBD (conservation, sustainable use and equitable sharing of the benefits of Biodiversity), an adequate ESIA should provide suitable answers to the following questions:

- Will the intended activity affect the physical environment to such an extent as to cause biological losses likely to lead to the extinction of genetic varieties or populations of species, or result in the loss of habitats or ecosystems?
- Will the intended activity surpass the maximum sustainable yield, the carrying capacity of the habitat/ecosystem or the maximum allowable level of disturbance of a given resource, population or ecosystem?
- Will the intended activity result in changes to the access to and rights over biological resources?

Figure 2 – Interactions between environmental and social aspects



- A** The activities undertaken lead to biophysical changes: projects or activities consist of biophysical or social interventions. Biophysical interventions result in biophysical changes (defined as changes to the characteristics of the major environmental compartments: soil, water, air, flora and fauna).
- B** Direct biophysical changes may trigger a chain of secondary biophysical changes.
- C** The activities undertaken result in social changes. Projects may involve social interventions leading to social changes (defined as changes to the characteristics of individuals, families, groups or society as a whole). Demographic, economic, socio-cultural, institutional and/or land use aspects may be involved, amongst others.
- D** Direct social changes may trigger a chain of secondary social changes.
- E** Direct social changes may cause biophysical changes and vice-versa.
- F** Biophysical changes lead to biophysical impacts. Impacts are defined as changes to the quality or quantity of goods and services provided by the biophysical environment, i.e. the ecological functions of the biophysical environment.
- G** Impacts result in changes in value to society (social impacts). Changes to the ecological functions of natural environments will lead to changes in their value to society, as the latter ascribes a specific value to these functions. Biodiversity values include use and non-use values.
- H** Social changes lead to social impacts, depending on the community involved.
- I** As human beings and societies as a whole are able to respond to impacts, social impacts may also lead to social changes.

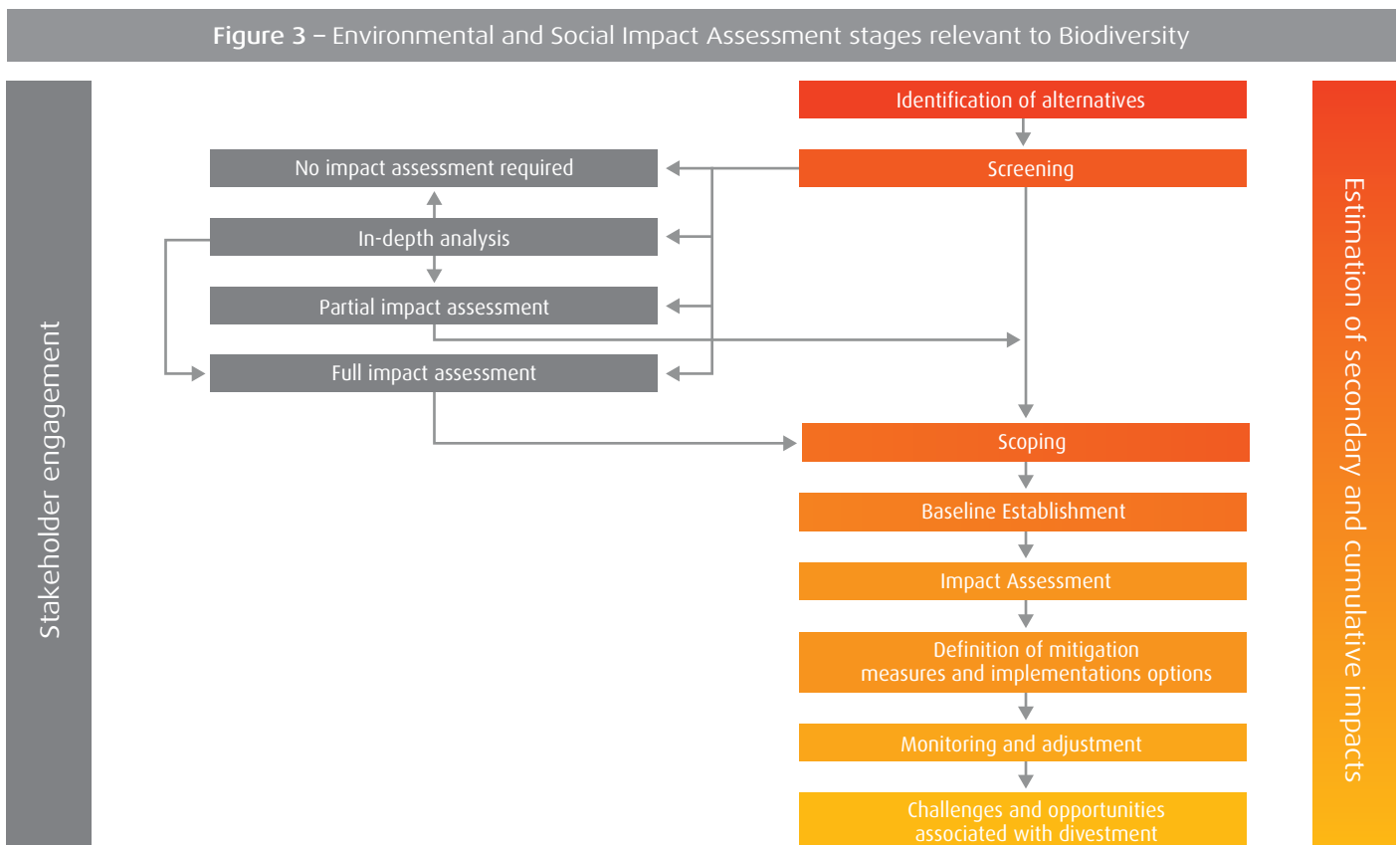
When answering the aforementioned questions, it must be borne in mind that the objectives, level, scope and detail of the ESIA into which Biodiversity issues should be integrated vary with the project stage. Available information and circumstances will also vary over the project lifecycle:

- Good practice dictates that a careful assessment of social and environmental risks, including an assessment of the potentially significant impacts of project activities, should be conducted during the pre-bid stage. Data obtained during this stage will be primarily based on existing information and surveys<sup>1</sup>. In these circumstances, it might be sensible to adopt a precautionary approach, given the likely scarcity of detailed Biodiversity data and the complexity of natural systems. It is also important to recognise that any information gathered at this stage may be commercially sensitive.
- More extensive and detailed Biodiversity data may be required before or during the exploration and appraisal stage. Data may be obtained from small-scale surveys, consultation with Biodiversity conservation NGOs, and theoretical and field studies in areas with similar geological, physical and biological characteristics.
- Detailed surveys may be required during the development stage, particularly in areas of great Biodiversity value, in order to provide a baseline (see 4.7 | Baseline establishment) for future monitoring, evaluation and research studies aimed at filling knowledge gaps.
- Operations may lead to impacts on Biodiversity not previously identified. This situation calls for monitoring and mitigation measures. Monitoring results will allow the Company to introduce improvements to processes and policies, if required.
- The information gathered during the decommissioning stage should be suited to restoration goals and definition of long-term liabilities, when appropriate.

A step-by-step description of how Biodiversity issues should be integrated into an ESIA is provided in the remainder of this section. This information is provided for guidance purposes only and must be adjusted to the specific characteristics of each ESIA. Steps into which the inclusion of Biodiversity issues is not required are not included.

## 4.2 | Stakeholder engagement in Biodiversity issues

Stakeholder engagement in Biodiversity issues is essential to the integration of the latter in ESIA. Accordingly, this concern must be taken into account across the entire assessment process.



<sup>1</sup>For more information see the Complementary Guide Integrating Biodiversity into Upstream Project Site Selection.

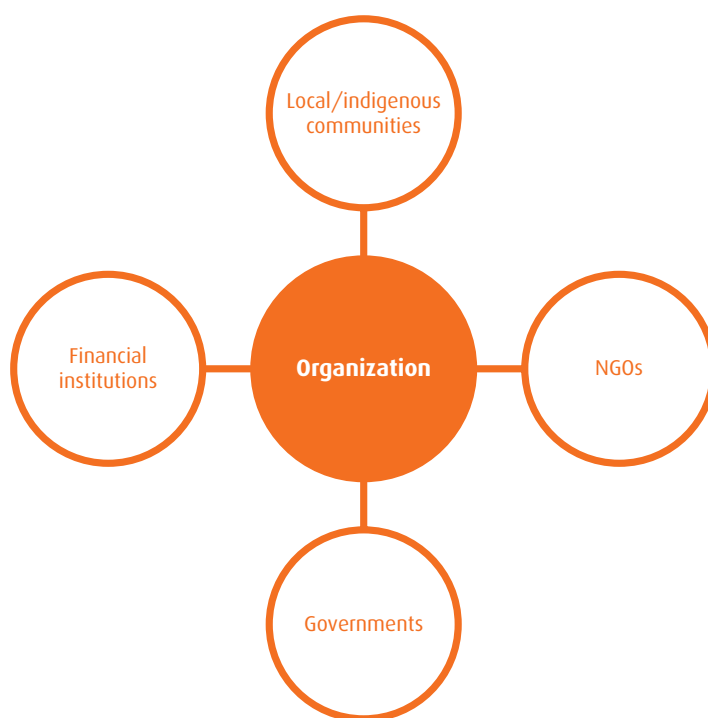
Several references are available to help Companies design and implement effective stakeholder engagement processes, such as “Doing Better Business through Effective Public Consultation and Disclosure: A Good Practice Manual”, International Finance Corporation, 1998, available [here](#), which stresses the need to recognise primary and secondary environmental impacts over time.

