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Review of the Terms of Reference for the ESIA of the 'AMAN' green hydrogen project

MAURITANIA



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Advisory report by the NCEA

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Acronyms and key words

Acronym / Term	Complete word / expression / meaning
A	
Aol	The area of influence is defined as the zone likely to be affected by a development. A distinction is made between the direct area of influence, in which project-related impacts such as noise or loss of habitat occur, and the indirect area of influence, in which certain indirect or induced effects may occur, such as the immigration of people seeking employment.
B	
BAP	Biodiversity Action Plan
BGP	Biodiversity-Gas-Patrol' programme. Partnership project to integrate marine and coastal biodiversity into the development of the hydrocarbons sector in Mauritania, supported by the United Nations Development Programme (UNDP) and financed by the Global Environment Facility (GEF).
D	
DECE	Environmental Assessment and Control Department (in french: DECE)
E	
EBSA	Ecologically or Biologically Significant Areas
EEZ	Exclusive economic zone
ESIA	Environmental and Social Impact Assessment
ESIA study area	The area that is studied in order to understand the general context in relation to the impact assessment. This area may go beyond the Area of Influence, to better understand the context of a receptor, including trends and pressures on the state of the receptor. Examples often include climate change considerations, but also economics and biodiversity.
ESMP	Environmental and social Management Plan
G	
GIS	Geographic Information System
Green Ammonia	Ammonia produced using hydrogen and nitrogen gas, themselves obtained using renewable electricity. Renewable electricity is also used to meet the energy requirements of the synthesis process.
Green Hydrogen	Hydrogen produced from water, using renewable energy sources.
GTA	Cross-border offshore gas project with Senegal, named Grande Tortue Ahmeyim
GW	Gigawatt / Giga watt
I	
IBA	Important Bird Area
IFC	International Finance Corporation
IFC PS	International Finance Corporation Performance Standard
IFC PS6	International Finance Corporation Performance Standard No. 6: Preservation of biodiversity and sustainable management of living natural resources.
IMROP	Mauritanian Institute of Oceanographic Research and Fisheries (in french: IMROP)
IUCN	International Union for Conservation of Nature
K	
KBA	Key Biodiversity Area

M	
MEDD	Ministry of Environment and Sustainable Development (In French: MEDD)
MoU	Memorandum of Understanding
N	
NCEA	Netherlands Commission for Environmental Assessment
NGO	Non-governmental organisation
Node	Group of wind turbines and solar panels linked by a connection infrastructure
O	
ODEMM	Option for Delivering Eco-Based Marine Management, an approach developed as part of the European Union's Marine Strategy Framework Directive
OSPAR	'Oslo-Paris' Convention for the Protection of the Marine Environment of the North-East Atlantic
P	
PNBA	Parc National du Banc d'Arquin
R	
Receptors	Environmental and social components of the project site
S	
SEP	Stakeholder engagement plan
Solar panel grid	A set of solar panels operating as a single unit
T	
ToR	Terms of Reference
V	
VESC	Valued Environmental and Social Components

Glossary adapted from the glossary of acronyms and key terms presented by RSK/ESC in the ESIA ToR.

PART A

1. Introduction

The NCEA has received a request for assistance from the Environmental Assessment and Control Department (DECE) of the Ministry of Environment and Sustainable Development (MEDD) in Mauritania. The DECE is facing new sectors where it currently lacks expertise, particularly in the development of green hydrogen.¹ It has therefore asked the Netherlands Commission for Environmental Assessment (NCEA) to carry out an independent review of the terms of reference for the Environmental and Social Impact Assessment (ESIA) of the 'AMAN' green hydrogen project.

The proposed project includes renewable energy, green hydrogen and green ammonia production facilities and associated export facilities. The project involves the installation of wind turbines and solar panels in an 8,500km² desert area east of the Nouadhibou peninsula. These installations are expected to generate up to 30 GW of renewable electricity. The ESIA should also take into account the project components planned in the coastal areas surrounding the Baie du Lévrier and the Cap Blanc peninsula. These include the installation of various infrastructures for the different components proposed in this major project.

Beyond the immediate scope of the AMAN project, the wider ambitions and planned projects are of crucial importance for Mauritania, reflecting an ambitious energy transition and a desire to position itself on the global green hydrogen scene. Initiatives such as the Memorandum of Understanding (MoU) signed by the Mauritanian government in the margins of COP 27 to explore the potential of hydrogen on a large scale, and the launch of feasibility studies for the NOUR project for the large-scale production of green hydrogen, underline the country's strategic vision in this field. In addition, these collaborations with foreign companies and the announcement of further plans to invest in similar initiatives demonstrate the international appeal of Mauritania's green hydrogen potential.

CWP Global, a global renewable energy developer with the ambition of being a major player in the strategy of decarbonisation through green hydrogen, is particularly interested in this project. The AMAN project is one of their first projects of this type at this stage in Africa.

The scale of the proposed project, with its likely interaction with other high impact activities and the possibility of similar projects in the future, raises the need to consider cumulative impacts. It is essential to consider how the government can encourage better use of resources between projects, while ensuring responsible and sustainable management of these initiatives for the long-term wellbeing of Mauritania.

¹ Hydrogen produced from a process of electrolysis of water is said to be green if it is produced with electricity produced from renewable energy sources. Source : <https://www.orygeen.eu/docs-actus/glossaire/hydrogene-vert/>

1.1 The project

The AMAN project is centered around the production of hydrogen and green ammonia, powered by renewable energy sources (solar panels and wind turbines) installed in the north-western part of Mauritania. The region targeted by this project includes the northern part of the Dakhlet Nouadhibou region and the north-western part of the Inchiri region, mainly located between Levrier Bay, the Banc d'Arguin national park and the Mauritanian railroad line (Nouadhibou – Zouerate).

The project concept consists of a system of green hydrogen and green ammonia production facilities and associated export facilities. Part of the finished products will be exported by sea, while the rest will supply iron ore mines and various domestic uses. The project also aims to use green hydrogen and green ammonia for a number of potential hydrogen derivatives. Renewable energy production will supply electricity to the project's assets and related facilities, including the desalination plant, electrolyzers, air separation equipment, ammonia synthesis plants, green hydrogen production facilities, transportation and export facilities, workers' housing, on-site camps, administrative and service facilities.

In addition to the export of ammonia, the AMAN project anticipates local use of the water, electricity, hydrogen and ammonia produced.

More concretely, the project intends to develop:

- A wind farm and solar panels in a desert area of 8,500 km²;
- A seawater desalination plant;
- A hydrogen production plant;
- An ammonia production plant;
- Waste management infrastructures;
- Warehousing and storage areas;
- Pipelines (on land and/or underwater) to transport water, waste and finished products;
- Port facilities for export by sea;
- Staff accommodation.

Implementation of this project will also require the development of ports, roads and other necessary supporting infrastructure. The entity responsible for these related developments has not yet been determined.

1.2 Request for advice and NCEA's approach

The Environmental Assessment and Control Department (DECE) of the Ministry of the Environment and Sustainable Development (MEDD) in Mauritania has asked the Netherlands Commission for Environmental Assessment (NCEA) in a letter dated 1 November 2023 to provide an independent advice on the Terms of Reference (ToR) for the ESIA of the Green Hydrogen Project named 'AMAN'. These ToR have been prepared by the British RSK

Environment Ltd group and Mauritanian consultancy firm ESC, on behalf of the CWP Global company.

The objective of this advice is to examine the quality of the ToR for the ESIA of the AMAN project in the light of IFC performance standards and international best practice, and to provide recommendations for adapting the ToR to meet these standards.

The advice was prepared by a working group of experts. For more information on the working group and the experts, please see the colophon. Due to the tight schedule, no on-site visits were carried out for the preparation of this advice. However, a visit will be scheduled as soon as the DECE requests the NCEA to review other documents related to this project, such as a draft ESIA report.

The NCEA group of experts used the following sources as references:

- Current Mauritanian legislation, in particular the implementing decree on environmental assessments (decree no. 064–2004 and no. 105–2007);
- Best practices and international standards;
- The experts' judgement.

As international standards, the NCEA used the performance standards of the International Finance Corporation (IFC).

Reading guide

The NCEA focuses on the importance of essential data to be collected and included in the Terms of Reference, or of necessary information and additional details. Chapter 2 summarizes the most important observations of the NCEA. Opportunities for improvement, key data to be collected and essential recommendations are detailed in chapter 3.

For better comprehension, the advice has been divided into two parts, A and B. Part A focuses on the key points in a concise manner. All recommendations are presented in boxes. Part B aims to go into greater depth on important elements to facilitate understanding and underline the importance of the subject.

2. Summary of key observations

Overall, the terms of reference (ToR) are well structured. They comply with international standards for this type of project. The main components of the project are presented and detailed. The potential environmental and social issues have been listed in general. A preliminary identification of potential interactions between the various components of the project and the receptors has been carried out. The classification is made in a binary way: impact / no impact. The ToR mentions an environmental and social management plan, but its potential scope and associated plans are not defined.

It is very important to stress that this ESIA relates to a project in its initial phase in a particular situation: a multifaceted project, with a great deal of uncertainty about the technical definition and the various options in terms of the location and size of the project's components. The project involves major environmental risks. The project's developments and activities will have impacts on terrestrial, coastal and marine environments. The ToR state that all the International Finance Corporation's performance standards are considered applicable to this project. However, its recommendations do not appear to have been fully implemented and followed. It is very important to look more closely at the issues relating to biodiversity, climate change and ecosystem services. Some components of the project present industrial risks (toxicity, explosiveness) with potential effects on health and the environment. The exact nature of the studies required for the specific components of the overall project (ESIA or simplified ESIA) is not clearly defined. It would be useful for the ToR to state the regulatory aspects relating to a hydrogen pipeline and the other components. In particular, it will be necessary to specify the appropriate legal framework for these new activities in Mauritania, such as the production and transport of hydrogen. In accordance with international standards, a hazard study is required.

The study area presented in the ToR does not cover all the proposed infrastructure options, nor all the areas where there may be impacts, including the coastal area of the Banc d'Arguin National Park which is of global importance for biodiversity. It is not clear whether the effects of previous activities on the valued environmental and social components are fully considered. The proposed approach is based on a good identification of spatio-temporal vulnerabilities. However, the methodology proposed to describe the vulnerability of the host environment is not correct, and does not take into account the enormous progress made by Mauritania in regulating projects with an impact on coastal and marine environments, which are subject to an ESIA. Yet, by identifying existing sensitivities, and measuring them in relation to the impacts of the AMAN project, the ESIA will be able to identify relevant actions to avoid and mitigate impacts and to compensate for them towards the objective of 'net zero impact' and well beyond.

The aim of an ESIA is to prevent and minimise negative impacts, but also to proactively seek to reinforce and create positive impacts. Positive benefits do not seem to be fully taken into account in a specific way. It is important to stress that realising and reinforcing these positive aspects may require specific additional efforts. The NCEA notes that potential positive impacts, other than creating value for products, appear to be left out on the scope of this ESIA, particularly with regard to aspects such as water and electricity for local needs. The vulnerability of the areas of influence requires a Biodiversity Action Plan, which proposes

measures for biodiversity. It is essential to ensure the first two stages of the mitigation hierarchy, avoidance and mitigation, before resorting to impact compensation.

Various alternatives are presented for certain components of the project. These alternatives will have very different potential impacts. In the context of these ToR, it seems essential to develop decision-making tools that will be integrated into the ESIA. A multi-criteria analysis appears to be the most appropriate solution. The complexity of the project means that an approach of this type is needed to inform decision-makers and other stakeholders during the ESIA process about the best alternatives to consider, their locations and the privileged options that will be studied in the ESIA. The set of weighting criteria for the multi-criteria analysis should be chosen in consultation with stakeholders and in a transparent manner to ensure the traceability of choices in alternative options. The ToR make several references to the mapping of projects and impacts. A Geographic Information System (GIS) will enable the sensitivity and vulnerability of ecosystems and economic activities to be visualised, and the results of modelling to be integrated. The GIS data collected as part of the 'Biodiversity-Gas-Petroleum' programme in Mauritania can be used to this end.

The ToR state that a stakeholder engagement plan has been prepared, but provide no feedback on the issues raised during the initial screening consultation and how they have been taken into account in the ToR. There is no specific information on an initial mapping of the project's stakeholders. It is clear that this mapping and the engagement actions that will be carried out will need to be adapted to the different components of the project and their location. As regards the collection of primary data to establish the socio-economic baseline study, the preferred instruments are solely qualitative. To get closer to the social, environmental, economic and cultural reality of the project's host context, it is important to cross-reference sources and use complementary tools.

Given the complexity of the project and its current imprecision, the NCEA thinks it is a good idea to set up an interministerial technical committee to monitor the ESIA, and for an ESIA to be launched at this stage upstream of the project's life cycle. Particularly if it will enable informed choices to be made ultimately, taking account of the project's environmental and social issues. However, the consequences of this ESIA for the project development and authorisation process are unclear. The involvement of the interministerial committee in the decision-making process surrounding the design of the overall project and its components would be very relevant and could be described in more detail in the ToR. As for the alternative options, the NCEA would like to stress the importance of developing and comparing them at several decision-making levels, deciding first on the strategic options before developing the more concrete options. It would be useful to represent this process in a diagram.

The recommendations relating to these observations concern 1) the ESIA process and decision-making, 2) the search for opportunities to create or strengthen positive impacts, 3) the assessment methodologies, 4) the main impact areas, 5) the ESMP and associated plans, and 6) the use of the IFC Performance Standards.