The need to involve different stakeholders, particularly indigenous populations, is strongly emphasised in the CBD COP 7 Decision (and in other documents). The close relationship between social and environmental/Biodiversity impacts adds to the relevance of this aspect. Stakeholder engagement allows the identification of resources and sources of information unknown to the general public, in addition to ensuring that all Biodiversity issues are considered. This is particularly true when ecological resources have not only functional but also cultural value to social groups.

Local communities should be given the opportunity to indicate which aspects are particularly relevant to them and identify ways to contribute to the overall process. In fact, these communities may possess extensive knowledge of local plants and animals, ecosystem functioning and ecosystem management techniques, which they often use to obtain food, medicines, fuels, materials and other products.

On the other hand, NGOs can be useful partners in bringing the various stakeholders together into the consultation process. Governments can provide relevant information on the regulatory requirements applicable to the area in question, whereas financial institutions can provide information on their own requirements and what they view as “best practice” in the specific situation in question.

Figure 4 – Stakeholder engagement



As well as identifying the information that can be obtained from stakeholders, it is equally important to understand their needs and concerns, in order to ensure that all parties benefit from the partnership established.

Consultation with stakeholders may become a rather complex process. Stakeholders whose interests in the project are unclear or unsubstantial, or not directly associated with the Communities involved, may express their wish to participate in the consultation process. Conversely, it might prove difficult to ensure that relevant stakeholder groups, such as indigenous populations, which are the most likely to possess traditional knowledge of Biodiversity, are adequately represented, owing to cultural, religious, economic or other factors.

In what concerns institutional and regulatory requirements, it should be borne in mind that an intensive consultation processes, strongly focused on Biodiversity, may be required in countries that are signatories to International Labour Organisation Convention No. 169 on indigenous peoples.

Additional information on integration of indigenous knowledge in project planning and implementation can be found in “Integrating Indigenous Knowledge in Project Planning and Implementation” (Emery, A.R., International Labor Organizations, The World Bank, Canadian International Development Agency, and KIVU Naturtem Inc., 2000), available [here](#).

### 4.3 | Identification of secondary and cumulative impacts

The entire ESIA is based on the estimation of the secondary and cumulative impacts of a given activity. This estimation consists of identifying and determining the magnitude of the secondary and incremental impacts of past, present and future activities.

As an essential factor to the successful integration of Biodiversity issues into an ESIA, stakeholder engagement must be ensured throughout the entire process, including this stage.

Long-term cycles may be critical in determining the effects of introduced stresses and changes. Gradual changes may have cumulative effects, which may lead to significant damages.

Strategic Impact Assessment, including the following tasks, may be required in order to evaluate cumulative effects:

- Impact assessment over an extensive area (i.e. by considering entire ecosystems and regions, instead of merely focusing on the project footprint);
- Consideration of impact on receptors resulting from interactions with other projects and activities, instead of solely considering the project under assessment;
- Estimation of significance considering different timescales and spatial scales.

#### 4.4 | Identification of alternatives

This stage, which can take place during the Scoping stage, involves an assessment of the proposed project and reasonable alternatives, including the decision not to proceed. This approach can be applied to the entire project and individual elements of the latter.

Project teams should have previously developed a suitable system to document the aforementioned assessment, for internal and external communication purposes. Biodiversity information must be considered when making critical decisions concerning the project. For instance, the experts responsible for integrating Biodiversity issues into the ESIA should assist the engineering team in determining the optimum pipeline corridor or facility location, so that sensitive areas, environmentally-friendly construction methods and ecosystem restoration issues are taken into account.

Consulting stakeholders can be extremely useful when evaluating alternatives, as stakeholders can provide local context and identify Biodiversity issues of particular relevance.

The duration of the activities in question is also relevant to their assessment: the need to find alternatives might be viewed differently if their impacts on Biodiversity are temporary rather than permanent (e.g. a dirt road versus a paved road connecting two or more communities).

#### 4.5 | Screening

Screening consists of a high-level review aimed at determining whether a full or partial ESIA is required, provided that the Company is allowed to decide on this matter. This stage establishes the basis for Scoping, in which key impacts are identified and terms of reference defined for the ESIA.

Several outcomes are possible:

- No ESIA is required;
- A full ESIA is required;
- A partial ESIA is required (often called a Preliminary or Initial Assessment);
- Further study is necessary to determine the level of ESIA required;
- The Company decides not to proceed with the project, based on available information.

Regardless of the outcome, Biodiversity issues are likely to influence the decision reached<sup>2</sup>. In fact, many countries focus primarily on legal issues when defining Screening criteria, such as the status of the area involved and the presence of protected species. These issues are often more relevant than Biodiversity value as such, as sites must be selected in compliance with the applicable legislation. On the contrary, other countries start by assessing the need for an ESIA, with a view to ensuring Biodiversity issues are suitably addressed within protected areas and priority conservation areas. In this sense, the integration of Biodiversity issues into the Screening stage will depend on the country or region where the project is to be developed.

The information included in National Biodiversity Strategies and Action Plans may be useful at this point, since Biodiversity conservation priorities are identified and conservation status data provided (see “Refined guidelines on biodiversity considerations in EIA and SEA” (Part 1: EIA), prepared in response to decision VI/7-A, July 2005). Additional information is available [here](#).

<sup>2</sup> For more information see the Complementary Guide Integrating Biodiversity into Upstream Project Site Selection.



The aforementioned source (“Refined guidelines on biodiversity considerations in EIA and SEA” (Part 1: EIA), prepared in response to decision VI/7-A, July 2005) also provides a few relevant questions concerning Biodiversity issues:

- Will the intended activity affect the physical environment, directly or indirectly, to such an extent as to cause biological changes likely to increase the risk of extinction of genotypes or populations of species, or result in the loss of habitats or ecosystems?
- Will the intended activity surpass the maximum sustainable yield, the carrying capacity of the habitat/ecosystem or the maximum allowable level of disturbance of a given resource, population or ecosystem, considering the range of possible values for the resource, population or ecosystem in question?
- Will the intended activity result in changes to the access to and rights over biological resources?

Additionally, some relevant questions to Screening of impacts on Biodiversity are shown in the following table:

Table 2 – Relevant questions to Screening of Impacts on Biodiversity		
Level of diversity	Conservation	Sustainable use
<b>Genetic diversity</b>	Could the intended activity result in the extinction of an endemic species of scientific, ecological or cultural value?	Could the intended activity cause a local loss of varieties of cultivated plants, and/or domesticated and related animals, genes or genomes of scientific and economic importance?
<b>Species diversity</b>	Could the intended activity lead, directly or indirectly, to the loss of a population of a species?	Could the intended activity affect the sustainable use of a population of a species?
<b>Ecosystem diversity</b>	Could the intended activity result, directly or indirectly, in serious damages or the total loss of an ecosystem, or types of land use, thus leading to the loss of ecosystem services of scientific, ecological or cultural value?	Could the intended activity affect sustainable soil exploitation, or types of soil use, to such an extent that the activities involved would become destructive or non-sustainable?

Source: Refined guidelines on biodiversity considerations in EIA and SEA (Part I: EIA), prepared in response to decision VI/7-A, July 2005.

Screening mechanisms may include the following elements:

- **Positive lists:** lists of projects requiring an ESIA;
- **Lists of geographical areas:** lists of regions of high Biodiversity value, where an ESIA is required;
- **Expert opinions;**
- A **combination** of the previous elements.

## 4.6 | Scoping

Scoping is an early, interactive process whose purpose is to identify major issues and key impacts, which will become the “terms of reference” of the ESIA. From a Biodiversity perspective, longer cycles and wider areas must be considered, as well as immediate, central issues, as the impacts associated with the former often have longer-lasting effects on Biodiversity.

Scoping is usually based on available information, including data gathered and considered in previous stages. The following information must be readily available:

- Location of protected areas;
- Location of sensitive or relevant ecosystems;
- Distribution of protected species;
- Distribution of habitats used by protected species, including non-local species;
- Distribution of protected habitats;
- Biodiversity experts, including taxonomy specialists;
- Use of Biodiversity resources (e.g. data, information, organisations).

The type of questions that might be asked during the scoping process is shown in section 4.8 | Impact analysis. It is important to engage the services of experts (ecologists and biologists) during this stage, particularly if project development areas are located

within or near protected areas or sensitive environments. These experts shall be required to review the project and possible areas for development, as well as identify relevant ecological functions and functions likely to be affected. In countries lacking a sufficient number of experts, skills must be acquired and international experts recruited to project teams.

Surveys may be required if gaps in Biodiversity data are found during the scoping process. Depending on data and resource requirements, these studies may range from brief assessments to more comprehensive, targeted studies, involving sampling procedures. Regardless of the survey method used, it is important not to allow seasonal factors or the need for long-term data to cause the overall value of any area to be underestimated. Nevertheless, collection of additional data may be precluded by the project schedule. In this sense, it is crucial to use standard Biodiversity sampling techniques and to recognise the strengths and limitations of survey data. Collection of several types of samples, over a reasonable timeframe, whenever possible, is essential to establishing an adequate baseline for the ESIA.

In addition to leading to the identification of impacts to be considered, scoping also allows the exclusion of issues of little concern, which results in a stronger focus on significant impacts and a more efficient use of resources.

Scoping is a key stage in managing social issues, as it aims to provide a basic framework for the project and to identify potential stakeholders, stakeholder expectations and potential social impacts (positive and negative) related to Biodiversity issues, as well as suitable mitigation measures and monitoring requirements. Subsequent assessments will be conducted during project development, in order to review and update scoping results.

Several methods can be used to identify and prioritise social impacts, namely discussion and interviews with stakeholders, amongst others. A useful reference within this scope is OGP document “Key questions in managing social issues in oil & gas projects, Report No. 2.85/332” (OGP, 2002), available [here](#).

## 4.7 | Baseline establishment

Impacts on Biodiversity are difficult to predict. Understanding how an ecosystem changes over time – even without a project – is no simple task. A snapshot of the existing conditions – the baseline environment – is a useful start in understanding how the system might be changed by the project.

Acknowledgement of the difficulties involved in establishing a baseline does not mean that this task should not be accomplished, but that an expert must be consulted in order to determine how relevant issues should be addressed. The skills and knowledge of an expert can expedite fieldwork and the interpretation of findings. Additionally, consultation with local stakeholders, such as local communities, academics and local organisations, may be helpful in establishing a more accurate baseline, as already mentioned.

In addition to the necessary information concerning specific environmental conditions at the project site, the baseline survey should provide information on Biodiversity elements (ecosystems and species, in particular) that might be affected. If the project site is located within or near a protected area and/or sensitive environment and relocation is not feasible, more extensive surveys shall be required in order to establish an adequate baseline. Ideally, field surveys should be designed to collect data on ecosystem functioning, as well as provide a record of all species and habitats involved. Such information might include drainage basin dynamics, size of intact habitats, seasonal events, migratory and breeding patterns, and predator-prey relationships, amongst other data. This information will be crucial to understanding how the ecosystem and the species it contains will react to environmental changes.

A more **cost-effective** option is to **combine different surveys**, e.g. **topographic and benthic surveys**.

Several resources are required to conduct Biodiversity surveys. Mobilising environmental survey teams to remote areas may also be costly.

Survey results should be shared with stakeholders. This is a useful approach, as it provides feedback on the activities undertaken and leads to the identification of further tasks, which may eventually be required. After the baseline has been established, the

impact of each alternative can be determined by analysing the effects of the corresponding activities, provided the following are ensured:

- The nature of the impact is considered (direct or indirect, short-or long-term, cumulative);
- The type of impact is identified (positive, i.e. which benefits Biodiversity; negative, i.e. which leads to loss of Biodiversity; or neutral, i.e. which causes no changes);
- The likely magnitude of the residual impact is determined (hectares of a given ecosystem or habitat/number of individuals of a given species, etc.);
- The effects of eventual emergency situations are taken into account, so that the associated risks are considered when designing emergency response plans.

## 4.8 | Impact analysis

The approach adopted by the CBD, which focuses on the interplay between the various factors, provides a model for understanding the role of the various elements involved, leading to the identification and prediction of primary and secondary impacts on Biodiversity and their effects over time. Additionally, this approach recognises that changes are not necessarily immediate, as they may result from a single or cumulative impacts, typically occurring when a given threshold is exceeded. This stresses the need for consistent, quantitative data as the basis for analysis, assessment and subsequent action, within the scope of a suitable ESIA.

The following must be taken into account when **identifying and assessing impacts**:

- Ability of an ecosystem/habitat/species to recover;
- Local value and role of Biodiversity;
- Cyclical and seasonal nature of certain processes;
- Local, regional or national significance of Biodiversity or ecological processes.

It is important to define the value of resources (low, moderate, high) that might be affected. As this is a somewhat subjective task, expert opinions are often required if a consensus is to be reached. Expert advice is also essential when designing a monitoring programme aimed at ensuring that impacts are adequately assessed against the baseline, and when defining measures aimed at improving operations, while minimising negative impacts.

Direct effects on Biodiversity should be considered when evaluating the overall significance of impacts, i.e. whether survivability thresholds are being exceeded, the likelihood of irreversible losses, in terms of national and international objectives (as established by the CBD), social changes and secondary impacts.

### Questions to be posed:

- Are endemic species found in the concession area? What is the level of endemism? What percentage of the global/regional population is found in the concession area?
- Are any critical ecosystem services/functions found in the concession area (e.g. breeding and/or feeding areas for migratory species, migration corridors for terrestrial species)?
- Is the ecosystem particularly vulnerable to the introduction of invasive species (e.g. is it an island)?
- Are there any non-designated areas of high Biodiversity value (e.g. ancient woodlands, coastal habitats, such as estuaries, dune systems, marshes, peat bogs, etc.)?
- Are there any ecosystems included within the scope of National, Regional or Local Action Plans?
- Are there any ecosystems and habitats representative of unique biological processes (e.g. hydrology), when compared to other ecosystems/habitats in the same area?
- Are there any protected species (e.g. Convention on Migratory Species, the Birds Directive, the Habitats Directive, etc.)?

Magnitude, the importance and sensitivity of the resources affected, and the value of services provided must be considered in order to evaluate the significance of impacts.

## 4.8.1 | Impact levels

### Ecosystem/Habitat

The value of habitats and ecosystems can be assessed according to the following criteria:

- Naturalness;
- Fragility;
- Size;
- Rarity;
- Diversity.

Naturalness and diversity can be strongly correlated; recreated habitats tend to be poorer and more sensitive than their natural and semi-natural equivalents. The fragility and sensitivity of a habitat/ecosystem, as well as its ability to recover from disturbance (either naturally or through adequate management), must be considered. These criteria are also related to size, naturalness and rarity. Fragile sites are often highly fragmented, which causes their size and number to decrease rapidly. These sites are also difficult to recreate.

In addition to the aforementioned criteria, the impact on the ability of an ecosystem to provide services in the long term should also be assessed. For example, the ability of a drainage basin to provide clean water, represent a defence against soil erosion and provide drainage services must be taken into account, as well as the potential impact of changes on the local economy and production systems that might depend on such services.

### Species

The importance of a habitat/ecosystem often depends on the species and communities it contains. Potential impacts on species can be assessed according to criteria such as the following:

- Population dynamics;
- Extent to which species are rare or under threat.

### Genetic

Many species include a large number of genetically distinct populations. Loss of genetic diversity in a population or series of populations is likely to have a significant impact, which should be suitably assessed. However, potential loss of genetic diversity is extremely difficult to determine, which might mean that impact assessment will necessarily focus on species and habitats/ecosystems.

## 4.8.2 | Potential impacts

Physical and biological impacts include the following:

### Habitat loss

- Permanent habitat loss at the project site;
- Temporary habitat loss at the project site (e.g. land occupied by construction equipment or temporary roads);
- Physical removal of soils and vegetation.

### Habitat fragmentation

- Reduced habitat connectivity may disrupt existing relationships between habitats or areas within the same habitat (e.g. migration routes may be interrupted);
- Physical barriers (e.g. above-ground pipelines) may restrict the movement of species. Normal non-migratory movement patterns may be affected by the presence of Oil & Gas project infrastructures;
- Deaths due to collisions with vehicles;
- Edge effects – if vegetation is removed, the linear border thus created may originate a microclimate and lead to changes in physical conditions, which may extend to varying distances from the edge. This newly created habitat may be colonised by edge species and facilitate the dispersal of some species;
- Smaller habitat patches may lead to a decrease in the size of specific plant populations, which may affect insect populations. As a minimum area is required to sustain viable populations, other species may also be affected, such as predatory birds. On the other hand, excessively small habitat patches may not be able to sustain a range of different species.

### Changes to natural processes

- Changes to groundwater systems may adversely affect habitats that depend on water levels (e.g. marshes). Depending on the geological features, lowering of the water level may affect habitats located at a considerable distance from the project site, as well as human communities living downstream;
- Changes to river flows – the accumulation of construction waste may cause changes to river flows, volume and water contents (e.g. solids increase turbidity, which can cause abrasion and hinder the movement of fish, as well as lead to the disappearance of filter feeding invertebrates);
- Leaching and changes to soil structure;
- Soil erosion.

## Pollution

- Water pollution due to spillages may affect aquatic Biodiversity and alter sediment and solid loads in watercourses;
- Emission of pollutants to the atmosphere (e.g. SO<sub>2</sub>, NO<sub>x</sub>, dust) may affect Biodiversity, either directly (e.g. dust can smother and suffocate plants) or via secondary impacts, such as changes to soil and surface water chemistry caused by pollutant washout.

## Disturbance

- The fauna may be affected by noise, lighting and vibration, both during the construction and operation stages;
- The introduction of non-native invasive species may cause significant long-term disturbance to a habitat and other species. This can either happen intentionally (e.g. by planting non-native invasive species during restoration) or unintentionally (e.g. non-native species brought to a site on equipment used elsewhere).

The social changes induced by the project may result in long-term impacts on Biodiversity, often more significant than the actual impacts of the project. Secondary impacts can assume many forms, which frequently include the following:

- Access to new areas: the building of roads and pipelines in previously inaccessible areas may facilitate settlement and human activities, namely hunting and logging, thus increasing pressure on natural resources.
- Immigration/new settlements: high labour demands, new infrastructures and the prospect of new employment and business opportunities often lead to a significant population increase in the area surrounding the project site, which will increase pressure on land, water bodies, wildlife and other natural resources, even after project activities have ceased, as the new settlements may remain.

A summary of the main primary and secondary impacts of each Upstream project stage (onshore and offshore) is provided in point 5 | Annex: Potential Primary and Secondary Impacts.

### 4.8.3 | Impact assessment

The criteria used to assess the significance of impacts must be clearly defined in the ESIA, which entails a definition of the amount of change deemed acceptable. Ideally, these limits will be based on the objectives and targets set for individual habitats and species (e.g. as set in National, Regional and Local Biodiversity Strategies and Action Plans and/or following consultation with stakeholders).

In the absence of specific conservation objectives, criteria should be defined on a case-by-case basis, based on expert opinions.