3. Opportunities for improvement and key recommendations

Overall, the terms of reference are well structured. They respect international standards for this type of project. The main components of the project are presented. They are detailed knowing that the project is in its initial phase with a lot of uncertainty about the technical definition, location and size of the project components.

Overall, the potential environmental and social issues have been listed in the ToR. The NCEA notes that it will be very important to deepen the issues linked to biodiversity, climate change and ecosystem services. Preliminary identification of potential interactions between the different project components (and related activities) and receptors has been carried out. The classification is made in a binary way: impact / no impact.

However, it is extremely important to emphasize that this ESIA is linked to a particular situation: a multifaceted project, involving a lot of uncertainties on the technical definition and the different options in terms of location and size of the project components, infrastructure, etc. The AMAN project, despite its advantages for accelerating the energy transition towards a CO2 neutral society, adds major environmental risks.

The observations and recommendations formulated below focus on aspects which, although having been mentioned in the Terms of Reference (ToR), are an opportunity to deepen the information disseminated to stakeholders and to provide assistance to decision-makers to make better or more informed decisions. They concern 1) the ESIA and decision-making process, 2) the search for opportunities to create or strengthen positive impacts, 3) evaluation methodologies, 4) the main areas of impact, 5) the ESMPs and associated plans, and 6) use of the IFC Performance Standards.

3.1 ESIA and the decision-making process

Given the complexity of the project and its current imprecision, the NCEA thinks that it is indeed relevant that an ESIA be launched at this stage upstream of the project life cycle. Especially if this will ultimately allow informed choices to be made, taking into account the environmental and social issues of the project.

However, this raises questions about the consequences of this ESIA in the project development and authorization process. A comprehensive ESIA is very useful. However, it would also be necessary (for many components) to plan specific ESIAs and hazard studies – for example for hydrogen production sites and transport facilities. For this, it will also be necessary to quantify all the infrastructures that the project plans to develop and their alternative options, and define the studies necessary for the ESIA. Feasibility or “Basic Engineering” type studies may be carried out by CWP or specialised engineering firms/companies. A summary of each feasibility or engineering study must appear as an annex to the ESIA.

The vulnerability of the study and influence areas requires the development of a Biodiversity Action Plan which identifies and proposes measures to preserve, restore and compensate for impacts on biodiversity. This plan, to be developed with the scientific community, will serve as a solid basis to then feed into the actions identified in the ESIAs and Management Plans.

As for alternative options, the NCEA would like to emphasize the importance of developing and comparing them at several decision levels, of first deciding on strategic options before developing more concrete options. Apart from the options already mentioned in the ToR, other strategic options could be considered such as a connection to the electricity network in Mauritania or Morocco instead of or in addition to the transport of products by ship. Depending on the strategic options selected, concrete options to be further developed will be chosen or added during the design process.

This all requires a chain of decisions at several levels distributed over several moments in time and at several scales. It also implies great diversity in the type and detail of information required and varied stakeholder engagement depending on the decisions to be made. It would be helpful to represent this process in a diagram.

Given the complexity of the project and the multiple uncertainties regarding the different options that will be developed, the NCEA finds that it is a good idea to set up an interministerial technical committee to monitor the ESIA (page 84 of the ToR). Its involvement in decision-making surrounding the design of the overall project and its components would be very relevant, particularly in view of the potential of the project to contribute to the achievement of the Mauritanian sustainable development objectives or even because of its impact which affects the both land and sea areas. The set-up of this committee could be described in more detail in the ToR. It would be useful to specify, for example, its composition, the objectives and modes of operation of this committee, and in particular what role it could have in the course of the ESIA or the project.

Recommendations

The NCEA appreciates the approach proposed for impact assessment with an early start which allows for refinement over time, encourages it and recommends:

- Specify the objectives, composition and mode of operation of the interministerial technical committee supposed to support the ESIA process;
- Describe in the ToR the overall path of the ESIA structured by a well-established process in terms of decisions to be made, alternative options to develop and evaluate, specific ESIAs to be carried out for components, actors to be involved (developed in the PEPP(s)) and content to be provided at each stage;
- Add a diagram representing this process.
- Define, in the ToR, the studies necessary for the ESIA with an example of a detailed table of contents or the content of feasibility studies or even engineering studies. A list of studies that will be made available for the drafting of the ESIA must be part of the ToR of the ESIA.
- Consider this ESIA as the document justifying the decisions to be taken for the development of the different components of the project and their alternative options.

Thus, the legal procedure relating to the ESIA can be used for interministerial approval on all aspects of the development of the AMAN project, and not only on the environmental and social impacts which are the prerogative of the MEDD.

- Include the ESIA and its results in broader frameworks such as the Coastal Development Master Plan, the national policy for the development of green hydrogen and a Marine Spatial Planning process.

Additional details are provided in Part B, Chapter I ESIA and decision-making process.

3.1.1 Zone of influence and scope of study

Chapter 4.2 is devoted to the preliminary determination of the study area of the overall ESIA and the zone of influence. The ESIA study area, illustrated in the TOR on the map shown below, includes the Cap Blanc peninsula, the Bay of Lévrier for the production infrastructure of end products, maritime transport and the desert areas in which will be installed the solar panels and wind turbines.

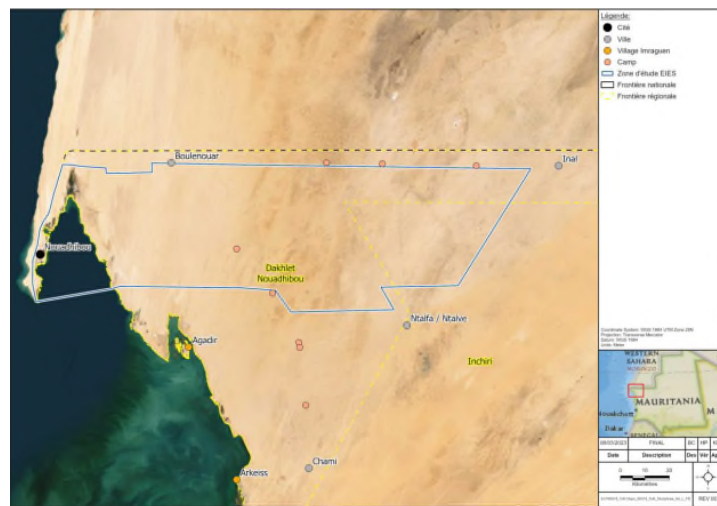


Figure: ESIA study area encompassing the surface area of the entire potential development of the project. Map taken from the ESIA ToR prepared by RSK/ESC

However, the study area does not cover all the proposed infrastructure options, nor all the areas where there may be impacts, that includes the coastal area further south including the Banc d'Arguin National Park. For example, in chapter 3.4.1, other infrastructures are mentioned that could be created as part of the project such as:

- The construction of new port facilities, north of Nouakchott and south of the Banc d'Arguin National Park,
- The construction of new port facilities on the continent, north of the Banc d'Arguin National Park,
- The reinforcement of the existing jetty at the small Port of Tanit, north of Nouakchott, and the reinforcement of the roads which serve this jetty. If the reinforcement works are deemed inappropriate, a new jetty and road infrastructure will be constructed,
- Other potential infrastructures.

Cumulative effects with other projects

In Chapter 7.7.8, entitled "Cumulative Impacts", the document describes the outline of the assessment approach in accordance with the IFC recommendations as presented in the "Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets. All cumulative impacts must be covered in the ESIA (environmental and social impacts), for all valued environmental and social components (VESC).

It is not clear from the ToR whether the effects of previous activities on VESC are fully considered in this approach. As the Mauritanian decree on ESIA stipulates: *"This analysis of the initial state in which the site is, in the event of the existence of negative impacts on the environment linked to a previous activity to which the former promoter did not remedy, must describe, quantify and evaluate these impacts prior to the activity subject to the impact or simplified impact study and the conditions in which the site is in its current state. This evaluation must be the subject of a second opinion from the Minister responsible for the Environment and the Minister concerned by the activity."*

The proposed approach is based on a good identification of spatio-temporal vulnerabilities. However, it is important to note that the approach recommended in the initial ESIA study to identify environmental receptors, as well as environmental components, is not suitable for the implementation of this scheme. Indeed, the description of the receiving biological environment simply enumerates the species of fauna without describing the degree of their respective sensitivities due to the threats that already weigh on them. However, by recognizing and identifying its existing sensitivities, and especially by measuring them in relation to the impacts of the AMAN project, the ESIA will be able to identify relevant actions to avoid and mitigate the impacts but also to compensate them towards the "net zero" impact objective and beyond. Given the nature of the project, contributing to the transition towards a carbon neutral society, and the country's extreme vulnerability to climate change, a better analysis of biodiversity (see OSPAR) could promote acceptance of the AMAN project and facilitate its integration into society. Also, given the scope of the overall project, it may be useful to consider a complete analysis of the ecological system of the landscape.

Presentation of information within the framework of the ESIA

In the conduct of the ESIA and its integration in the context of legal authorizations, two options are proposed for organizing the deliverables linked to this ESIA and the consultation of the authorities, as well as the public inquiry. The first would be structured around specific volumes linked to the different components of projects classified by nature, and the second proposes to integrate all the components of the project into a single volume. It is mentioned that option 2 was used in the Grande Tortue Ahmeyim (GTA) offshore gas project. The AMAN project is different and brings together a large, heterogeneous, geographically dispersed number of components with specific impacts. Option 2 does not seem suitable and the disadvantages presented by the ToR are realistic. A presentation by component, with its own ESIA and, where applicable, its own stakeholder engagement process, seems more appropriate.

Specific ESIAs for components of the overall project

The exact nature of the studies required for the specific components of the overall project (ESIA or simplified ESIA) is not clearly defined. According to the Mauritanian legal framework,

hydrogen production sites (ToR pages 17) are subject to an ESIA but not power lines or pipelines (simplified ESIA). It would be useful in the ToR to rule on the regulatory aspects relating to a hydrogen pipeline and other components, such as port, electrolysis stations, desalination station, or others. More particularly, it will be necessary to specify the appropriate legal framework for these new activities in Mauritania such as the production and transportation of hydrogen. Where applicable, the ESIA will take into account international standards (such as ISO) while waiting for the legal framework to be updated.

Recommendations

Given the complexity of the overall project and its imprecision at this stage, the NCEA recommends:

- Expand the study area to cover all possible project options and all potential impact areas of national or international importance. It will also be necessary to present new maps covering all the proposed infrastructure options and all the areas where there may be impacts.
- Specify how possible project options currently located outside the study area will be articulated, with particular attention to cumulative impacts at the regional and/or national level.
- Take into account the situation previous to the arrival of the project in the cumulative impacts.
- Specify from a legal point of view, in the TOR the different types of ESIA (impact study or simplified study), as well as necessary hazard studies depending on the components of the project.
- Identify, in the current Mauritanian legal framework, possible shortcomings to regulate in particular the production and transport of hydrogen in terms of safety, environment and identify, in the event of insufficiency of the current legal framework, the normative framework to apply. Provide the benchmarks or list the internationally recognized good practices that will be applied.
- List and describe the principles retained for the techno-economic feasibility studies or engineering studies for the options and alternatives retained, for each installation or infrastructure.
- Consider a comprehensive ecological system analysis of the landscape.

3.1.2 Stakeholder engagement

The engagement of communities and other stakeholders is an essential element in an ESIA process. The ToR specifies that a stakeholder engagement plan (SEP) has been prepared. However, there is no feedback in the ToR on the issues raised during the initial consultation as part of the screening and how they were taken into account in the ToR. There is no specific information on an initial mapping of project stakeholders. It is clear that this mapping and the engagement actions that will be carried out will have to be adapted to the different components of the project and their location, even if there will probably be common stakeholders. The ToR do not mention whether there will be under these conditions an overall SEP and/or a SEP by specific ESIA.

In connection with the stages in project design, decision-making, as well as the ESIA presentation options, it is clear that separate consultations according to the project components or groups of components (option 1) will be more appropriate than a consultation

encompassing all the components in their heterogeneity (option 2). Indeed, this would make the process too complex, too cumbersome and insufficiently targeted.

In order to facilitate genuine and meaningful stakeholder participation, regardless of the stage and level of involvement, transparency in the project design and decision-making process is a precondition. This includes facilitating access to information on the project, such as the ToR of the ESIA.

Furthermore, it is not specified anywhere in the ToR that information materials adapted to the target audiences will be prepared. The complexity of the project and its novelty, in certain aspects, compared to more traditional sectors (mining, etc.) requires that a significant information effort be deployed.

Recommendations

In order to ensure meaningful and effective participation of stakeholders, the NCEA recommends:

- Choose the engagement option that will allow consultation specifically on the different components of the project and will promote inclusive and effective stakeholder engagement.
- Specify in the ToR that accessible, relevant and culturally adapted information materials will be prepared.
- Specify the content of the PEPP in the TOR and integrate it into the deliverables.
- Publish the ToR with other information on the AMAN project.

3.2 Opportunities to create or strengthen positive impacts

It should be remembered that in the context of an ESIA, the objective is not only to prevent and minimize negative impacts, but also to enhance and proactively seek to strengthen positive impacts. In this case, the positive benefits currently seem not to be fully taken into specific consideration. It is important to emphasize that realizing and strengthening these positive aspects may require specific additional efforts.