#### Assessment of impact on habitats

Some criteria used to assess the significance of impacts are shown in the following table:

Table 3 – Assessment of impact on habitats

<b>Major Negative Impact</b>	The project may adversely affect the integrity of an area/region, causing substantial changes to its ecological features, structure and functions in the long term. This may lead to the destruction of the habitat or group of habitats, affect populations of species and/or cause irreversible changes to the landscape.
<b>Moderate Negative Impact</b>	The area's integrity will not be adversely affected in the long term, but the short/medium-term effects on some (although not all) ecological features, structures and functions are likely to be significant. The area may be able to recover and return to its former baseline condition through natural regeneration and/or restoration.
<b>Minor Negative Impact</b>	Neither of the above applies, although some minor impacts of limited extent, or affecting a few elements, may occur. Nevertheless, recovery through natural regeneration will be easy.
<b>Positive Impact</b>	Examples include a series of mitigation measures whereby previously fragmented areas are united through habitat creation processes (connectivity concept), or features such as ditches, hedges, scrub, linear woodland, grassland, large wetlands or small ponds are used to create microhabitats. Although useful, many of these improvements should be regarded as minor positive impacts, as they will not lead to significant Biodiversity gains within the natural area. However, evident gains (as determined through stakeholder engagement) should be regarded as moderate or major positive impacts (e.g. gains of national importance). Nevertheless, it should be borne in mind that impacts viewed as positive in the short term may, if not suitably designed, lead to negative impacts in the long term.



## Assessment of impact on species

Table 4 – Assessment of impact on species

<p><b>High-Magnitude Impact</b></p>	<p>This type of impact affects an entire population or species to such an extent that the resulting decline in abundance and/or change in distribution will result in the inability of the population or species to return to its former level through natural recruitment (reproduction, immigration from unaffected areas), either permanently or for several generations. This, on its turn, will affect any population or species dependent upon the former. This type of impact may also affect a resource essential to survival, or of commercial value, to such an extent that users will be affected for a long time.</p>
<p><b>Moderate-Magnitude Impact</b></p>	<p>This type of impact affects part of a population and may result in a decline in abundance and/or reduced distribution over one or more generations. However, it does not threaten the long-term integrity of the population, or of any other populations dependent upon it. The magnitude and cumulative character of the consequences are equally important. A moderate impact on a wide area should be regarded as a Major Negative Impact. A short-term effect on the well-being of resource users may also be considered a moderate impact.</p>
<p><b>Low-Magnitude Impact</b></p>	<p>This type of impact affects a specific group of individuals in a population over a short time period (one generation or less), but does not affect other levels or the population as a whole.</p>

Impact on ecosystems and/or species should also be considered from a holistic perspective, in order to assess how the project will interfere with Biodiversity Action Plans (which may be national, regional or local, and be aimed at a species or an ecosystem/habitat). Opportunities to contribute to the achievement of such goals may also arise from this assessment.

The involvement of key stakeholders is vital in determining impact significance, as many of the ecological functions that make ecosystems or species important are related to their environmental, economic or cultural value, or to the services provided. In this sense, stakeholders may provide useful advice for defining suitable mitigation measures.

Finally, it should be noted that a Low- or Moderate-Magnitude Impact may represent a High-Magnitude Impact at the genetic level, if a distinct or isolated subspecies, or a geographical variant, is significantly affected by the project.

### 4.8.4 | Definition and implementation of mitigation measures

Definition and implementation of mitigation measures is based on the following hierarchy: Avoid – Reduce – Remedy – Compensate. The purpose of Mitigation is to identify suitable measures to safeguard the environment and the community affected by the project. Mitigation is both a creative and practical ESIA stage, as it seeks to find the best ways to avoid, minimise and remedy impacts. Mitigation measures should translate into adequate actions, which must be undertaken correctly and timely if they are to be successful. This process, known as Impact Management, takes place during project implementation. An official Plan, including an action calendar, should be prepared.

#### Mitigation Goals:

- Finding more suitable courses of action;
- Facilitating the social and environmental benefits of a project;
- Avoiding, reducing, remedying or compensating adverse impacts;
- Ensuring that residual impacts are acceptable.

A few examples of how the aforementioned goals may be achieved are shown in the following table:

Table 5 – Examples of how to mitigate impacts on Biodiversity

<p><b>Avoiding or Reducing Impacts at the Source</b></p>	<p>Facilities should not be located within sensitive environments; land occupation should be reduced to a minimum. Sustainably harvested/extracted materials should be selected. Habitats should be kept intact.</p>
<p><b>Minimising Impacts at the Site</b></p>	<p>Suitable Biodiversity management measures should be defined and implemented at the site, within the scope of the Environmental Management System (e.g. habitat creation, identification of species of interest, minimisation of disturbance during construction and maintenance, etc.). Waste management policies aimed at preventing adverse effects on Biodiversity should be implemented.</p>
<p><b>Repairing or Remedying Impacts</b></p>	<p>Affected areas should be restored using native species, through means compatible with the local ecology.</p>
<p><b>Compensation in Kind or through Other Means</b></p>	<p>Impacts should be offset by creating or managing habitats in affected areas. Ideally, the compensation measures adopted should be agreed with stakeholders prior to the impacts in question. In some countries, this approach is required by law.</p>

Mitigation issues may arise repeatedly over the project lifecycle. Since they represent a trade-off between pre-existing conditions and those resulting from the project, such issues will be formally or informally monitored as part of the authorisation process. At this stage, as during the previous, the Company may engage the services of contractors. Accordingly, it is important to ensure that impact mitigation standards and expectations are clearly specified in service provision agreements and agreements with other parties in the Joint Venture.

Several mitigation measures are available for the majority of impacts. The participation of various entities, as well as careful consideration of present and future ecosystem balance, and of who will benefit from the measures adopted, will be essential to ensuring an adequate choice. For example, a mitigation measure that benefits a community in the short term may have an adverse impact on future generations. Social mitigation measures should be regarded as social investments, as they may promote cooperation between stakeholders and project proponents, in addition to reducing risks. The involvement of government agencies and regulatory authorities may also contribute to the long-term success of the project, particularly when such entities are partners and/or stakeholders.

Therefore, it is essential to ensure that the Company management supports mitigation efforts, so that the required resources to implementing mitigation programmes are made available and effective assessment is encouraged. The project may also benefit from the involvement of Public Relations Departments, which may bring the positive effects of the mitigation measures adopted to the attention of the media.

Secondary impacts on Biodiversity may be difficult to manage. Early, active stakeholder engagement is essential. Companies may wish to consider promoting or participating in Strategic Environmental Assessments whose scope includes Biodiversity issues. Regional Plans may promote conservation and address issues such as infrastructures, access and immigration, suggesting options for resource exploitation that would not have arisen from an ESIA alone.

The following reference documents should also be considered when defining mitigation measures:

**Table 6 – Additional reference documents to be considered when defining mitigation measures**

Reference	Summary Description
JNCC guidelines for minimising the risk of disturbance and injury to marine mammals from seismic surveys, Joint Nature Conservation Committee, June 2009	Describes good practice regarding the protection of marine mammals during offshore seismic surveys.
Good Practice in the Prevention and Mitigation of Primary and Secondary Biodiversity Impacts, The Energy & Biodiversity Initiative	Describes prevention and mitigation measures for the various impacts on Biodiversity of Upstream Oil & Gas activities (onshore and offshore).
Environmental management in oil and gas exploration and production: an overview of issues and management approaches, Joint E&P Forum/ UNEP Technical Publication, 1997	Describes the most relevant impacts, as well as management approaches and operating practices and procedures in the Oil & Gas industry.
CI Policy Paper: Mainstreaming Biodiversity Conservation into Oil and Gas Development, Conservation International	Provides information on risks to Biodiversity resulting from Oil & Gas exploration and production projects, in addition to presenting a series of good practices.

## 4.8.5 | Monitoring and adjustment

Although continuous monitoring may not be required, impacts must be monitored during crucial project stages.

Systematic assessment of Biodiversity data against baseline values will allow the Company to evaluate impact levels and act accordingly, through any of the following:

- Checking of compliance with the terms and conditions required for project approval during the construction and operation stages;
- Assessment of the effectiveness of monitoring measures;
- Identification of additional actions required to solve problems;
- Conduction of audits and assessments that will contribute to improving future ESIA studies.

Without adequate follow-up, ESIA would become a merely theoretical exercise, solely aimed at securing project approval, instead of a series of practical tasks carried out for the purpose of achieving environmental and social benefits. Nevertheless, it should be

stressed that ESIA cannot turn around an environmentally unsound project. However, it is critical to consider ESIA information in decision-making processes and to use ESIA tools to the best advantage whenever new information becomes available.

Monitoring also allows the Company to evaluate the accuracy of impact forecasts and the degree of success of mitigation measures, which is particularly important when uncertainty is considerable.

Monitoring programmes should be well structured and include procedures applicable to each project stage. Additionally, standard data collection methods and techniques must be used, as well as adequate control mechanisms, in order to ensure data comparability, both over time and with data from other projects. Monitoring results should be made available to the general public, in order to strengthen relationships with stakeholders and allow national planning and nature conservation management.

Although monitoring options vary with the species, habitats and groups involved, common indicators are typically used to signal negative and positive trends.

#### 4.8.6 | Challenges and opportunities associated with divestment

Unless adequately planned, cessation of project activities may result in the simultaneous cessation of beneficial activities for Biodiversity, which will affect both Biodiversity and Company reputation.

As a crucial project stage, cessation of project activities should be considered in the ESIA. A successor may be appointed at this stage, who will be responsible for ensuring the continuity of Biodiversity conservation efforts, either self-funded or funded by other Organisations.

Several possibilities are available for consideration by the Company responsible for the project, namely the following:

- Negotiating the maintenance of environmental protection activities, including Biodiversity conservation, with the government agencies involved, following transfer of operatorship;
- Negotiating with other partners;
- Implementing self-funded Biodiversity conservation measures;
- Providing all required information to future operators, in order to ensure that Biodiversity assessment efforts continue to be undertaken and facilitate decision-making processes after divestment.

## ANNEX: POTENTIAL PRIMARY AND SECONDARY IMPACTS

A (non-exhaustive) summary of the potential primary and secondary impacts of Upstream onshore project activities is shown in the following tables.

### Onshore activities

Table 7 – Potential primary impacts of onshore seismic surveys (non-exhaustive list)

Activity	Location	Potential Impacts
Seismic lines and networks	Project site	<ol style="list-style-type: none"> <li>1. Vibrations can cause damages to vegetation and surface water systems</li> <li>2. Short-term disturbance of wildlife and human populations caused by vibrations resulting from the use of explosives</li> <li>3. Erosion and changes to surface water systems caused by seismic lines and inadequate use of explosives</li> </ol>
Heliports and airfields	Project site	<ol style="list-style-type: none"> <li>1. Short-term habitat disturbance resulting from heliports</li> <li>2. Wildlife disturbance as a result of noise</li> </ol>
Other infrastructures	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Erosion and changes to surface water systems</li> <li>2. Loss of vegetation, which may affect local habitats</li> </ol>
Drainage	Project site	<ol style="list-style-type: none"> <li>1. Erosion and changes to surface water systems, leading to short-term (and possibly long-term) impacts on local habitats</li> </ol>
Erosion (loss of superficial soil layers)	Project site, concession area	<ol style="list-style-type: none"> <li>1. Reduced revegetation capacity, possibly leading to long-term impacts on the affected area</li> <li>2. Silting of watercourses, which may adversely affect aquatic and marine species</li> </ol>
Site levelling and cleaning	Project site	<ol style="list-style-type: none"> <li>1. Erosion and changes to surface water systems</li> <li>2. Loss of vegetation, which may affect and fragment local habitats</li> </ol>
Camp installation	Project site	<ol style="list-style-type: none"> <li>1. Waste and effluent discharges, which may affect local habitats</li> <li>2. Habitat destruction resulting from the building of access roads and installation of camps</li> <li>3. Short-term disturbance caused by lighting, noise and other camp activities</li> </ol>
Traffic	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Short-term disturbance caused by traffic</li> <li>2. Short-term disturbance caused by noise</li> <li>3. Soil compaction and changes to surface water systems</li> <li>4. Death or mutilation of animals as a result of collisions</li> </ol>
NO <sub>x</sub> emissions	Project site, concession area	<ol style="list-style-type: none"> <li>1. Short-term wildlife disturbance caused by NO<sub>x</sub> in the soil</li> </ol>

**Table 7 (continuation) – Potential primary impacts of onshore seismic surveys (non-exhaustive list)**

Activity	Location	Potential Impacts
SO <sub>2</sub> emissions	Project site, concession area, local area, country, transboundary area	<ol style="list-style-type: none"> <li>1. Short-term disturbance caused by emissions</li> <li>2. Damages to the local flora and fauna</li> <li>3. Potentiation of the impact of acid rain</li> </ol>
VOC emissions	Project site, concession area	<ol style="list-style-type: none"> <li>1. Short-term disturbance caused by emissions</li> <li>2. Damages to the local flora and fauna</li> </ol>
Noise	Project site	<ol style="list-style-type: none"> <li>1. Short-term disturbance</li> </ol>

**Table 8 – Potential secondary impacts of onshore seismic surveys (non-exhaustive list)**

Activity	Location	Potential Impacts
Access roads	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Erosion and changes to surface water systems</li> <li>2. Loss of vegetation, which may affect local habitats</li> </ol>
Introduction of non-native species	Project site, concession area, local area, corridor	<ol style="list-style-type: none"> <li>1. Removal or elimination of the native flora and fauna</li> </ol>
Exploration of new areas	Project site, concession area, local area, corridor	<ol style="list-style-type: none"> <li>1. Immediate destruction of local habitats, which might lead to more extensive destruction if access is not restricted (potential long-term impact)</li> <li>2. Increased pressure on the flora and fauna</li> </ol>
Immigration	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact)</li> <li>2. Pressure on the flora and fauna</li> <li>3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity</li> </ol>
New settlements	Project site, concession area, local area, corridor	<ol style="list-style-type: none"> <li>1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact)</li> <li>2. Increased pressure on the flora and fauna</li> <li>3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity</li> </ol>
Cultivation	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact)</li> <li>2. Introduction of non-native species into local ecosystems</li> <li>3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity</li> </ol>
Hunting and poaching	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Elimination or decline in populations of local species, possibly leading to their extinction</li> <li>2. Ecological changes resulting from the removal of essential species, such as predators</li> </ol>
Gathering of forest products other than timber	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Pressure on the flora and fauna</li> <li>2. Ecological changes resulting from the loss of essential species to the ecosystem</li> </ol>
Trade with local communities	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Pressure on the flora and fauna</li> <li>2. Elimination or decline in populations of local species, possibly leading to their extinction</li> </ol>



Table 9 – Potential primary impacts of onshore exploration and exploratory drilling (non-exhaustive list)

Activity	Location	Potential Impacts
Heliports and airfields	Project site	<ol style="list-style-type: none"> <li>1. Short-term habitat disturbance resulting from heliports</li> <li>2. Wildlife disturbance as a result of noise</li> </ol>
Other infrastructures	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Erosion and changes to surface water systems</li> <li>2. Loss of vegetation, which may affect local habitats</li> </ol>
Drainage	Project site	<ol style="list-style-type: none"> <li>1. Erosion and changes to surface water systems, leading to short-term (and possibly long-term) impacts on local habitats, and possible contamination resulting from run-off</li> </ol>
Erosion (loss of superficial soil layers)	Project site, concession area	<ol style="list-style-type: none"> <li>1. Reduced revegetation capacity, possibly leading to long-term impacts on the affected area</li> <li>2. Silting of watercourses, which may adversely affect aquatic and marine species</li> </ol>
Site levelling and cleaning	Project site	<ol style="list-style-type: none"> <li>1. Erosion and changes to surface water systems</li> <li>2. Loss of vegetation, which may affect and fragment local habitats</li> </ol>
Camp installation	Project site	<ol style="list-style-type: none"> <li>1. Waste and effluent discharges, which may affect local habitats</li> <li>2. Habitat destruction resulting from the building of access roads and installation of camps</li> <li>3. Short-term disturbance caused by lighting, noise and other camp activities</li> <li>4. Erosion and changes to surface water systems</li> </ol>
Traffic	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Short-term disturbance caused by traffic</li> <li>2. Short-term disturbance caused by noise</li> <li>3. Soil compaction and changes to surface water systems</li> <li>4. Death or mutilation of animals as a result of collisions</li> </ol>
NO <sub>x</sub> emissions	Project site, concession area	<ol style="list-style-type: none"> <li>1. Short-term wildlife disturbance caused by NO<sub>x</sub> in the soil</li> </ol>
SO <sub>2</sub> emissions	Project site, concession area, local area, country, transboundary area	<ol style="list-style-type: none"> <li>1. Short-term disturbance caused by emissions</li> <li>2. Damages to the local flora and fauna</li> <li>3. Potentiation of the impact of acid rain</li> </ol>
VOC emissions	Project site, concession area	<ol style="list-style-type: none"> <li>1. Short-term disturbance caused by emissions</li> <li>2. Damages to the local flora and fauna</li> </ol>
Noise	Project site	<ol style="list-style-type: none"> <li>1. Short-term disturbance</li> </ol>
Water produced	Project site, concession area	<ol style="list-style-type: none"> <li>1. Contamination of local watercourses, groundwater and surface water, which may affect the flora and fauna</li> </ol>
Effluents	Project site, concession area	<ol style="list-style-type: none"> <li>1. Contamination of local watercourses, groundwater and surface water, which may affect the flora and fauna</li> </ol>
Gravel/mud from drilling operations	Project site, concession area	<ol style="list-style-type: none"> <li>1. Contamination of water wells at the project site, local watercourses, groundwater and surface water, which may affect the flora and fauna</li> </ol>
Spillages	Project site, concession area	<ol style="list-style-type: none"> <li>1. Contamination of local habitats, particularly watercourses, groundwater and surface water, which may affect the flora and fauna</li> </ol>
Waste disposal	Project site	<ol style="list-style-type: none"> <li>1. Negative impacts on the ecosystem as a result of waste discharges</li> </ol>

Table 10 – Potential secondary impacts of onshore exploration and exploratory drilling (non-exhaustive list)

Activity	Location	Potential Impacts
Access roads	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Erosion and changes to surface water systems</li> <li>2. Loss of vegetation, which may affect local habitats</li> </ol>
Introduction of non-native species	Project site, concession area, local area, corridor	<ol style="list-style-type: none"> <li>1. Removal or elimination of the native flora and fauna</li> </ol>
Exploration of new areas	Project site, concession area, local area, corridor	<ol style="list-style-type: none"> <li>1. Immediate destruction of local habitats, which might lead to more extensive destruction if access is not restricted (potential long-term impact)</li> <li>2. Increased pressure on the flora and fauna</li> </ol>
Immigration	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact)</li> <li>2. Pressure on the flora and fauna</li> <li>3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity</li> </ol>
New settlements	Project site, concession area, local area, corridor	<ol style="list-style-type: none"> <li>1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact)</li> <li>2. Increased pressure on the flora and fauna</li> <li>3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity</li> </ol>
Cultivation	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact)</li> <li>2. Introduction of non-native species into local ecosystems</li> <li>3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity</li> </ol>
Hunting and poaching	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Elimination or decline in populations of local species, possibly leading to their extinction</li> <li>2. Ecological changes resulting from the removal of essential species, such as predators</li> </ol>
Gathering of forest products other than timber	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Pressure on the flora and fauna</li> <li>2. Ecological changes resulting from the loss of essential species to the ecosystem</li> </ol>
Trade with local communities	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Pressure on the flora and fauna</li> <li>2. Elimination or decline in populations of local species, possibly leading to their extinction</li> </ol>