The NCEA noted unseized opportunities for taking into account positive impacts at three levels:

- Strengthening positive impacts does not seem to be expressly stated as a specific objective of this ESIA as indicated on page 8 of the ToR. However, it should be noted that on page 3, it is specified that *“CWP ensures that the method adopted not only minimizes its footprint, but also creates value – for the environment, for its employees, for its partners and for the communities in which the company operates.”*
- In the impact assessment methodology, the promotion of positive impacts does not seem to be fully integrated. The opportunity for reinforcement and presentation of positive impacts will be essential for the project. The question then arises as to the absence of analysis of the positive impacts in terms of duration, geographical extent and importance.

- The Environmental and Social Management Plan (ESMP), according to page 16, seems to focus mainly on managing negative impacts. This once again raises a question about taking into account positive impacts, which often also require substantial efforts, such as the promotion of local employment, the creation of green jobs, the strengthening of skills, support for local supply chains, women's employment, etc. To ignore these aspects would be to assume that they will happen spontaneously, which is not necessarily guaranteed. It is crucial to study these aspects and consider the possibilities for action by the project leader and its partners (State, other companies, etc.) aimed at strengthening the positive economic impacts of the project.

In addition, the NCEA also notes that potential positive impacts, other than the valorization of products, seem to be excluded from the scope of this ESIA, in particular with regard to aspects such as water and electricity for local needs. . This observation contrasts with an official communication from CWP, where it is mentioned that *“the AMAN project will also provide cheap electricity, as well as more than 50 million cubic meters of fresh water to local communities and agriculture, obtained by desalination of sea water”*.

Recommendations

In order to fully and specifically take into account the positive impacts, the NCEA recommends – both for the construction phase and the operation phase – to:

- Plan a specific study as part of the ESIA of the labor market and carry out a gap analysis between the potential needs of the project in terms of number, type, skills and local capacities. Deduce axes in terms of training for example in the short, medium and long term.
- Plan a specific study as part of the ESIA which explores the local purchasing sector for goods and services and the possibility of building a strategy in the medium and long term to strengthen them (local fabric analysis in terms of capacities and quantitative and qualitative gaps; analysis in terms of feasibility and benefits).
- Identify, from the analysis of the local situation, under which conditions access to water and energy for local populations could be promoted and integrate this into the multi-criteria analysis for the choice of the different components and their location.

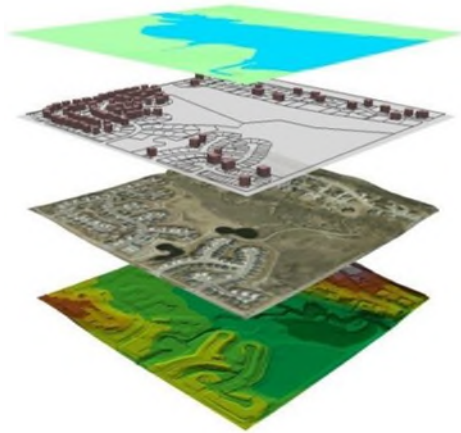
3.3 Evaluation methodologies

3.3.1 Cartographic tool

The TOR repeatedly mentions the mapping of projects or impacts. This spatial approach offers a vision that allows us to grasp the scale and position of the different components of the project, as well as the relationships with pre-existing infrastructure, such as the road network and ports.

The NCEA deduces that it is planned to set up a Geographic Information System (GIS) of the ArcGIS type. A GIS will make it possible to visualize the sensitivity and vulnerability of ecosystems and their spatiotemporalities (spaces and periods) and economic activities (fishing, etc.). The results of the modeling (discharges at sea, cloud of toxic ammonia gas,

etc.) could also be part of the GIS. In addition, the data collected (GIS) as part of the “Biodiversity–Gas–Oil” program in Mauritania can be used.



Recommendations

The NCEA underscores that the establishment of a Geographic Information System (GIS), such as ArcGIS, must be part of the ESIA. She recommends:

- Make the GIS available to the client (or another stakeholder) with obtaining the license and training of its staff after publication of the ESIA; the GIS will thus be updated and used during the construction and operation phases.
- Identify and train the actors who will use these tools in order to enable the tools associated with the ESIA (multi-criteria analysis – GIS) to follow the evolution of the project.

3.3.2 Decision support tools

Different alternatives are presented in the ToR for certain components of the project, for example in paragraph 3.2.4 – Seawater desalination plant:

The desalination plant will produce brine (water highly loaden with salts and other minerals). Currently, CWP is evaluating three different options for brine management, namely:

- the installation of evaporation basins,
- the discharge of brine into the sea via a pipeline and the installation of diffusers,
- the use of this brine as a raw material in other chemical production processes.

These alternatives will have very different potential impacts, particularly concerning the fate of salts deposited in evaporation ponds, which could constitute a source of impact in the long term. Consequently, within the framework of these ToR, it seems essential to develop decision support tools which will be integrated into the ESIA.

Among the available tools, a multi-criteria analysis appears to be the most suitable solution for such a project. Indeed, the complexity of the project makes an approach of this type necessary to inform decision-makers and other stakeholders during the ESIA process on

1) the best alternatives to consider, their locations and 2) the preferred option(s) which will be studied in the ESIA. The criteria for the multi-criteria analysis should take into account potential cumulative effects by considering other similar planned projects (for example, the NOUR green hydrogen project) and other planned projects having impacts on the same environmental or social aspects.

All weighting criteria for the multi-criteria analysis must be chosen in consultation with stake holders and in a transparent manner in order to guarantee the traceability of choices in the alternative options. This should also be included in the Stakeholder Engagement Plan.

To analyse and discuss aspects that cannot be managed (only) by multi-criteria analysis, an approach developed within the framework of the Marine Strategy Framework Directive of the European Union should be considered. ODEMM (Options for delivering Ecosystem-Based Marine Management) focuses on the structure, tools and resources needed to choose and evaluate management options based on the principles of Ecosystem Management (EM) in coastal and marine environments, where the impacts of anthropogenic effects mix and sometimes amplify. The proposed approach is one that can translate policy objectives into an operational process of creating, evaluating and choosing management options to inform decision-makers. The Mauritanian government, or CWP Global in collaboration with the Mauritanian government, could carry out this analysis for example as part of the development of a Biodiversity Action Plan.

Recommendations

Given the complexity of the project and the real risk of cumulative effects, the NCEA recommends:

- Plan to carry out a multi-criteria study (analysis), with an Electre-III type tool, to append the important aspects of the multi-criteria study to the ESIA and to summarize them in the “Alternatives” chapter.
- List, in the ToR, the principles of multi-criteria evaluation including the minimum components to consider (economic aspects, social and environmental impacts, etc.).
- Ask the consultant to justify the weighting applied to each criterion, and that these weightings be defined in consultation with the Client and/or critical stakeholders; it will make it possible to define the project's performance indicators.
- Determine relevant criteria, to be approved/validated by the scientific community (Mauritanian and international), to map the spatio-temporal vulnerabilities of the whole area. This includes the consolidation of existing data available in the various institutes in Mauritania but also abroad and the carrying out of reference studies linked to the activities and components of the project.
- Inclusion of the criteria of the “Atlas of vulnerability to surface pollution” can be considered for more effective management of risks linked to maritime transport of hydrogen and ammonia.

² The Electre III multi-criteria method offers the possibility of establishing a classification among different possible actions to solve a decision problem, taking into account several criteria.

Once an iterative approach to the project is adopted, this multi-criteria evaluation can be updated by the Client (or other stakeholder) who must then be trained in the use of the software.

For in-depth details regarding multi-criteria analysis and fundamental principles, see Part B, Chapter III Evaluation Methodology.

3.4 Main areas of impact

3.4.1 Process and transport security

Certain components of the project present industrial risks (toxicity, explosiveness) with potential effects on health and the environment, such as the production, storage and transport of ammonia or hydrogen. In accordance with international standards, a hazard study is necessary. This study, essential for a project of this scale, is generally carried out by the client or specialized firms, which may be the subject of a separate call for tenders or carried out jointly with the ESIA.

Hazard studies will include the production, storage and transport of dangerous products, whether by gas pipeline, maritime transport, etc. The main results of the modeling, carried out using software such as Phast 3D, Aria Risk, Aermol, or ADMS 5 for explosions or toxic clouds, must be annexed to the ESIA. The results of these studies should also be integrated into a cartographic tool and could contribute to a multi-criteria analysis.

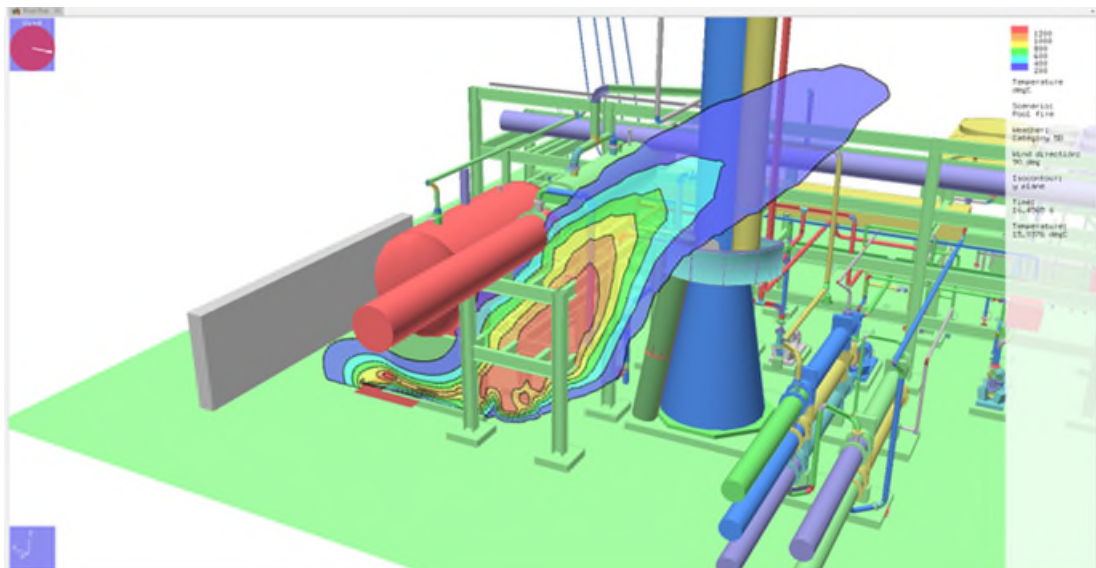


Figure: Example of leak modeling of flammable compounds with Phast software.

Source : <https://www.dnv.com/> Phast and Safeti 8.71)

Recommendations

In view of the aspects relating to industrial risks of several components of the project, the NCEA recommends:

- (Have) carried out a hazard study in accordance with international standards. It must include modeling of dangerous or toxic compounds, such as the dispersion of a toxic cloud or explosion scenarios, for example.
- Although distinct from the ESIA, integrate the main results of this study into the ESIA.

3.4.2 Environmental impacts

The AMAN project, despite its advantages for accelerating the energy transition towards a CO2 neutral society, adds major environmental risks. Preliminary identification of potential interactions between the different project components (and related activities) and receptors has been carried out. The classification is done in a binary way: impact / no impact (tables 6.1 and 6.2 p. 85/86). The evaluations are a priori correct provided that the projects are perfectly designed and operated. However, the classification of biological receptors does not lend itself to a 'state of the art' evaluation and must therefore be redone.

Preliminary impacts for the construction phase (ToR, table 6.1)

A project may or may not create impacts depending on its design. For example, for maritime pipelines for water, hydrogen, ammonia or other derivatives/quality and landscape value, it is indicated “no impact”. However, the landing zone of a pipeline can affect the coastline depending on the construction method. An open trench on the coast without prevention can destabilize the shoreline with regressive erosion (landscape).

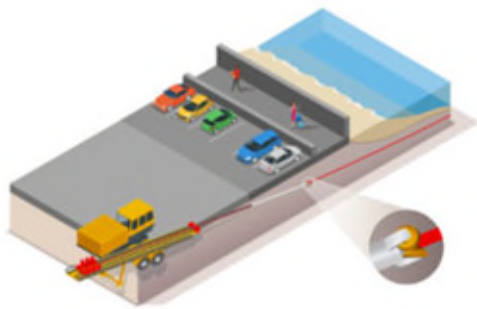


Figure : Construction by drilling or “sinking” No impact



Photo : Fight against erosion for the landing of the DUNANT marine cable on the beach of Saint-Hilaire de Riez (France) source: <https://merceron.com/>

During the construction phase, many components can create impacts. It must be clearly explained that all project components for the construction phase will be reassessed in terms of potential impacts during the ESIA (overall ESIA, and specific ESIA of the project components based on the design (engineering) of each project component .

Preliminary identification of impacts for the exploitation phase (ToR, table 6.2)

For all support infrastructure (waste management, employee accommodation, etc.) and for all optional components (hydrogen derivatives plants, etc.), “no impact” was noted for many aspects: water quality, surface water and groundwater, soils, biological environment, etc. This statement of absence of impact cannot be given “a priori”. It will depend on the construction and operating conditions and therefore it is necessary to study the potential impacts on the environment.

Some examples:

- A leaky waste management infrastructure without rainwater control can lead to serious contamination of surface or groundwater. A well-designed and operated installation will only have an impact in an accident situation.
- In the absence of a sanitary water treatment plant for employee accommodation, wastewater can irreversibly affect surface water
- It is not possible to state “a priori” that a hydrogen derivatives plant for the processing of iron ore will have “no impact” on the physical or biological environment. This will depend on the design of the installations and all associated utilities and modes of operation. Therefore, not studying the impacts “a priori” does not seem acceptable.