Table 11 – Potential primary impacts of onshore field development (non-exhaustive list)

Activity	Location	Potential Impacts
Heliports and airfields	Project site	<ol style="list-style-type: none"> <li>1. Short-term habitat disturbance resulting from heliports</li> <li>2. Wildlife disturbance as a result of noise (usually limited to the project period; however, long-term use of the same flight patterns may affect wildlife in a wide area)</li> </ol>
Other infrastructures	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Erosion and changes to surface water systems</li> <li>2. Loss of vegetation, which may affect local habitats</li> </ol>
Drainage	Project site	<ol style="list-style-type: none"> <li>1. Erosion and changes to surface water systems, leading to short-term (and possibly long-term) impacts on local habitats, and possible contamination resulting from run-off</li> </ol>
Erosion (loss of superficial soil layers)	Project site, concession area	<ol style="list-style-type: none"> <li>1. Reduced revegetation capacity, possibly leading to long-term impacts on the affected area</li> <li>2. Silting of watercourses, which may adversely affect aquatic and marine species</li> </ol>
Site levelling and cleaning	Project site	<ol style="list-style-type: none"> <li>1. Erosion and changes to surface water systems</li> <li>2. Loss of vegetation, which may affect and fragment local habitats</li> </ol>
Camp installation	Project site	<ol style="list-style-type: none"> <li>1. Waste and effluent discharges, which may affect local habitats</li> <li>2. Habitat destruction resulting from the building of access roads and installation of camps</li> <li>3. Short-term disturbance caused by lighting, noise and other camp activities</li> <li>4. Erosion and changes to surface water systems</li> </ol>
Traffic	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Short-term disturbance caused by traffic</li> <li>2. Short-term disturbance caused by noise</li> <li>3. Soil compaction and changes to surface water systems</li> <li>4. Death or mutilation of animals as a result of collisions</li> </ol>
Pipeline corridors	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Habitat destruction and fragmentation caused by removal of vegetation</li> <li>2. Introduction of invasive species as a result of revegetation activities</li> <li>3. Impact on animal movements</li> </ol>
Laying soils	Project site, concession area	<ol style="list-style-type: none"> <li>1. Levelling of sensitive habitats</li> <li>2. Increased erosion, leading to an increasing in turbidity, which may affect the benthic fauna and habitats</li> </ol>
Revegetation	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. If used in revegetation, non-native species may disrupt the ecosystem and crowd out native species</li> </ol>
NO <sub>x</sub> emissions	Project site, concession area	<ol style="list-style-type: none"> <li>1. Short-term wildlife disturbance caused by NO<sub>x</sub> in the soil</li> </ol>
SO <sub>2</sub> emissions	Project site, concession area, local area, country, transboundary area	<ol style="list-style-type: none"> <li>1. Short-term disturbance caused by emissions</li> <li>2. Damages to the local flora and fauna</li> <li>3. Potentiation of the impact of acid rain</li> </ol>
VOC emissions	Project site, concession area	<ol style="list-style-type: none"> <li>1. Short-term disturbance caused by emissions</li> <li>2. Damages to the local flora and fauna</li> </ol>
Noise	Project site	<ol style="list-style-type: none"> <li>1. Short-term disturbance</li> </ol>
Water produced	Project site, concession area	<ol style="list-style-type: none"> <li>1. Contamination of local watercourses, groundwater and surface water, which may affect the flora and fauna</li> </ol>
Effluents	Project site, concession area	<ol style="list-style-type: none"> <li>1. Contamination of local watercourses, groundwater and surface water, which may affect the flora and fauna</li> </ol>

Table 11 (continuation) – Potential primary impacts of onshore field development (non-exhaustive list)

Activity	Location	Potential Impacts
Gravel/mud from drilling operations	Project site, concession area	1. Contamination of water wells at the project site, local watercourses, groundwater and surface water, which may affect the flora and fauna
Spillages	Project site, concession area	1. Contamination of local habitats, particularly watercourses, groundwater and surface water, which may affect the flora and fauna
Waste disposal	Project site	1. Negative impacts on the ecosystem as a result of waste discharges

Table 12 – Potential secondary impacts of onshore field development (non-exhaustive list)

Activity	Location	Potential Impacts
Access roads	Project site, concession area, local area	1. Erosion and changes to surface water systems 2. Loss of vegetation, which may affect local habitats
Introduction of non-native species	Project site, concession area, local area, corridor	1. Removal or elimination of the native flora and fauna
Exploration of new areas	Project site, concession area, local area, corridor	1. Immediate destruction of local habitats, which might lead to more extensive destruction if access is not restricted (potential long-term impact) 2. Increased pressure on the flora and fauna
Immigration	Project site, concession area, local area, corridor	1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact) 2. Pressure on the flora and fauna 3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity
New settlements	Project site, concession area, local area, corridor	1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact) 2. Increased pressure on the flora and fauna 3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity
Cultivation	Project site, concession area, local area	1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact) 2. Introduction of non-native species into local ecosystems 3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity
Hunting and poaching	Project site, concession area, local area	1. Elimination or decline in populations of local species, possibly leading to their extinction 2. Ecological changes resulting from the removal of essential species, such as predators
Gathering of forest products other than timber	Project site, concession area, local area	1. Pressure on the flora and fauna 2. Ecological changes resulting from the loss of essential species to the ecosystem
Trade with local communities	Project site, concession area, local area	1. Pressure on the flora and fauna 2. Elimination or decline in populations of local species, possibly leading to their extinction

Table 13 – Potential primary impacts of onshore production (non-exhaustive list)

Activity	Location	Potential Impacts
Heliports and airfields	Project site	<ol style="list-style-type: none"> <li>Habitat disturbance resulting from heliports</li> <li>Wildlife disturbance as a result of noise (usually limited to the project period; however, long-term use of the same flight patterns may affect wildlife in a wide area)</li> </ol>
Other infrastructures	Project site, concession area, local area	<ol style="list-style-type: none"> <li>Erosion and changes to surface water systems</li> <li>Loss of vegetation, which may affect local habitats</li> </ol>
Drainage	Project site	<ol style="list-style-type: none"> <li>Erosion and changes to surface water systems, leading to short-term (and possibly long-term) impacts on local habitats, and possible contamination resulting from run-off</li> </ol>
Erosion (loss of superficial soil layers)	Project site, concession area	<ol style="list-style-type: none"> <li>Reduced revegetation capacity, possibly leading to long-term impacts on the affected area</li> <li>Silting of watercourses, which may adversely affect aquatic and marine species</li> </ol>
Traffic	Project site, concession area, local area	<ol style="list-style-type: none"> <li>Disturbance caused by traffic</li> <li>Disturbance caused by noise</li> <li>Soil compaction and changes to surface water systems</li> <li>Death or mutilation of animals as a result of collisions</li> </ol>
Pipeline corridors	Project site, concession area, local area	<ol style="list-style-type: none"> <li>Habitat destruction and fragmentation caused by removal of vegetation</li> <li>Introduction of invasive species as a result of revegetation activities</li> <li>Impact on animal movements</li> </ol>
Revegetation	Project site, concession area, local area	<ol style="list-style-type: none"> <li>If used in revegetation, non-native species may disrupt the ecosystem and crowd out native species</li> </ol>
NO <sub>x</sub> emissions	Project site, concession area	<ol style="list-style-type: none"> <li>Wildlife disturbance caused by NO<sub>x</sub> in the soil</li> </ol>
SO <sub>2</sub> emissions	Project site, concession area, local area, country, transboundary area	<ol style="list-style-type: none"> <li>Disturbance caused by emissions</li> <li>Damages to the local flora and fauna</li> <li>Potential of the impact of acid rain</li> </ol>
VOC emissions	Project site, concession area	<ol style="list-style-type: none"> <li>Disturbance caused by emissions</li> <li>Damages to the local flora and fauna</li> </ol>
Noise	Project site	<ol style="list-style-type: none"> <li>Disturbance</li> </ol>
Water produced	Project site, concession area	<ol style="list-style-type: none"> <li>Contamination of local watercourses, groundwater and surface water, which may affect the flora and fauna</li> </ol>
Effluents	Project site, concession area	<ol style="list-style-type: none"> <li>Contamination of local watercourses, groundwater and surface water, which may affect the flora and fauna</li> </ol>
Gravel/mud from drilling operations	Project site, concession area	<ol style="list-style-type: none"> <li>Contamination of water wells at the project site, local watercourses, groundwater and surface water, which may affect the flora and fauna</li> </ol>
Spillages	Project site, concession area	<ol style="list-style-type: none"> <li>Contamination of local habitats, particularly watercourses, groundwater and surface water, which may affect the flora and fauna</li> </ol>
Waste disposal	Project site	<ol style="list-style-type: none"> <li>Negative impacts on the ecosystem as a result of waste discharges</li> </ol>

Table 14 – Potential secondary impacts of onshore production (non-exhaustive list)