Emissions

The renewable energy generation will power the project assets, including related facilities, such as the desalination plant, electrolyzers, air separation devices, ammonia synthesis plants, green hydrogen production facilities, transportation and export facilities, worker housing, on-site camps, administrative facilities and service facilities. Electricity generators will be needed as an alternative, which will result in emissions. At this stage of the study, the size of these generators have not yet been determined and the impacts cannot yet be assessed with sufficient precision. This will be part of a component of the project and must then be the subject of the ESIA specific to the components.

Potential impacts on biodiversity

Potential impacts include bird deaths linked to wind turbine blades, accidental discharges or spills at sea, changes in bird migratory behavior, and disruption of coastal ecosystems. The scoping study correctly identified that the overall AMAN project area is part of the "East Atlantic Flyway" of migratory birds from the Palearctic but ignores that seabirds also come from Antarctica. They cross the entire overall area planned for the project each year with two seasonal peaks, from September to November and from March to June (and not just once, September/October, as indicated in the scoping study). Birds (shorebirds, seabirds, passeriform birds, gliding birds, such as raptors, vultures, storks), but also bats, are the species most vulnerable to installations of renewable energy sources.

Coastal installations and offshore discharges can cause cascading effects on marine and coastal ecosystems. Lévrier Bay, planned for the installation of most of the project components, is already subject to increasing pressures due to the activities of fishmeal factories, infrastructure, intensive fishing, and the effects of climate change. For example, the discharge of effluent from fishmeal factories alters water quality and is strongly suspected of having caused, during hot periods, massive strandings of coastal fish (e.g. infected mullets stranded on the beaches of Nouadhibou in 2020, 2021, 2022 and 2023).

In its position as guardian of this crucial area for biodiversity, Mauritania is vested with the responsibility of taking proactive measures for the protection of these fragile ecosystems, on which the fishing sector closely depends. The absence of such actions would have consequences on this strategic sector of the country and could have repercussions well beyond its borders. Due to the importance of the overall area planned for the Aman project, coinciding with the centerpiece of the "East Atlantic Flyway", the CWP and the Mauritanian authorities have a particular responsibility to prepare for and anticipate potential impacts with cross-border aspects.

Analysis of the reference state of biodiversity and monitoring of impacts

On page 83, the study mentions that *"The project team carried out a preliminary assessment of the types of receptors and resources present based on a desk review, stakeholder engagement and site visits. This assessment will be updated as additional information on the location and design of each project component becomes available."* Receptors and resources considered with respect to the biological environment have been defined as follows:

- avifauna (birds),
- marine ecosystems (excluding birds),
- terrestrial ecosystems (excluding birds).

However, birds are an integral part of both marine and terrestrial ecosystems. Exclusively marine species, such as shearwaters and gannets, only land on land during their breeding periods outside Mauritania. In addition, birds with rather terrestrial affinities coexist and interact with these terrestrial ecosystems. Some seabirds also rest and breed on the coast, highlighting the impossibility of classifying them as an isolated component.

It is relevant to highlight a possible gap in this division, characterized by the absence, during the preliminary assessment, of the potential impacts of maritime transport on avifauna and terrestrial ecosystems. An example to study is that an accidental spill of fuel or ammonia from a maritime incident could lead to irreversible consequences for seabird populations, as well as shorebirds and other categories of birds present in large numbers in intertidal and coastal zones. A more in-depth analysis of these crucial interactions could contribute to a more complete assessment of the potential impacts of the project.

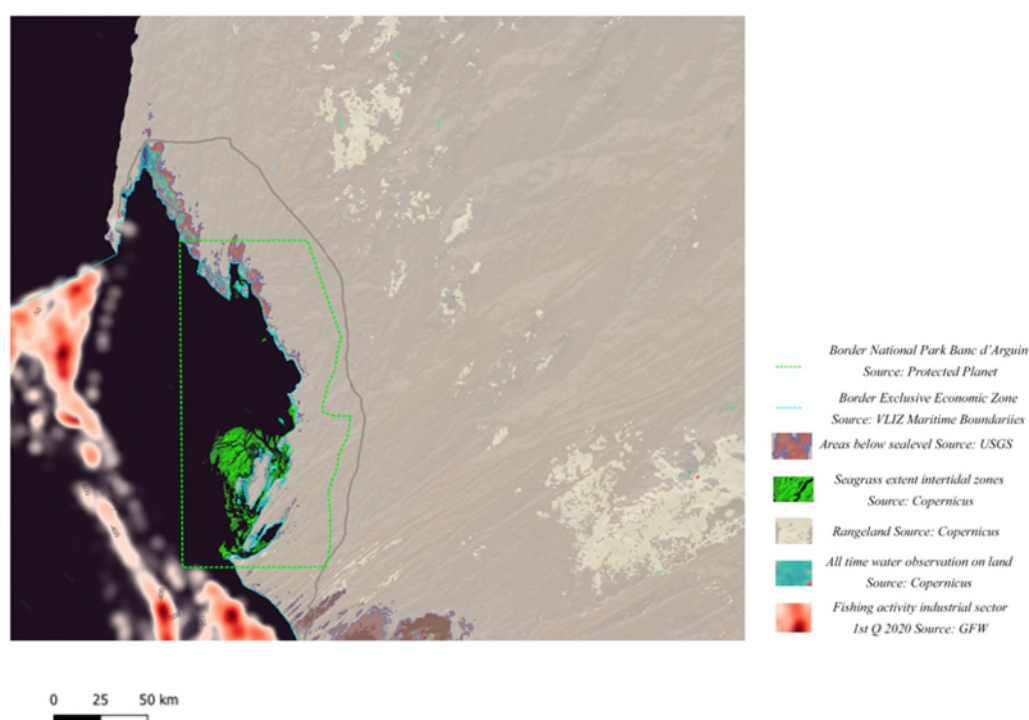


Figure: Map showing some key elements of the AMAN project host environment. Source: SIG MARVEL of the BGP Program.

The studies are planned to establish a reference state and to monitor impacts from the start of the project. These studies are currently limited to (pages: 89, section 4.4):

1. Species on the IUCN Red List, such as certain species of marine mammals, sharks, rays and fish, as well as fish and octopus breeding areas.
2. Species defined as protected according to article 9 of law 97-006 of the Hunting and Nature Protection Code.
3. Protected areas (national parks, cf. PNBA, Cap Blanc satellite reserve).
4. Areas identified as vulnerable or of biological interest (see IBA, EBSA).

Many vulnerable species in Mauritania are not listed in the red list or by the hunting code. Furthermore, areas currently designated as protected do not encompass all vulnerable biodiversity habitats, nor do they ensure ecological connectivity or the preservation of migratory species. The areas identified in the scoping study, such as the ZICO "Important Bird Conservation Areas" or the ZIEBs, are far too large to constitute a decision-making tool for

³ The maritime border (EEZ), the limits of the Banc d'Arguin National Park, the area below sea level (Areas below sea level), the extent of seagrass meadows and the area where most migratory birds concentrate and also green turtles which come from Guinea Bissau to fatten there (Seagrass extent), grazing areas in desert areas important for migratory birds and nomads (Rangeland), temporarily flooded land areas (on the coast with the sea water and inland with rainwater) (All time water observation), the main areas of the industrial fishing sector (first quarter 2020) (Fishing activity) which coincide with the areas of concentration of seabirds, and the Nouadhibou–Nouakchott road.

the project. They do not make it possible to identify areas to avoid in a relatively small space such as the overall area allocated to the project. At best, IBAs or EBSAs help to raise awareness that the project is going to take place in a sensitive area that is of international importance.

Recommendations

The NCEA recommends:

- Revise Table 6.2 extensively, or alternatively a commitment should be made and clearly explained that all project components for the construction phase will be reassessed in terms of potential impacts during the ESIA (overall ESIA, and project specific ESIA) depending on the design (engineering) of each project.
- Plan to study the potential impacts on the environment for all support infrastructure and for all optional components.
- Redo the classification of biological receptors according to OSPAR criteria, based on the maritime atlas of vulnerable areas in Mauritania and the opinions of the scientific community.

In view of the potential negative impacts and the global importance of biodiversity in Mauritania, the NCEA recommends managing the activities and developments of the AMAN project by adopting an ecosystem and integrated approach to managing impacts on biodiversity, based on the principle "*avoid, mitigate and compensate*", to achieve the objective of "*net zero impact on biodiversity*" and more particularly by:

- Favoring close collaboration between CWP Global and Mauritanian biologists working on the Baie du Lévrier and the Banc d'Arguin and international support to develop and implement a robust environmental strategy. This cooperation will make it possible to benefit from the specialized expertise necessary to guarantee optimal environmental management of the project and to continue efforts to consolidate and repatriate data on biodiversity in Mauritania (a large part of which still resides abroad).
- Planning to locate construction such as wind farms, solar panel farms, factories outside the most vulnerable areas within the migration corridor.
- Avoiding the discharge of liquid waste into the sea, which could further aggravate the alteration of the chemical and bacterial composition of the bay.
- Integrating the "*atlas of vulnerability to surface pollution*" of the BGP Program into the ESIA to manage maritime transport risks (export of hydrogen and ammonia by sea).
- Carrying out reference and monitoring studies consistent with the technical tools already developed within the framework of the BGP Program in order to valorize the data and methodologies (see Microcontamination early warning system, atlas of vulnerability to accidental pollution at sea).

4 "Biodiversity – Gas – Oil" Program: Partnership project to integrate marine and coastal biodiversity into the development of the hydrocarbon sector in Mauritania, supported by the United Nations Development Program (UNDP) and financed by the Fund for Global Environment (GEF)

3.4.3 Social impacts

Collection of primary data and tools to be used

Regarding the collection of primary data to establish the socio-economic baseline study, the privileged instruments are only qualitative. The NCEA does not note in these ToR the requirement to use a socio-economic survey on a representative sample in the zone of influence of the specific components of the project more suitable to draw up a relevant baseline for the ESIA.

Relying solely on consultation risks giving an incomplete, or sometimes even anecdotal, vision of social and economic aspects. Qualitative data would complement quantitative data in addition to available secondary data. To get closer to the social, environmental, economic and cultural reality of the project's host context, it is important to cross-check sources and use complementary tools (quantitative, qualitative, secondary and primary data).

Concerning nomadic populations, the ToR specifies on page 77 that semi-nomadic camps could exist. However, it would also be necessary to use cartographic data on nomadic trails and existing grazing areas in the zone of influence by approaching the stakeholders concerned (Ministry, National Group of Pastoral Associations, etc.) to better understand this presence and the possible impacts on them.

Gender

Generally speaking, taking gender into account in ESIA is essential. This consideration, according to IFC standards, must be done at all levels of the ESIA (basic study with data segregated by sex, consultation, differentiated impacts, mitigation measures and ESMPs, complaints management mechanism). However, the NCEA notes that the ToR only make a reference to gender when they mention the organization of separate focus groups during the consultation.

Land issues and resettlement

Given that at this stage the precise components of the project are not yet clearly defined, consideration of a resettlement policy framework is of particular importance. In general, IFC Performance Standard No. 5 recommends establishing such a framework when project components and their geographic locations are not sufficiently defined. This framework provides the opportunity to define the principles, strategy and methods to be followed in the event of potential impacts on livelihoods, homes and structures due to the project.

However, what is currently proposed appears to be limited to a livelihood recovery framework, as mentioned on page 99. This raises legitimate questions: Why the limitation to economic resettlements? Has the possibility of physical resettlement been considered, and if so, what factors led to this conclusion? Clarification on this point would be useful to better understand the scope of the screening study on this subject.

Furthermore, the NCEA notes that this framework is not included in the deliverables. However, a resettlement policy framework is a document, which, like the stakeholder engagement plan, must be prepared as soon as possible, at the scoping phase for example in order to frame all resettlement situations if they are unavoidable and linked to a specific component of the project (production installation, pipeline, road, etc.).

Recommendations

The NCEA recommends:

- Strengthen and clarify the specification in terms of data collection for the socio-economic baseline study of the ESIA through suitable complementary quantitative and qualitative tools.
- Collect more precise data on the population of nomads in the project's area of influence, based in particular on known grazing routes and their cartographic representation, in order to determine the areas likely to contain them in relation to the components of the project.
- Include in the ToR a detailed methodology for collecting primary data
- Produce a more comprehensive resettlement policy framework that integrates aspects of livelihood restoration and any possible physical resettlement.
- Integrate the production of this framework into the deliverables and study timeline
- Carry out a complete study of land, land use and potential problems linked to it.
- Document the land acquisition procedure for the different components of the project.
- Consolidate the principle of avoiding resettlements wherever possible and integrate this explicitly into the project's development options by using a dedicated criterion in the multi-criteria choice tool, as previously discussed in chapter 3.4 "Methodologies evaluation methods used and proposed".

In order to ensure that gender is taken into account in the ESIA according to IFC standards, the NCEA recommends:

- Integrate the gender perspective into all stages of the ESIA (data collection, identification and assessment of impacts, mitigation measures) as well as the Resettlement Policy Framework
- Ensure that women can express themselves and put forward their points of view on the project, its impacts, and mitigation measures. Consistently engage them in consultation.