Activity	Location	Potential Impacts
Access roads	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Erosion and changes to surface water systems</li> <li>2. Loss of vegetation, which may affect local habitats</li> </ol>
Introduction of non-native species	Project site, concession area, local area, corridor	<ol style="list-style-type: none"> <li>1. Removal or elimination of the native flora and fauna</li> </ol>
Exploration of new areas	Project site, concession area, local area, corridor	<ol style="list-style-type: none"> <li>1. Immediate destruction of local habitats, which might lead to more extensive destruction if access is not restricted (potential long-term impact)</li> <li>2. Increased pressure on the flora and fauna</li> </ol>
Immigration	Project site, concession area, local area, corridor	<ol style="list-style-type: none"> <li>1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact)</li> <li>2. Pressure on the flora and fauna</li> <li>3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity</li> </ol>
New settlements	Project site, concession area, local area, corridor	<ol style="list-style-type: none"> <li>1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact)</li> <li>2. Increased pressure on the flora and fauna</li> <li>3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity</li> </ol>
Cultivation	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact)</li> <li>2. Introduction of non-native species into local ecosystems</li> <li>3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity</li> </ol>
Hunting and poaching	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Elimination or decline in populations of local species, possibly leading to their extinction</li> <li>2. Ecological changes resulting from the removal of essential species, such as predators</li> </ol>
Gathering of forest products other than timber	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Pressure on the flora and fauna</li> <li>2. Ecological changes resulting from the loss of essential species to the ecosystem</li> </ol>
Trade with local communities	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Pressure on the flora and fauna</li> <li>2. Elimination or decline in populations of local species, possibly leading to their extinction</li> </ol>



Table 15 – Potential primary impacts of onshore transmission (non-exhaustive list)

Activity	Location	Potential Impacts
Heliports and airfields	Project site	<ol style="list-style-type: none"> <li>Habitat disturbance resulting from heliports</li> <li>Wildlife disturbance as a result of noise (usually limited to the project period; however, long-term use of the same flight patterns may affect wildlife in a wide area)</li> </ol>
Other infrastructures	Project site, concession area, local area, corridors, country, transboundary area	<ol style="list-style-type: none"> <li>Erosion and changes to surface water systems</li> <li>Loss of vegetation, which may affect local habitats</li> </ol>
Drainage	Project site, concession area, local area, corridors, country, transboundary area	<ol style="list-style-type: none"> <li>Erosion and changes to surface water systems, leading to short-term (and possibly long-term) impacts on local habitats, and possible contamination resulting from run-off</li> </ol>
Erosion (loss of superficial soil layers)	Project site, concession area, local area, corridors, country, transboundary area	<ol style="list-style-type: none"> <li>Reduced revegetation capacity, possibly leading to long-term impacts on the affected area</li> <li>Silting of watercourses, which may adversely affect aquatic and marine species</li> </ol>
Site levelling and cleaning	Project site, concession area, local area, corridors, country, transboundary area	<ol style="list-style-type: none"> <li>Erosion and changes to surface water systems</li> <li>Loss of vegetation, which may affect and fragment local habitats</li> </ol>
Traffic	Project site, concession area, local area, corridors, country, transboundary area	<ol style="list-style-type: none"> <li>Disturbance caused by traffic</li> <li>Disturbance caused by noise</li> <li>Soil compaction and changes to surface water systems</li> <li>Death or mutilation of animals as a result of collisions</li> </ol>
Pipeline corridors	Project site, concession area, local area, corridors, country, transboundary area	<ol style="list-style-type: none"> <li>Habitat destruction and fragmentation caused by removal of vegetation</li> <li>Introduction of invasive species as a result of revegetation activities</li> <li>Impact on animal movements</li> </ol>
Laying soils	Project site, concession area	<ol style="list-style-type: none"> <li>Levelling of sensitive habitats</li> <li>Increased erosion, leading to an increasing in turbidity, which may affect the benthic fauna and habitats</li> </ol>
Revegetation	Project site, concession area, local area	<ol style="list-style-type: none"> <li>If used in revegetation, non-native species may disrupt the ecosystem and crowd out native species</li> </ol>
NO <sub>x</sub> emissions	Project site, concession area, local area, corridors, country, transboundary area	<ol style="list-style-type: none"> <li>Wildlife disturbance caused by NO<sub>x</sub> in the soil</li> </ol>
SO <sub>2</sub> emissions	Project site, concession area, local area, country, transboundary area	<ol style="list-style-type: none"> <li>Disturbance caused by emissions</li> <li>Damages to the local flora and fauna</li> <li>Potential of the impact of acid rain</li> </ol>
VOC emissions	Project site, concession area, local area, corridors, country, transboundary area	<ol style="list-style-type: none"> <li>Disturbance caused by emissions</li> <li>Damages to the local flora and fauna</li> </ol>
Noise	Project site	<ol style="list-style-type: none"> <li>Disturbance</li> </ol>
Spillages	Project site, concession area	<ol style="list-style-type: none"> <li>Contamination of local habitats, particularly watercourses, groundwater and surface water, which may affect the flora and fauna</li> </ol>

Table 16 – Potential secondary impacts of onshore transmission (non-exhaustive list)

Activity	Location	Potential Impacts
Access roads	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Erosion and changes to surface water systems</li> <li>2. Loss of vegetation, which may affect local habitats</li> </ol>
Introduction of non-native species	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Removal or elimination of the native flora and fauna</li> </ol>
Exploration of new areas	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Immediate destruction of local habitats, which might lead to more extensive destruction if access is not restricted (potential long-term impact)</li> <li>2. Increased pressure on the flora and fauna</li> </ol>
Immigration	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact)</li> <li>2. Pressure on the flora and fauna</li> <li>3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity</li> </ol>
New settlements	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact)</li> <li>2. Increased pressure on the flora and fauna</li> <li>3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity</li> </ol>
Cultivation	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact)</li> <li>2. Introduction of non-native species into local ecosystems</li> <li>3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity</li> </ol>
Hunting and poaching	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Elimination or decline in populations of local species, possibly leading to their extinction</li> <li>2. Ecological changes resulting from the removal of essential species, such as predators</li> </ol>
Gathering of forest products other than timber	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Pressure on the flora and fauna</li> <li>2. Ecological changes resulting from the loss of essential species to the ecosystem</li> </ol>
Trade with local communities	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Pressure on the flora and fauna</li> <li>2. Elimination or decline in populations of local species, possibly leading to their extinction</li> </ol>

Table 17 – Potential primary impacts of onshore decommissioning (non-exhaustive list)

Activity	Location	Potential Impacts
Heliports and airfields	Project site	<ol style="list-style-type: none"> <li>1. Habitat disturbance resulting from heliports</li> <li>2. Wildlife disturbance as a result of noise (usually limited to the project period; however, long-term use of the same flight patterns may affect wildlife in a wide area)</li> </ol>
Other infrastructures	Project site, concession area, local area, corridors, country, transboundary area	<ol style="list-style-type: none"> <li>1. Erosion and changes to surface water systems</li> <li>2. Loss of vegetation, which may affect local habitats</li> </ol>
Landfill	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Loss of land use options</li> <li>2. Long-term dispersion of contaminants from non-restored areas</li> <li>3. Long-term impacts on drainage patterns</li> <li>4. Invasion of non-restored areas by non-native species</li> <li>5. Health and safety issues affecting subsequent users</li> </ol>
Camp removal	Project site	<ol style="list-style-type: none"> <li>1. Waste and effluent discharges, which may affect local habitats</li> <li>2. Habitat destruction resulting from the building of access roads and installation of camps</li> <li>3. Disturbance caused by lighting, noise and other camp activities</li> <li>4. Erosion and changes to surface water systems</li> </ol>
Traffic	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Disturbance caused by traffic</li> <li>2. Disturbance caused by noise</li> <li>3. Soil compaction and changes to surface water systems</li> <li>4. Death or mutilation of animals as a result of collisions</li> </ol>
Pipeline corridors	Project site, concession area, local area, corridors, country, transboundary area	<ol style="list-style-type: none"> <li>1. Habitat destruction and fragmentation caused by removal of vegetation</li> </ol>

Table 18 – Potential secondary impacts of onshore decommissioning (non-exhaustive list)

Activity	Location	Potential Impacts
Access roads	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Erosion and changes to surface water systems</li> <li>2. Loss of vegetation, which may affect local habitats</li> </ol>
Introduction of non-native species	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Removal or elimination of the native flora and fauna</li> </ol>
Exploration of new areas	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Immediate destruction of local habitats, which might lead to more extensive destruction if access is not restricted (potential long-term impact)</li> <li>2. Increased pressure on the flora and fauna</li> </ol>
Immigration	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact)</li> <li>2. Pressure on the flora and fauna</li> <li>3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity</li> </ol>
New settlements	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact)</li> <li>2. Increased pressure on the flora and fauna</li> <li>3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity</li> </ol>
Cultivation	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Immediate destruction and fragmentation of local habitats, which might lead to more extensive destruction if the number of immigrants does not decrease with time (potential long-term, extensive impact)</li> <li>2. Introduction of non-native species into local ecosystems</li> <li>3. Erosion, changes to surface water systems and changes to water quality caused by increased human activity</li> </ol>

## Offshore activities

A summary of potential impacts of Upstream offshore Oil & Gas project activities is shown in the following tables.