3.5 ESMPs and associated plans

An environmental and social management plan is mentioned on page 119 which specifies the ESIA plan and its content. The potential contours of the ESMP and associated plans are however not defined in the ToR, nor are associated plans mentioned. However, components of the project will eventually require, for example, a rehabilitation plan. This raises questions about the nature of these plans and the potential impacts they will cover, at the level of detail expected. Will a detailed or abbreviated operationalization framework for the ESMP be proposed (responsibilities of the different actors, contractors, procedures, capacity building, etc.)?

The ESMP is a central element and the culmination of the work carried out within the framework of the ESIA. An ESMP must be relevant and appropriate to the site(s) and take into account legal and international obligations. It must indicate management actions, with objectives, responsible persons and planning in order to avoid any confusion, but also allow adaptive management to changes throughout the project. The ESMP and associated plans should facilitate effective monitoring and audits. It is therefore important to provide details on the contours of what is intended to be contained in the ESMP and its associated plans.

It is indicated on page 35 of the ToR that the construction process will be phased and should last at least 10 years. This will also require rigorous reflection on surveillance and monitoring systems, both at the institutional level and at the level of the project leader. The analysis of institutional capacities to follow this project should also be addressed and the possibility of a capacity building programme considered.

Recommendations

In order to enable effective monitoring of the project and its impacts, NCEA wishes to emphasize the importance of and recommends:

- Specify in the ToR the level of detail that will be envisaged in the development of the ESMP, and the type of plans that could potentially be developed according to the preliminary impacts identified. It is not necessary to be exhaustive at this stage, but to list the most likely plans.
- Analyze the institutional capacities to manage this project, and address the possibility of a capacity-building program.

3.6 Use of the IFC Performance Standards

The terms of reference mention on page 28 that all International Finance Corporation performance standards are considered applicable to this project, and present them all in Table 2.3. However, the recommendations made under these standards do not appear to be fully implemented and followed.

For example: performance standard no. 6.

To facilitate sustainable management of private sector projects, the IFC recommends that companies follow a management approach based on the hierarchy: avoiding, mitigating and offsetting impacts on vulnerable biodiversity. This hierarchy is defined by Performance Standard 6 from the Convention on Biodiversity (CBD). It aims to help companies anticipate environmental impacts and strive to achieve the objective of “zero loss of biodiversity”. Furthermore, oil and gas companies, such as BP, Shell and Total, have also adopted this principle of zero loss of biodiversity for their operations in Mauritania. However, the development of a Biodiversity Action Plan as recommended by IFC performance standard 6 for any project likely to impact critical habitats is not provided for in the ToR. However, this document is essential to guide the development of a good strategy for the conservation of biodiversity and the restoration of ecosystems. An example is shown in Part B, Chapter II Creating or strengthening positive impacts.

However, as far as biodiversity is concerned, it is crucial to recognize that the identification of compensation measures, particularly in terms of potential positive impacts, is also

a delicate step. In a context where the impacts on biodiversity, and the ecosystem services derived from them, are not precisely assessed or quantified, these actions can easily be perceived as greenwashing by various stakeholders. This is why a Biodiversity Action Plan, validated by the Mauritanian government in consultation with the scientific community, is essential to ensure compliance with the first two stages of the mitigation hierarchy, namely avoidance and mitigation, before resorting to impact compensation.

With regard to the project's carbon footprint, it is stated in the introduction to the ToR (p.2) that CWP wants to contribute to achieving “net zero emissions”, while at the same time committing itself to finding new solutions for local communities and indigenous peoples, particularly those who have often remained on the sidelines of mainstream economic growth. These vulnerable groups are often closely dependent on ecosystem services, and therefore on biodiversity conservation. Furthermore, the last part of this declaration does not seem to be adapted to the Mauritanian context, and it would be useful to do so. The Biodiversity Action Plan also helps to identify relevant actions to reinforce the potential of ecosystems to sequester carbon (cf. Green Wall, rehabilitation of wetlands in the lower delta, protection of “blue carbon” etc.).

Another example concerns the mainstreaming of gender issues as advocated by the IFC. Notably in Performance Standards no. 1 Environmental and social risk and impact assessment and management – Stakeholder engagement section, no. 2 Labor and working conditions, and no. 5 Land acquisition and involuntary resettlement. The example is described in paragraph 3.4.3 Social impacts, the Gender section.

Recommendations

The NCEA confirms that all IFC performance standards are applicable to this project and recommends:

- Explicitly describe the implications for the project for each performance standard, in a manner adapted to the Mauritanian context.
- Follow the IFC guidelines and redefine the project's environmental aspirations around the hierarchy of impact mitigation: avoid, mitigate and compensate to achieve the objective of “zero loss of biodiversity”.
- Develop a Biodiversity Action Plan (BAP), as recommended by the IFC (Performance Standard 6) for any project likely to impact critical habitats (see East Atlantic Flyway, World Heritage of the Banc d'Arguin National Park, Baie de l'Etoile, biodiversity hotspots upwelling zone) and integrate the results into the ESIA and Environmental Management Plans. Consolidate in this BAP existing knowledge on the spatio-temporal vulnerabilities of the host environment and its zone of influence by taking into account existing threats.

PART B

Part B of this opinion aims to go into more detail on the important elements described in part A in order to facilitate understanding and highlight the importance of the subject. It also suggests ways in which they can be taken into account in the project, its support and the ToR for the ESIA.

I. ESIA and the decision-making process

Because of its multifaceted nature, the project requires an iterative design and decision-making process, unfolding over several stages. At this stage, it is characterised by a range of options and alternatives, some of them relating to political decision that still need to be taken and documented. In the context of the ambitious objectives of the Mauritanian government and CWP Global to accelerate the energy transition with 30 GW of generation over a large area, it is imperative to take into account the complexity of this project.

The area in question covers 8,500 km², not including the marine life zone likely to be impacted. As a rule of thumb, an area of less than 250 km² could potentially accommodate all the wind and solar farms needed to achieve 30 GW of capacity in a dense grid. Although the figures may vary, there appear to be some important considerations regarding the how, where and what of environmental assessment.

It is imperative to seek alternatives and take a strategic approach to the design of spatial alternatives for solar and wind farms, aiming for reduced and/or different impacts. Large areas may be unsuitable or reserved for other land uses. However, this requires concrete spatial designs to be proposed for comparative assessment within an ESIA.

Given the size of the project, its location, and the various impacts to be considered in terms of production, the ecosystem and safety for the population, it is essential to carry out a thorough and transparent assessment of the various options, taking into account their respective impacts. This assessment should adopt a broader perspective, emphasising a balance between environmental, social and economic objectives.

The ToR state on p.99 that 'project components may be assessed at different times, with assessment commencing as soon as adequate information on the design and implementation options for the component concerned is available'. And also that 'the assessment of the impact of each component of the project will be an iterative process, the results of which will enable changes in location or design to be justified in order to eliminate or minimise the impacts of the project.'

This iterative, multi-stage design and decision-making process will be refined to produce a portfolio of well-defined projects with a (very) limited choice of alternatives and a more narrow focus, emphasising impact minimisation and mitigation.

The purpose of a scoping report for an ESIA is to inform the public and decision-makers about the ESIA process and the broad outlines of the project that the ESIA accompanies. In the case of a process integrated with project development, it should also provide information on the process of arriving at an approved project – the road ahead.

It would therefore be useful to include a diagram illustrating the stages of the project, with the corresponding activities and the expected results/outputs of each stage, both for the project itself and for its ESIA. This diagram should provide a visual clarification of the final elements and the to-dos, explicitly distinguishing between the project and its ESIA. It is essential that the timing of the two is presented in such a way as to indicate how and when over time, they are interconnected and influence each other.

An ESIA serves stakeholder engagement with increasing levels of ambition for stakeholder participation in project decision-making:

- Verifying whether the project complies with the country's environmental and social norms and standards
- Providing the conditions under which the project becomes acceptable (mitigation measures)
- Providing the best alternative for the project, influencing its design
- Providing the instruments for informing and involving stakeholders and the public
- Participation: a process leading to a joint effort by the authorities, technical specialists, the project owner, and other stakeholders to reach a better decision.

Given the ambitions of the AMAN project and the commitments made by CWP Global⁵ it would be logical for the ambitions for stakeholder involvement in this project to be at the same level. A more detailed stakeholder analysis at each stage would help to guide the communication and consultation strategy for the stage in question, based on the roles and communication needs of each stakeholder identified and using available and appropriate channels.

Integration into wider frameworks: the example of Marine Spatial Planning

In such a diffuse environment as the sea, factors of change, whether man-made or natural, are juxtaposing, interacting, and amplifying each other. The difficulty of disentangling the impacts of the AMAN project from other sources of environmental stress calls for a governance approach adapted to this reality. For this reason, countries hosting different maritime sectors (e.g. fishing, maritime transport, offshore oil development, wind farms) have at the same time framed each sector and project within a broader governance framework.

⁵ 'Our projects aim to have a long-term positive impact on the communities around them, and we always work in partnership with local stakeholders to ensure this. Transparency and engagement are key to our success; involving the community and getting them excited about decarbonising their cities and helping them build infrastructure that will benefit them in the future.' – Source : [Community – CWP Global](#)

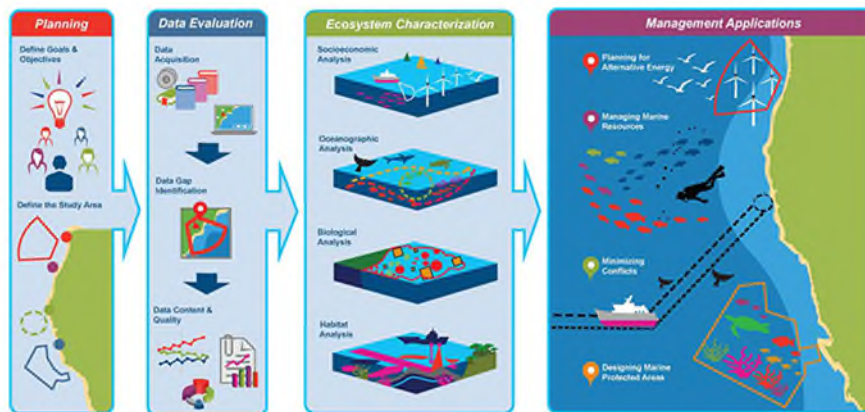


Figure: Diagram of a marine spatial planning process. Source: [01. What is Marine Spatial Planning? | PIPAP \(sprep.org\)](#)

The Marine Spatial Planning (MSP) process involves a number of stages and players to ensure the sustainable use of a pre-determined marine area by involving the various stakeholders with an interest in that area. The stages consist of:

1. *Information gathering:* Scientists, researchers and maritime experts gather data on the marine ecosystem (spatial and temporal vulnerability), human activities and economic needs.
2. *Stakeholder consultation:* An interministerial committee brings together local communities, maritime industries, environmental organisations and other stakeholders with the aim of achieving sustainable management of human activities in the marine area in question. The scientists inform the stakeholders of the ecological, social and economic vulnerabilities, but also the compatibility between uses, existing or potential conflicts and propose different scenarios to resolve these conflicts. The stakeholders explain their needs, concerns and perspectives.
3. *Planning:* The maritime authorities work with all stakeholders to draw up a development plan that takes account of human activities as well as spatial and temporal vulnerabilities.
4. *Scenario building:* At the same time, different scenarios are examined to assess their impact on the environment and the economy. Options are explored that maximise the benefits while minimising the risks, framed by thresholds/ norms of ecological indicators (early warning system, biomarkers).
5. *Validation and Adoption:* The plan is submitted to to an approval process involving government authorities and marine stakeholders.
6. *Implementation:* Once approved, the plan is implemented with the ongoing collaboration of stakeholders. Maritime authorities and the scientific community monitor and adjust the plan over time using the early warning system.

Collaboration between these different groups is essential for developing sustainable maritime plans that are acceptable to all.

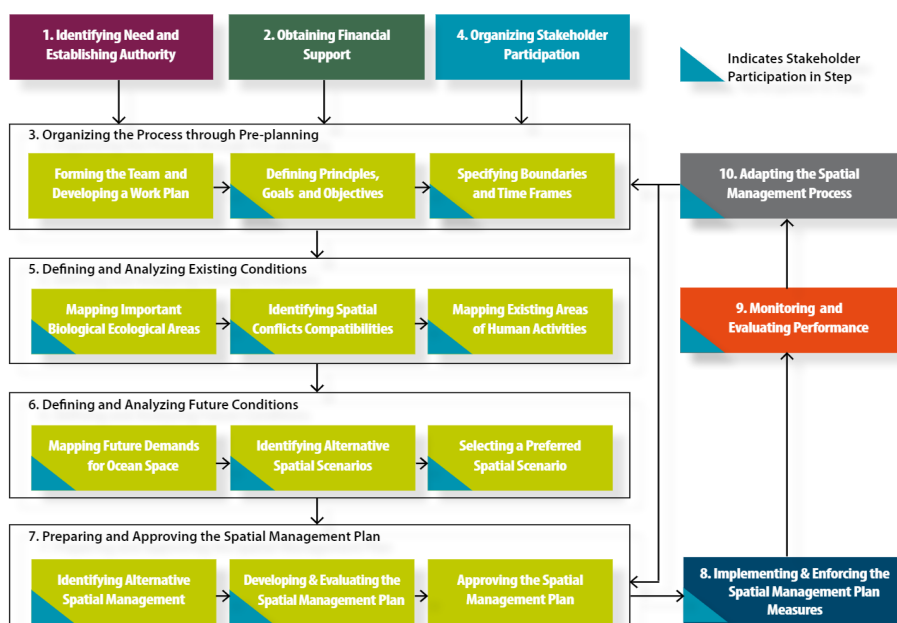


Fig. 1. A Step-by-Step Approach to Marine Spatial Planning

14 MARINE SPATIAL PLANNING — A Step-by-Step Approach toward Ecosystem-based Management

Figure : Marine spatial planning: a stepwise approach to ecosystem management
Intergovernmental Oceanographic Commission (IOC), Charles Ehler and Fanny Douvère, 2009

Multi-sector involvement and oversight by an inter-ministerial committee

Paying close attention to the coordination and opportunities of other sectors (coastal management, tourism, fisheries, etc.) at an early stage increases the chances of identifying new opportunities and balancing short-term and long-term interests. This is important because the production of green hydrogen, green ammonia and renewable energy, while generating short-term benefits, also has long-term environmental and economic impacts.