**Table 19 – Potential primary impacts of offshore seismic surveys (non-exhaustive list)**

Activity	Location	Potential Impacts
Seismic lines and networks	Project site, concession area	1. Short-term disturbance of marine species caused by noise
Traffic	Project site, concession area	1. Damages caused to habitats (corals, mangroves) by anchoring and operation vessels 2. Short-term disturbance caused by noise and vibrations
NO <sub>x</sub> emissions	Project site, concession area	1. Short-term wildlife disturbance caused by NO <sub>x</sub> emissions
SO <sub>2</sub> emissions	Project site, concession area, local area, transboundary area	1. Short-term disturbance caused by emissions 2. Damages to the local flora and fauna
VOC emissions	Project site, concession area	1. Short-term disturbance caused by emissions 2. Damages to the local flora and fauna
Noise <sup>3</sup>	Project site	1. Short-term disturbance
Waste disposal	Project site	1. Negative impacts on the ecosystem as a result of waste discharges
Ballast water discharge	Project site, concession area, local area, corridor	1. Introduction of non-native species 2. Ecosystem contamination with chemicals and ballast water

**Table 20 – Potential secondary impacts of offshore seismic surveys (non-exhaustive list)**

Activity	Location	Potential Impacts
Fishing, gathering of marine products (corals)	Project site, concession area	1. Depletion of local fish stocks 2. Damages to habitats and corals

<sup>3</sup> According to the Joint OGP/IAGC Position Paper: Seismic Surveys & Marine Mammals, seismic surveying is the sole technology that allows an accurate search for offshore hydrocarbon deposits. It is also mentioned that the resulting noise levels are similar to those naturally occurring in oceans (see Annex I). This document can be consulted as a reference document.

Table 21 – Potential primary impacts of offshore exploration (non-exhaustive list)

Activity	Location	Potential Impacts
Traffic	Project site, concession area	1. Damages caused to habitats (corals, mangroves) by anchoring and operation vessels 2. Short-term disturbance caused by noise and vibrations
Dredging	Project site, concession area	1. Habitat damage and damages to the local flora and fauna
Anchoring	Project site	1. Localised damages to sensitive habitats, particularly corals
NO <sub>x</sub> emissions	Project site, concession area	1. Short-term wildlife disturbance caused by NO <sub>x</sub> emissions
SO <sub>2</sub> emissions	Project site, concession area	1. Short-term disturbance caused by emissions 2. Damages to the local flora and fauna
VOC emissions	Project site, concession area, local area, transboundary area	1. Short-term disturbance caused by emissions 2. Damages to the local flora and fauna
Noise	Project site	1. Short-term disturbance
Water produced	Project site, concession area	1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna
Effluents	Project site, concession area	1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna
Cooling water	Project site, concession area	1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna
Gravel/mud from drilling operations	Project site, concession area	1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna
Spillages	Project site, concession area	1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna
Waste disposal	Project site	1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna
Ballast water discharge	Project site, concession area, local area, corridor	1. Introduction of non-native species 2. Ecosystem contamination with chemicals and ballast water

Table 22 – Potential secondary impacts of offshore exploration (non-exhaustive list)

Activity	Location	Potential Impacts
Fishing, gathering of marine products (corals)	Project site, concession area	1. Depletion of local fish stocks 2. Damages to habitats and corals
Trade with local communities	Project site, concession area, local area	1. Pressure on the flora and fauna 2. Elimination or decline in populations of local species, possibly leading to their extinction



Table 23 – Potential primary impacts of offshore field development (non-exhaustive list)

Activity	Location	Potential Impacts
Traffic	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Damages caused to habitats (corals, mangroves) by anchoring and operation vessels</li> <li>2. Short-term disturbance caused by noise and vibrations</li> </ol>
Deposition of gravel	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Smothering and suffocation of species living at the bottom of the ocean</li> </ol>
Dredging	Project site, concession area	<ol style="list-style-type: none"> <li>1. Habitat damage and damages to the local flora and fauna</li> <li>2. Damages to habitats outside the project area, due to silting as a result of operations</li> </ol>
Anchoring	Project site	<ol style="list-style-type: none"> <li>1. Localised damages to sensitive habitats, particularly corals</li> </ol>
Pipeline corridors	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Habitat destruction and fragmentation</li> </ol>
NO <sub>x</sub> emissions	Project site, concession area	<ol style="list-style-type: none"> <li>1. Wildlife disturbance caused by NO<sub>x</sub> emissions</li> </ol>
SO <sub>2</sub> emissions	Project site, concession area, local area, country, transboundary area	<ol style="list-style-type: none"> <li>1. Disturbance caused by emissions</li> <li>2. Damages to the local flora and fauna</li> </ol>
VOC emissions	Project site, concession area	<ol style="list-style-type: none"> <li>1. Disturbance caused by emissions</li> <li>2. Damages to the local flora and fauna</li> </ol>
Noise	Project site	<ol style="list-style-type: none"> <li>1. Short-term disturbance</li> </ol>
Water produced	Project site, concession area	<ol style="list-style-type: none"> <li>1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna</li> </ol>
Effluents/cooling water	Project site, concession area	<ol style="list-style-type: none"> <li>1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna</li> </ol>
Gravel/mud from drilling operations	Project site, concession area	<ol style="list-style-type: none"> <li>1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna</li> </ol>
Spillages	Project site, concession area	<ol style="list-style-type: none"> <li>1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna</li> </ol>
Waste disposal	Project site	<ol style="list-style-type: none"> <li>1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna</li> </ol>

Table 24 – Potential secondary impacts of offshore field development (non-exhaustive list)

Activity	Location	Potential Impacts
Fishing, gathering of marine products (corals)	Project site, concession area	<ol style="list-style-type: none"> <li>1. Depletion of local fish stocks</li> <li>2. Damages to habitats and corals</li> </ol>
Trade with local communities	Project site, concession area, local area	<ol style="list-style-type: none"> <li>1. Pressure on the flora and fauna</li> <li>2. Elimination or decline in populations of local species, possibly leading to their extinction</li> </ol>

Table 25 – Potential primary impacts of offshore production (non-exhaustive list)

Activity	Location	Potential Impacts
Traffic	Project site, concession area, local area	1. Damages caused to habitats (corals, mangroves) by anchoring and operation vessels 2. Short-term disturbance caused by noise and vibrations
Anchoring	Project site	1. Localised damages to sensitive habitats, particularly corals
Pipeline corridors	Project site, concession area, local area	1. Habitat destruction and fragmentation
Ballast water discharge	Project site, concession area, local area, corridor	1. Introduction of non-native species 2. Ecosystem contamination with chemicals and ballast water
NO <sub>x</sub> emissions	Project site, concession area	1. Wildlife disturbance caused by NO <sub>x</sub> emissions
SO <sub>2</sub> emissions	Project site, concession area, local area, transboundary area	1. Disturbance caused by emissions 2. Damages to the local flora and fauna
VOC emissions	Project site, concession area	1. Disturbance caused by emissions 2. Damages to the local flora and fauna
Noise	Project site	1. Disturbance
Water produced	Project site, concession area	1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna
Effluents/cooling water	Project site, concession area	1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna
Gravel/mud from drilling operations	Project site, concession area	1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna
Spillages	Project site, concession area	1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna
Waste disposal	Project site	1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna

Table 26 – Potential secondary impacts of offshore production (non-exhaustive list)

Activity	Location	Potential Impacts
Fishing, gathering of marine products (corals)	Project site, concession area	1. Depletion of local fish stocks 2. Damages to habitats and corals
Trade with local communities	Project site, concession area, local area	1. Pressure on the flora and fauna 2. Elimination or decline in populations of local species, possibly leading to their extinction

Table 27 – Potential primary impacts of offshore transmission (non-exhaustive list)

Activity	Location	Potential Impacts
Traffic	Project site, concession area, local area, corridors, country, transboundary area	<ol style="list-style-type: none"> <li>1. Damages caused to habitats (corals, mangroves) by anchoring and operation vessels</li> <li>2. Short-term disturbance caused by noise and vibrations</li> </ol>
Deposition of gravel	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Smothering and suffocation of species living at the bottom of the ocean</li> </ol>
Dredging	Project site, concession area	<ol style="list-style-type: none"> <li>1. Habitat damage and damages to the local flora and fauna</li> <li>2. Damages to habitats outside the project area, due to silting as a result of operations</li> </ol>
Anchoring	Project site	<ol style="list-style-type: none"> <li>1. Localised damages to sensitive habitats, particularly corals</li> </ol>
Pipeline corridors	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Habitat destruction and fragmentation</li> </ol>
NO <sub>x</sub> emissions	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Wildlife disturbance caused by NO<sub>x</sub> emissions</li> </ol>
SO <sub>2</sub> emissions	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Disturbance caused by emissions</li> <li>2. Damages to the local flora and fauna</li> </ol>
VOC emissions	Project site, concession area, local area, corridor, country, transboundary area	<ol style="list-style-type: none"> <li>1. Disturbance caused by emissions</li> <li>2. Damages to the local flora and fauna</li> </ol>
Noise	Project site	<ol style="list-style-type: none"> <li>1. Disturbance</li> </ol>
Spillages	Project site, concession area	<ol style="list-style-type: none"> <li>1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna</li> </ol>

Table 28 – Potential primary impacts of offshore decommissioning (non-exhaustive list)

Activity	Location	Potential Impacts
Deposition of gravel	Project site, concession area, local area, corridor, country, transboundary area	1. Smothering and suffocation of species living at the bottom of the ocean
Dredging	Project site, concession area	1. Habitat damage and damages to the local flora and fauna 2. Damages to habitats outside the project area, due to silting as a result of operations
Anchoring	Project site, concession area, local area	1. Localised damages to sensitive habitats, particularly corals
Pipeline corridors	Project site, concession area, local area, corridor, country, transboundary area	1. Habitat destruction and fragmentation
Waste disposal	Project site, concession area, local area	1. Contamination of local habitats, possibly extending to the entire concession area, which may affect the flora and fauna



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