The proposal to set up an interministerial committee to monitor this ESIA at an early stage is a good initiative and could, as far as coastal and maritime components are concerned, also trigger the wider Marine Spatial Planning process. However, there are questions about how this committee will operate that need to be clarified. The ToR should address for example the following points to clarify its role:

1. Representation of ministries and other structures such as regional representations: several sectors may be impacted and need to be involved. The ToR should specify which ministries will be represented on the committee. Consideration could be given to setting up two separate interdepartmental committees, one for land areas (renewable energy resources), and the other for activities on the coast and offshore (hydrogen and ammonia production plants, maritime transport). This specialised approach could enable more targeted management of the issues specific to each field and zone of impact.
2. Methods of input and operation: it must be clearly defined how the committee will be informed, how often, and on what basis (what types of information). An explanation of how the committee will operate is also necessary. Transparent procedures will ensure an adequate flow of information for the committee's decision-making.

3. Role in the ESIA and related decisions: It is crucial to clearly define the committee's role both in the ESIA process and in the decision-making processes related to the ESIA. This will ensure effective integration and meaningful input into key decisions.

II. Creating or reinforcing positive impacts

The positive spin-offs could have been taken into account in a more concrete manner, for example, through the promotion of local content, including initiatives such as local employment, particularly for women, the strengthening of technical and management skills, support for local purchase chains, etc. By way of comparison, the REH project in Australia (Pilbara region), which was also initiated by CWP and shares similarities with the AMAN project in certain respects, occupies 6,500 km² and will produce 26 GW of solar and wind energy, as well as 1.6 Mt of hydrogen and 10 Mt of green ammonia, and includes measures such as the creation of companies in the value chain, given the scale of the project.

On the other hand, for the project in Mauritania, it seems to be stated, particularly on page 5, that the project will be based mainly on imports of construction materials. The spin-offs mentioned are mainly in low value-added sectors such as catering, security, construction and transport, as mentioned on page 83. The technical capacities and industrial fabric of the two countries may differ. Even so, in the context of an ESIA and especially for a project of this scale, it is reasonable to expect an in-depth analysis of these spinoffs and the exploration of avenues and their feasibility for strengthening these structuring spinoffs for the country's economy are included. Even if this has to be envisaged in a dedicated complementary study.

The project also provides for the local use of water, electricity, hydrogen and ammonia produced from the project's renewable energy sources. Supply facilities to meet local needs are planned. An official CWP communication states that *"the AMAN project will also provide low-cost electricity and over 50 million cubic meters of fresh water for local communities and agriculture through seawater desalination"*. However, it should be stressed that availability will depend on the production capacity of the desalination plants and the specific water requirements of the project; details that are not yet available.

In the ToR it is stated that: *"Surplus freshwater produced could be supplied to other users. If appropriate arrangements can be made with stakeholders and other third parties, CWP proposes to incorporate metered abstraction facilities as part of the freshwater pipeline infrastructure, the location of these facilities to be determined as part of the stakeholder engagement."* This is a societal measure. However, a study of people's 'needs' does not yet seem to have been carried out. With this in mind, the possibility of using any surplus to benefit local communities could be considered.

Positive impacts on biodiversity and nature

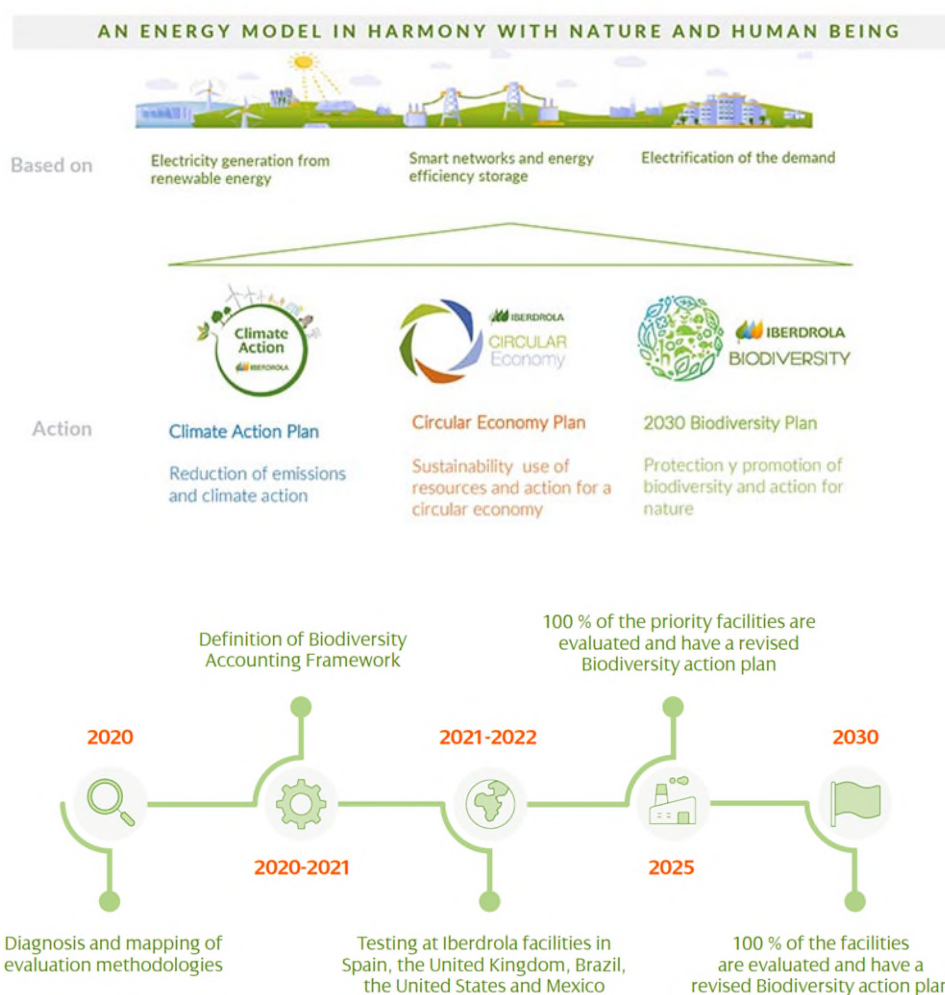
In part A, it was stressed that it is crucial to recognise that identifying offset measures is a delicate stage. Before putting forward suggestions for maximising positive impacts, a Biodiversity Action Plan, validated by the Mauritanian government in consultation with the scientific community, must first be drawn up to ensure compliance with the first two stages of the mitigation hierarchy, i.e. avoidance and mitigation, before resorting to offsetting.

Nevertheless, the opportunities for investing in biodiversity in Mauritania and making a contribution to Sustainable Development – and thus creating more positive impacts – are manifold:

- In the introduction, CWP affirms its commitment to the ambitious goal of ‘net zero emissions’. To offset its carbon footprint, the company could invest in the restoration and conservation of biodiversity in Mauritania. Under the auspices of the Ministry of Environment, the country is implementing ‘bio-geo-engineering’ projects such as the ‘Great Green Wall’ and the restoration of wetlands in the Lower Delta of the Senegal River. These initiatives are helping to rehabilitate ecosystems with a high capacity to sequester and store CO₂.
- Less well known, but just as important, is the potential of the Mauritanian sea to store more CO₂, known as ‘blue carbon’, through the conservation and restoration of ecosystems such as the seagrass beds of the PNBA, the preservation of high-carbon seabeds and the protection of populations of large whales. Research carried out as part of the BGP programme has shown that whale populations are increasing off the coast of Mauritania. Large whales have been identified by the IMF as the ‘natural solution’ to accelerate the transition to a carbon-neutral global society.⁶
- Mauritania could strengthen its position on the international scene in terms of financing adaptation to climate change by deepening its research into the impacts on marine ecosystems and the costs on the socio-economy. Funding for this research could encourage financial support from the international community for the conservation and restoration of marine biodiversity. This would not only help to increase the country's resilience to global warming, but would also benefit the international community by exploiting the natural potential of this marine area to increase the (underground) storage of CO₂ (e.g. protection of the great whales or the carbonate seabed).

The figures below show an example of the Iberdola Company integrating Biodiversity Action Plans into their activities, based on regularly updated analysis and mapping (GIS) in line with IFC Performance Standard 6.

⁶ [Nature's Solution to Climate Change – IMF F&D](#)



III. Evaluation methodologies

The ToR states on p. 99 that "Impact assessment for all project components will be undertaken in a structured and consistent manner. The impact assessment methodology has been developed to meet the requirements of Mauritanian legislation and the IFC's Environmental and Social Sustainability Performance Standards (2012). The impact assessment will be an iterative process".

The methodology, however, is not described in the ToR. In order to provide decision-makers and stakeholders with an overview of the assumptions and choices made in the methodology, the following elements should be described in the ToR and then in the ESIA report:

- The process of developing scenarios or options
- The construction of criteria for comparative evaluation of scenarios
- The weighting of criteria
- The evaluation of each scenario on all criteria
- The aggregation of scenario performances

- Negotiating the choice of scenario
- Detailed assessment and elaboration of environmental and social measures

Multi-criteria analysis

Decision-support tools allow to provide relevant answers to a wide range of problems implementing several possible choices (siting of industrial sites, clean-up strategies, etc.), to help with diagnosis and, more generally, to facilitate strategic or operational decision-making in imprecise and/or uncertain environments. It is an evaluation of alternative choices and scenarios, in order to select the wisest possible choice according to the objectives and results sought. The figure below shows the stages in a multicriteria analysis.

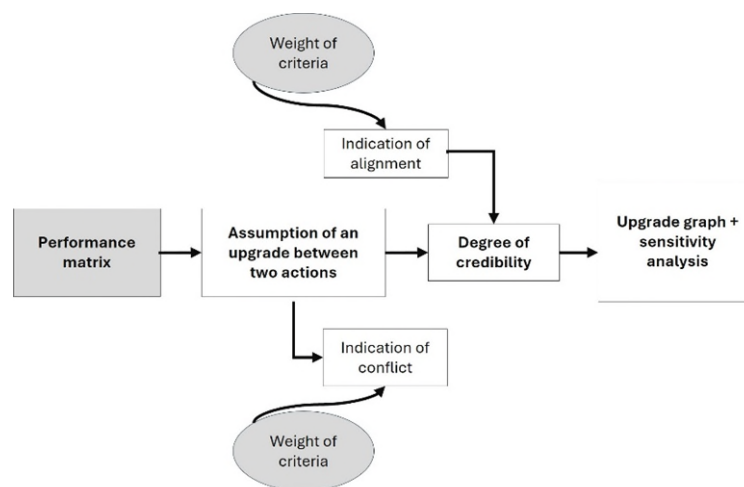


Figure: diagram of the stages in a multi-criteria analysis

The aim of a decision support tool is to provide decision-makers with alternative scenarios, analysed for their potential impact, effectiveness, coherence and usefulness.

Stakeholder involvement

It is essential to involve the stakeholders and beneficiaries of projects to facilitate them to take ownership of the choices made. In particular, the process must be transparent for the weighting stage (e.g. giving priority to the project's environmental quality, or to economic aspects, deadlines, technical feasibility, etc.) and for veto thresholds (e.g. absence of irreversible effects on a protected marine area, etc.). An iterative approach with input from decision-makers is preferred, and the number of criteria should be kept to a minimum. A sensitivity analysis will enable the assessment of the robustness of the results to changes in the values of certain variables and weightings.

To ensure good project governance, it is needed to to establish a participative, opposable and transparent working approach with critical stakeholders. In concrete terms, the consultant must be able to explain and communicate the constraints (no discharge in a protected area, etc.), the judgment criteria and the results of the analysis. Communication via an Environmental and Social Performance Index is desirable.

Some aspects may not be managed by the multicriteria analysis, such as uncertainties, missing data or temporal variations. These aspects will have to be discussed and managed separately.

ODEMM

The ODEMM programme⁷ (Options for delivering Ecosystem-Based Marine Management) is one of the tools available for analyzing and discussing aspects that cannot be managed (solely) by multi-criteria analysis. The ODEMM Linking Framework can be used to identify all the links between sectors, pressures, ecological components and the Good Environmental Status indicators of the Strategic Frameworks for the Marine Environment, Biodiversity and Adaptation to Climate Change. The figure below shows an example, presented in the form of a Horrendogram.

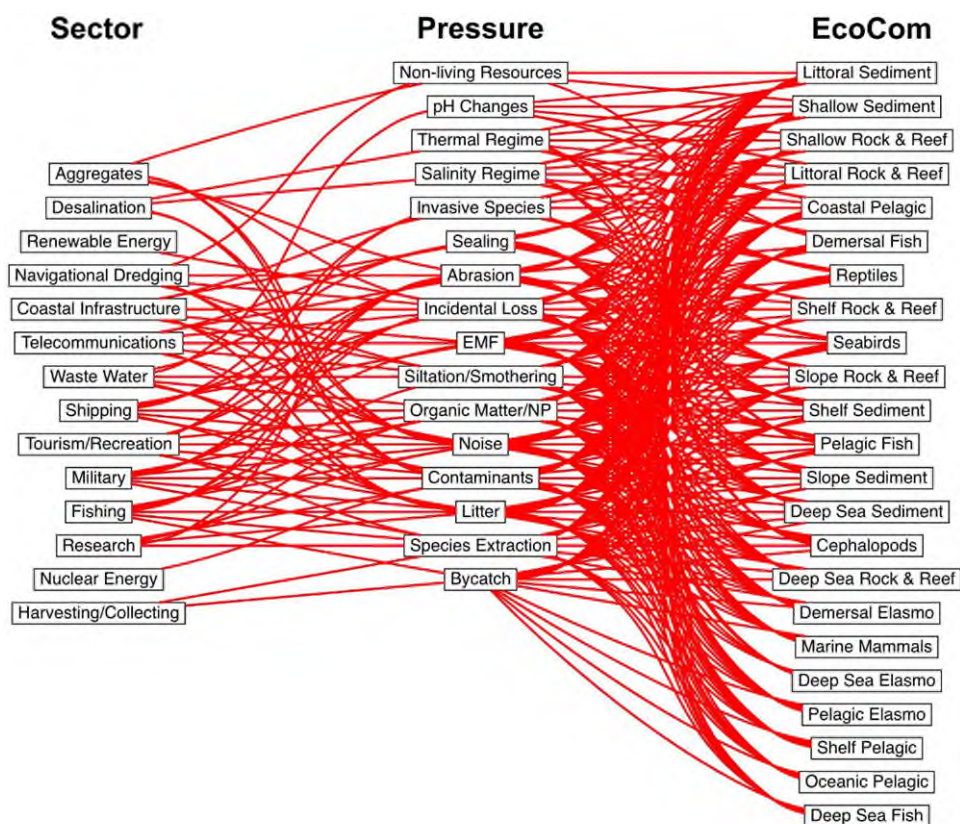


Figure: example of a Horrendogram, obtained from expert opinions on the impacts of different anthropogenic sources, illustrating the complexity of the linking framework. All sectors, pressures and ecological components assessed in the study area are shown, with red lines representing connections.

The Pressure Assessment, of which an example is shown in the table below, can then be used to start weighting the impact of the sectors and pressures that occur. Through expert opinion, the tool illustrates an overall picture of all the pressures that occur together in a system. It can also be useful to further classify these pressures in some way to prioritize management

⁷ [Approach for ecosystem-based management | The European Maritime Spatial Planning Platform \(europa.eu\)](http://approach-for-ecosystem-based-management-|The-European-Maritime-Spatial-Planning-Platform-(europa.eu))

by considering strategic trade-offs between sectors to create space for one sector by relieving pressure on biodiversity through reforms in another sector.

Sectors	Pressures (count)	EcoCom (count)	Total Links (count)	PC (%)	IR (average)	IR (sum)	IR Rank (average)	IR Rank (sum)
Fishing	8	23	125	16.03	0.043	5.339	1	1
Shipping	8	23	111	14.23	0.017	1.896	2	2
Wastewater	6	16	67	8.59	0.012	0.794	3	3
Tourism/Recreation	8	18	86	11.03	0.007	0.578	4	4
Military	8	22	82	10.51	0.002	0.152	8	5
Desalination	4	12	35	4.49	0.002	0.075	7	6
Telecommunications	7	23	97	12.44	0.000	0.040	11	7
Navigational Dredging	6	9	23	2.95	0.001	0.026	9	8
Coastal Infrastructure	7	16	54	6.92	0.000	0.025	10	9
Aggregates	5	5	9	1.15	0.002	0.021	6	10
Nuclear Energy	1	4	4	0.51	0.004	0.016	5	11
Research	6	23	79	10.13	0.000	0.003	13	12
Harvesting/Collecting	2	5	7	0.90	0.000	0.001	12	13
Renewable Energy	1	1	1	0.13	0.000	0.000	14	14

EcoCom, Ecological Components. The green color gradation indicates light colors for low values and dark colors for high values. The red color gradation indicates light colors for low impact risk and dark colors for high impact risk.

Table: Classifications of descriptors identified by cumulative and average impact risk (IR), as well as proportional relationships (PR), and cumulative and average risk scores for sectors.

The aim is to ensure the sustainable development of maritime sectors and human activities on the coast. The Risk Assessment quantifies the results of the Pressure Assessment and can give a relative risk value of the pressures in the system and indicate which sectors contribute to them.

These analyses are then discussed at successive meetings of a multi-disciplinary team of experts (expert judgement), including specialists in bird and marine ecology, fisheries, oceanography, biogeography and ecotoxicology, and are organized to assign scores to each impact chain, as defined in the linkage framework matrices.

IV. Impacts on biodiversity

Biodiversity baseline and impact monitoring

With the Biodiversity-Gas-Petroleum Programme (BGP), managed by the Ministry of Environment, Mauritania has made enormous progress in regulating projects with an impact on coastal and marine environments, which are subject to the preparation of an Environmental and Social Impact Assessment (ESIA). The technical tools developed as part of this programme facilitate the identification of targeted actions for ecosystem-based marine and coastal management.

It is regrettable that the methodology proposed in the Terms of Reference (ToR) of the ESIA for the AMAN project is not based on this already acquired knowledge and tools. The ecological data available and consolidated by this BGP Programme would make it possible to

apply methodologies of analysis similar to those used in the OSPAR region and to go beyond the monospecific (species by species) approach proposed by the consultants.

The IUCN red list, protected areas enjoying some form of national or international legal recognition, article 9 of law 97-006 of the Hunting and Nature Protection Code or areas recognised as vulnerable by law and/or environmental organisations are not enough. The red list is first and foremost a tool for raising awareness and monitoring the state of biodiversity worldwide. Furthermore, the red list is non-exhaustive and most of the species threatened in Mauritania do not appear on it. The same reasoning applies to the threatened species included in article 9 of law 97-006 of the Hunting and Nature Protection Code, which is also non-exhaustive and therefore insufficient as an additional criterion for the red list.

The word 'vulnerability' has many definitions and is often described in relation to a specific threat/pressure. The atlas of vulnerability, drawn up as part of the BGP programme, uses the following definition: 'Risk incurred by species or ecosystems of approaching the minimum threshold necessary to guarantee their viability'. This atlas also provides guidance on how best to compartmentalise marine and coastal ecosystems to analyse in depth their respective vulnerabilities to the impacts of human activity. It emphasises the importance of this analysis while maintaining a perspective on ecological connectivity. The atlas of vulnerability to surface pollution is based on a multitude of criteria specific to the avifauna and megafauna communities present off the coast of Mauritania. This atlas exists for the OSPAR region and is now also available for the waters of the upwelling zone off Mauritania.

Best practice for describing and mapping the vulnerability of an area should consider at least the following criteria listed below:

Texel/Faial criteria for describing/mapping used in the OSPAR region :

- Global importance: The global importance of the area for a species is demonstrated when a high proportion occurs in the project area (regardless of whether it is on the IUCN Red List or not).
- Regional importance: The importance of the project area for a crucial stage in the life cycle of a species (cf. the importance of the Banc d'Arguin seagrass beds for the rooker of Guinea-Bissau green turtles, or the importance of the upwelling zone in the upwelling zone during the migration of round sardinella).
- Rarity: A species is considered rare if its total population size is small. In the case of a sessile species or a species with restricted mobility at any stage of its life cycle, a species is rare if it occurs in a limited number of locations. In the case of a highly mobile species, rarity will be determined by the total population size.
- Sensitivity: A species is '(very) sensitive' when:
 - a. it has very low resistance (i.e. i.e. it is very easily negatively affected by the activity or component of the project due to its behaviour or rarity, cf. vultures to wind turbines, bats, etc.);
 - b. it has (very) weak resilience (i.e. after a negative effect of human activity, recovery is likely to take a very long time, or even not at all, see coral

reefs in the case of deep-water trawling, Egyptian vulture in the case of wind turbines).

- **Keystone species:** A species that exerts a regulating influence on a community/ ecosystem (e.g. maerl beds, seagrass beds, small pelagics, sharks, etc.).
- **Decline:** means a significant decrease observed or indicated in terms of quality (quality refers to life history parameters). The decline may be historical, recent or current. 'Significant' does not necessarily have to be understood in a statistical sense.

Anticipated impacts on biodiversity

Among the potential impacts of the AMAN project, it will be necessary to anticipate:

- **Direct mortalities:** birds, but also bats, can fatally collide with the blades or masts of wind turbines, solar panels and high-voltage cables. Birds may mistake solar panel farm for fresh water tanks and may collide when trying to land on them. After an accident with a tanker or rupture of a pipeline, certain species of seabirds dive into the pollution layer, soil their plumage and drown. In the event of an ammonia spill, sea turtles, mammals, fish, fish larvae and birds risk being poisoned by ammonia fumes. However, the potential impacts are still poorly understood (source: [EDF-Europe Ammonia-at-Sea-Summary.pdf \(edfeurope.org\)](#)).
- **Sublethal effects:** Daily spills, such as wastewater from accommodation, seawater desalination plants, hydrogen and ammonia production plants, and ammonia spills can cause cascading effects. In particular, untreated wastewater or ammonia spills fuel a proliferation of bacteria increasing the biological demand for oxygen thus aggravating existing mortalities of fish and other organisms in Lévrier Bay.
- **Loss of habitat:** birds avoid wind farms, high voltage pylons, solar panel parks and their surroundings. Consequently, these areas become temporarily or permanently unsuitable as feeding or resting areas. Coastal infrastructure also reduces resting areas for seabird or sea turtle nesting areas.
- **Formation of barriers:** wind power installations can create barriers. Migrating birds and those on their way to or from the breeding or resting place change their trajectory. This requires additional time and energy. The birds therefore have to eat more while the time to search for food is reduced.
- **Change in species composition:** installations can attract insects which in turn attract insectivorous birds and tall structures can create a favorable environment for raptors.

Scientific documentation to be expected:

- Use existing data on the ecological vulnerability of the region and take into consideration other threats that already weigh on biodiversity (see fishing, maritime transport, infrastructure);

- Use BGP Program approaches to determine relevant criteria to map spatio-temporal vulnerabilities from the overall area to project activities and components;
- Identify gaps in existing knowledge;
- Collect and consolidate migratory bird monitoring data (location data, GPS, recorders, cf. University of Groningen RUG, VU, etc.) to refine field studies;
- Design and validate with the national and international scientific community the additional studies to be carried out;
- Carry out a risk analysis of all impacts (cumulative effects) which weigh on the different components of the host environment through expert/scientific opinion exercises in order to situate the risks of the AMAN project in relation to other projects /sectors (see ODEMM);
- Feed the results of expert opinions into more strategic environmental policy frameworks (PDALM, Marine Spatial Planning, PANE) to create more space for the project by reducing the impacts of other sectors (i.e. reforms of other sectors, make compensations or “trade-offs”).
- Develop a Biodiversity Action Plan (BAP) consolidating existing knowledge on the spatio-temporal vulnerabilities of the host environment and its zone of influence.
- Integrate the results of the BAP into the ESIA and the Environmental and Social Management Plans as well as the environmental management decision support tools already developed within the framework of the Gas and Oil Biodiversity Program.

Strengthen environmental management tools:

- Complete the “Marvel” Geographic Information System (product derived from the Gas and Oil Biodiversity Program) on the ecological vulnerability of coastal and marine environments with data collected as part of the AMAN project and work with the University of Nouakchott to receive and host the device;
- Strengthen the Marine Micro-Contamination Early Warning System (bioassessments, biomarkers, monitoring of heavy metals and hydrocarbons in different matrices, physico-chemical parameters).

Measures to strengthen environmental policies:

- Participate as CWP in broader environmental management policy frameworks by communicating during tripartite consultations/dialogues (State-Private Sector-civil society) the risk analyzes on the biodiversity of the AMAN project, but also its impacts in relation to other anthropogenic sources (see ODEMM Analysis)
- Contribute to reducing threats to biodiversity through advocacy for necessary reforms to be carried out for other sectors by making available a scientific argument on the state of biodiversity in the area of influence of the AMAN project to stakeholders;
- Support the Ministry of the Environment in its mission to reduce pressure on vulnerable sites/biodiversity (support the establishment of offshore MPAs, strengthen the protection status of Baie de l'Etoile, or promote trade-offs/ compromise to be made between sectors in overexploited locations as recommended by the IFC notice for the PS6.

V. Land Issues and Resettlement

Given the nature and scale of the facilities required, this type of project will require a significant amount of land. According to the ToRs, the solar and wind energy production sites alone, including all the associated infrastructure (upstream site), will require 8500 km² (850,000 ha). There will also be land requirements for desalination, electrolysis and green ammonia production facilities (downstream site), which are likely to be closer to the east coast and more densely populated areas. Some of these requirements will be more linear in nature and will cover long areas (pipelines, transmission lines).

Port facilities to be redeveloped (port of Nouadibou, Tanit) and new or redeveloped roads could also have land and resettlement implications, although responsibility for developing these infrastructures has not yet been identified (page 4). Land rights and access to land are only mentioned on page 86 in the list of receptors and resources that will be taken into account.

It is essential to address this topic in depth, and it would be beneficial if the ToR provided guidance on the nature of the issues to be explored. This would enable a thorough understanding of the nature of the land tenure and occupation involved in the project. For example, it would be relevant to explore the possible presence of collective rights, even though private ownership and the public domain of the state are the norm in Mauritania. In addition, the review could also consider the possibility of potential conflicts related to the ownership or use of land and other resources.

Appendix A: Environmental issues

This Appendix aims to provide more insight into the environmental issues to be explored in future studies.

Hot and desert lands

The overall project area envisaged to accommodate the renewable energy installations is characterized by low primary production, with rainfall limited to less than 100–150mm. The topography includes sand dunes and barely vegetated plains, dominated mainly by *Leptadenia pyrotechnica*, thorn bushes and euphorbias. In the depressions, groups of trees, such as acacias (*Acacia tortilis*) and desert date palms (*Balanites aegyptiaca*), add to the diversity of this poor environment.ⁱⁱ

The extensive desert areas of the project are part of the trajectory taken by approximately 2.1 billion passeriform and almost passeriform birds, migrating from the Palearctic to sub-Saharan Africa, in addition to an undetermined number of large migratory birds such as gliders which exploit the rising currents to move such as birds of prey or even storks. Biodiversity in this inhospitable environment remains relatively restricted, with less than 30 species recorded, mainly represented by members of the Sylviidae family, the Northern Wheatear (*Oenanthe oenanthe*), the Common Oedicnemus (*Burhinus oedicnemus*), or even the Western Warbler. blackhead (*Sylvia atricapilla*).^{ix}

The precise importance of these arid zones for passeriform birds remains largely unknown. Longtime considered as a barrier flown over in one fell swoop by these migratory birds, desert areas appear to be of much more significant importance as feeding and resting sites than initially assumed.

Palaeartic populations wintering south of the Sahara are experiencing a worrying decline compared to birds that stay further north. The great droughts of the 1970s and 1980s, the deforestation of the Sahel, the hydraulic development of rivers, climate change, and to a lesser extent mining projects, have all contributed to the deterioration of the quality of wintering and transit areas for migratory birds.^{ix}

With climate change, precipitation trends are uncertain: projections range from a slight increase to a decrease in annual precipitation up to 11 mm by 2080. However, future dry and wet periods are expected to become more extreme.^{ix}

Cold and rich sea

The marine and coastal environment planned to accommodate hydrogen and ammonia production plants is of global importance for biodiversity, on which one of the world's largest fishing fleets relies. Under the influence of the trade winds, cold water rich in nutrients but poor in oxygen from the layer of water called South Atlantic Central Water (SACW) rises to the sunny surface, causing massive growth of microscopic plants, phytoplankton.

This constitutes the basis of a complex and prosperous ecosystem.ⁱⁱⁱ

This phenomenon, known as upwelling, occurs from November to March along most of the Mauritanian slope and lasts all year round at Cap Blanc. This place is also considered the beating heart of the “Canary Current Eastern Boundary Upwelling System” which extends from Senegal to Portugal. There are only four major upwelling ecosystems in the world, all located on the eastern edges of the oceans. Although these environments cover only one percent of the planet's water surface, they contribute 20% of the fishery resources caught in the sea. In addition, the mineral salts present in the Sahara dust further amplify this important primary production important in Mauritanian waters ^{iv}.

This biological wealth is manifested in winter through the presence of more than 3 million birds. Two million shorebirds feed in the intertidal zones along the coast, while nearly a million seabirds forage offshore in the upwelling zone. The coastal environment in the vicinity of the project is home to significant populations of Afro-tropical birds, as well as endemic species, such as the Banc d'Arguin Spoonbill (*Platalea leucorodia balsaci*) and the Mauritanian Gray Heron (*Ardea cinerea monicae*).^{iv}

The coastline is populated by two-thirds of the world's population of ruddy godwits (*Limosa lapponica*), and almost half of the world's population of red knots (*Calidris canutus*).^{iv} Further offshore, at the level of the upwelling zone, the planktivorous seabirds of the Palearctic (including 15% of the world population of broad-billed phalaropes) delight themselves alongside Afrotropical birds, on zooplankton, eggs and larvae of marine organisms. At the same time, fish-eating birds (including 30% of the global gannet population) collaborate with dolphins, sharks and tuna to bring together schools of small fish, called “small pelagics”, into a compact ball of food, known as “baitball”. When fish-eating birds go into “hunting” mode with tuna, dolphins and sharks, they become essential indicators for artisanal fishermen, guiding them towards schools of fish within the immensity of the marine space.^v In summer, the composition of seabird species changes with the arrival of migratory birds from Antarctica, which seek refuge in the rich waters of Mauritania to protect themselves from the southern winter (cf. Wilson's Storm Petrels or Puffin sooty).^v

Seabirds and megafauna, easily visible on the surface, indicate areas and periods rich in biodiversity. They are predictable around the Mauritanian slope formed by upwelling and a spectacular geomorphology of the slope cut by numerous canyons.

These ecological indicators for places rich in biological matter have been mapped off the coast of Mauritania to support the plan to combat catastrophic pollution aimed at better prepared actions at sea to curb the risks. An in-depth reanalysis of these same spatio-temporal data could also inform ecosystem management for pelagic fisheries. This would allow this fishing sector to avoid areas and periods that are too sensitive, thus contributing to the reduction of incidental fishing for threatened species, such as sharks,

cetaceans, rays and turtles. In a "business as usual" scenario, certain sharks caught incidentally are likely to disappear from the region, thus causing cascading effects on fisheries resources (see Spread of diseases through stocks of fisheries resources, change in species composition, etc)^{°.vii}

On the seabed of this upwelling zone, scleractinian corals are found which form the largest cold-water coral reef in the world. The soft bottoms also shelter corals which, alongside other organisms, feed on the remains of the biological production created on the surface. These habitats are considered critical areas for fisheries resources in the OSPAR area, USA and New Zealand, and benefit from special protection.^{viii}

Furthermore, a proposal already exists to protect five zones at the Mauritanian slope, demarcated by the scientific community where the physical disturbance of the seabed should be avoided, or even prohibited, which is still not implemented (cf. Demersal trawling, laying of pipelines).^{viii}

In general, anthropogenic warming of the earth leads to warmer, less oxygenated and more acidic oceans and the marine environment of the host country is very sensitive to these changes.^x

Warmer water

Species playing a key role within the Mauritanian marine ecosystem have temperate affinities and live on the coast and offshore areas at the limit of their biogeographic zone, such as *Zostera noltii* occupying 75% of the seagrass meadows of the Banc Arguin. The slightest increase in temperature (more than 1.5°C) would be fatal to them.^{ix} But also mobile species with tropical affinity, such as round Sardinellas, are impacted and migrate with the increase in water temperature from Senegal towards the north. Mauritania still benefits from it, but this "Northward shift" trend could continue to the detriment of the country.^x

The increase in temperature is also raising sea levels (melting ice, thermal expansion) which is expected to increase by 36 cm by 2080. This increase presents a threat to the coastal zone which is partly located below sea level, protected by a fragile coastal dune which is at Nouakchott exploited for construction. A lot of new infrastructure and housing is located in these low-lying areas. Furthermore, the intrusion of sea water into land areas could infiltrate towards the water table and the quality of these fresh water reservoirs.^x

Less oxygenated water

Surface water, always warmer, also contains less and less oxygen, inducing a reduction in ventilation towards the depths. This deoxygenation is considered by the scientific community as the most alarming impact of climate change on the marine ecosystem. While in the desert, water is the essential parameter that governs life, underwater, it is oxygen that becomes the determining factor for the development of complex and flourishing underwater life.^{xi} In Mauritania, deep waters already have naturally low oxygen levels qualified as hypoxic due to the intense mineralization of biological material formed on the surface.^{vii}

A large number of species, notably those which inhabit coral reefs between 400 and 600 meters deep, are already at the edge of their ability to survive in such an environment poor in oxygen. South of Cap Blanc there is an area between 400 and 700 meters having a low oxygen level that could be considered a "deadzone".^{vii}

With this global warming, an Oxygen Minimum Zone is expanding extensively, both horizontally and vertically, in the Atlantic Ocean. This decrease in oxygen, entirely attributable to climate change, could cause the entire deep zone in Mauritania, already naturally depleted in oxygen, to shift towards anoxic conditions. This could lead to significant mortalities among complex organisms, including fisheries resources.^{xii}

It is essential to note that overfishing and harmful impacts on marine habitats exacerbate the process of water deoxygenation. The decline in plankton consumers, such as zooplankton-feeding fish, as well as disruption of seabed, increase the availability of biological material in the water column for bacteria. Their proliferation depletes the water column of oxygen, thus increasing the risk of transition from a hypoxic to an anoxic environment.^{xiv} This process, also known as "deadzonification", is usually preceded by "medusification" of waters, where cnidarians take the place of fish to deplete biological material in the water column.^{xiv} In recent years, seasonal blooms of jellyfish have been regularly observed during the summer, providing a clear warning signal. This situation highlights the importance for the authorities to implement a more attentive management approach in the area of fishery.^{xiii}

More acidic water

The third impact of climate change on the oceans is acidification. About a third of the CO₂ derived from fossil fuel consumption is absorbed by the oceans, leading to a decrease in pH and a disruption of the carbonate chemistry in seawater. These chemical changes particularly affect species with an exoskeleton composed of lime (see coccoliths, bivalves). The water pH of the Greater Canary Current Upwelling Ecosystem is already naturally low, making this eco-region particularly vulnerable to this anthropogenic acidification.^{xiv}

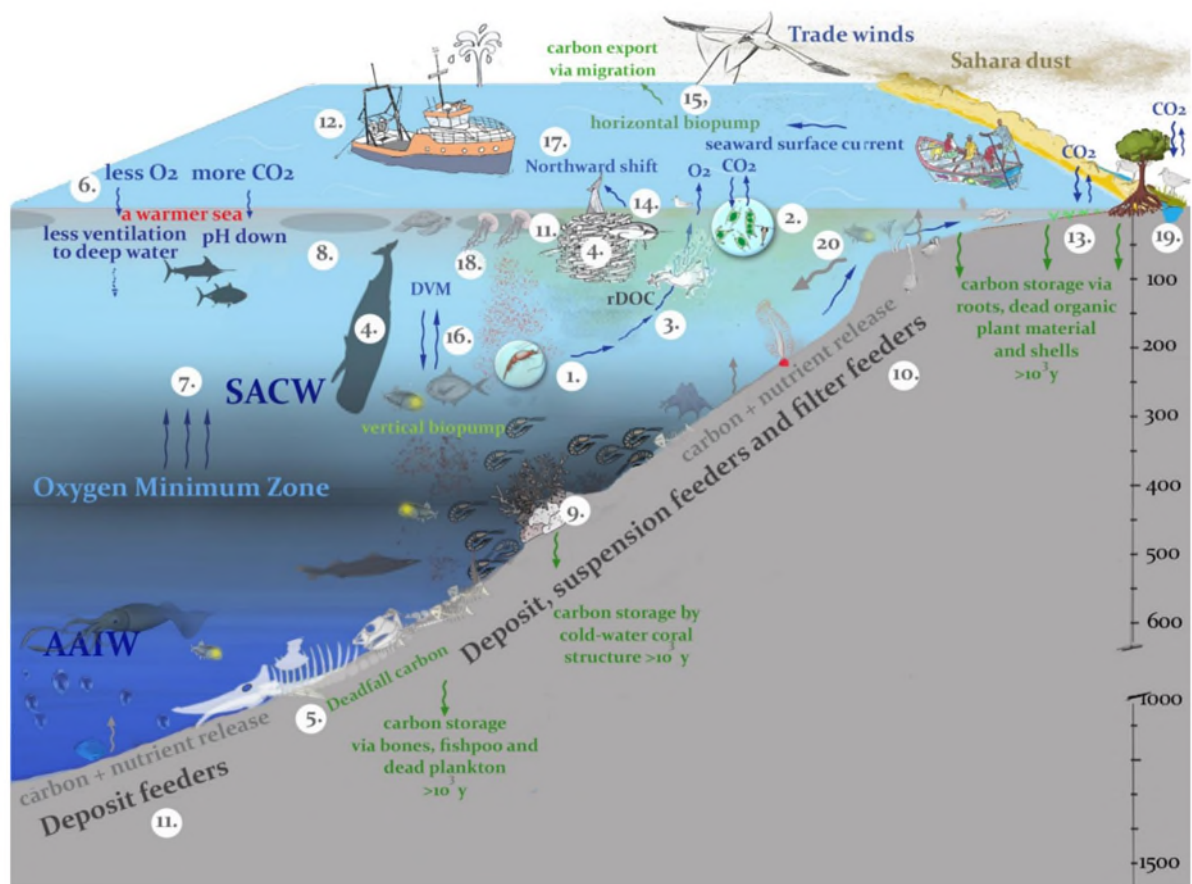


Figure: A simplified representation of the Mauritanian marine ecosystem. Source: taken from Biodiversity Action Plan developed for BP.

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