I.B Environmental Assessment

Purpose of the environmental assessment

An environmental assessment is performed to understand and evaluate the potential environmental effects of a marine renewable energy project and to promote the sustainable development and implementation of ocean energy projects. The assessment should be used by stakeholders and consenting or regulatory bodies to inform the decision making process from concept to decommissioning.

Objectives of the environmental assessment

An environmental assessment of a marine renewable energy project should be conducted to:

- Identify, predict, evaluate and classify the potential environmental and socio-economic impacts (beneficial and harmful) from concept to decommissioning;
- Recognize and evaluate possible cumulative impacts of the project itself and in combination with other projects and / or marine activities;
- Contribute to site selection by identifying significant environmental and socio-economic features of the possible deployment areas, by estimating their sensitivity to the project characteristics (baseline survey outcomes);
- Select appropriate mitigation measures for harmful impacts;
- Establish a monitoring programme for the deployment, operation, decommissioning and post-decommissioning stages;
- Consult with and inform stakeholder groups and the public in general;
- Propose and implement environmental management actions[1];
- Inform the project development process.

Reporting of the activity

The environmental analysis is normally reported by the results of the Environmental Impact Assessment (EIA). However, and since the environmental analysis should also be considered as a planning instrument, it would be desirable that it could form an integral part of the project development from the beginning. In this way, there are several environmental assessment techniques (SEA, ERA, LCA[2]) which can be consulted / applied before conducting an EIA to inform and support the decision making process of the device concept design and activities planning. The results of these complementary environmental assessment techniques / instruments can further be integrated in the EIA report. An EIA usually comprises the following phases:

- Screening, which identifies the areas of legislation under which the project falls;
- Scoping, which establishes the boundaries of the investigation, the assessments and measurements required, and any assumptions to be made;
- Baseline survey, which identifies the state of the environment at the deployment site and in surrounding areas, prior to any installation or deployment activity;
- Potential environmental impacts identification and evaluation, both positive and negative;
- Monitoring programme for the deployment, operation, decommissioning and post-decommissioning stages of the project;

[1] An adaptive management process should be followed in the early stages of technology development aiming to improve the efficiency and effectiveness of the environmental assessment process.
[2] SEA: Strategic Environmental Assessment; ERA: Environmental Risk Assessment; LCA: Life Cycle Assessment.

- Mitigation measures, to reduce or eliminate adverse impacts;
- Consultation, with feedback from stakeholders and general public, which should feed constantly into the EIA process.

Each phase listed above comprises of an active process that culminates with a report.

Contents of the protocol

The main topics of the Environmental Assessment protocol of marine renewable energy projects (wave and tidal) will cover:

1. Environmental assessment approaches

1.1 Strategic Environmental Assessment (SEA)
1.2 Environmental Impact Assessment (EIA)
1.3 Environmental Risk Assessment (ERA)
1.4 Life Cycle Assessment (LCA)

2. Adaptive management

3. Site selection and conceptual design: environmental concerns

4. Environmental Impact Assessment guidelines

4.1. Screening
4.2. Scoping
4.3. Baseline studies
    4.3.1. Sensitivity characterization
4.4. Impact analysis
4.5. Consultation
4.6. Mitigation and impact management
4.7. Monitoring

5. Potential impacts and mitigation options

5.1. Types of environmental and socio-economic impacts
    5.1.1. Prototype (single devices)
    5.1.2. Large scale projects (farms)
5.2. Mitigation measures and benefits gained
5.3. Information gaps and issues for future research

6. Impact analysis tools

6.1. Checklists
6.2. Matrices
6.3. Geographic Information Systems
6.4. mathematical modelling

7. Environmental key issues

Exclusions

Most marine energy projects are likely to include land based works, and some may have significant impacts on-shore due to equipment installation or infrastructures that support marine devices deployment. Such works will need to be considered in the environmental assessment but will not be addressed within these protocols.

Principles

1. Planning and management of the environmental assessment

- The scope of the environmental assessment is intended to be as is show in Fig. 1;
- The environmental analysis should be conducted in order to identify, describe and evaluate specific aspects of device design and supporting activities that need to be subjected to detailed environmental scrutiny at all stages of device deployment, from concept to decommissioning;
- The environmental assessment planning should also include an extensive review of the political, legal and maritime spatial planning framework in existence at any potential project site (Strategic Environmental Assessment);
- The environmental assessment planning should allow continuous reappraisal and adjustment practices, in order to meet the desired outcomes (adaptive management actions);

2. Baseline characterization

- Describe a systematic approach for identifying environmental and social factors that may affect site selection;
- Provide a rationale for characterising the sensitivity of a site that will affect the extent and variety of data gathering from the site;
- Describe the key aspects of the receiving environment that should, as a minimum be considered in environmental assessment of a site (including environmental, commercial and leisure uses);
- All data gathering should utilise any established protocols that are appropriate to the site and should show variability (seasonal and inter-annual) so that subsequent monitoring can demonstrate any significant environmental effects;
- Particular attention should be paid to environmental characteristics that correspond to the risks identified for the designs under consideration;
- Any amendments to generic protocols required to deal with site specific issues should be based on expert advice, taking full account of the analytical framework within which the data collection is nested;

3. Potential impacts prediction and mitigation options

- The physical constraints of device design on marine biota must be identified and, where appropriate, minimized at the design phase;
- The generic and critical uncertainties of the device's environmental effects that require further basic research should be identified;
- The list of the potential environmental and socio-economic impacts in a specific site should be prioritized[3];
- Life Cycle Analysis should follow the standardized process established by the International Organization for Standardization (ISO, 14000);
- The selection of mitigation measures should give priority to avoidance of impacts, then minimization and finally restoration;

4. Monitoring

- Should quantify the presence and extent of key impacts of the device deployment and supporting activities on the identified environmental sensitive issues;

[3] The importance of different risks is closely tied to the site chosen.

- Should take into account the natural temporal and special variability of the site;
- Should be performed throughout device installation, operation decommissioning and post-decommissioning periods during prototype sea-trials and commercial operation scales in line with recommendations from regulators and current state of knowledge regarding specific potential impacts;
- The monitoring plan should follow an adaptive management process in order to identify and respond to uncertainties regarding the project's effects;
- The monitoring plan should provide a rationale for the type, number and duration of measurements according to the key environmental aspects identified in the baseline survey; where possible, reference protocols or methods/ instrumentation should be used;
- As for the baseline survey and wherever possible, data gathering should utilise any established protocols that are appropriate and should show variability (seasonal and inter-annual) in order to evaluate potential environmental effects;
- An assessment should be performed on the interference of multiple devices on the receiving environment to establish appropriate array spacing and assist the design of the final deployment arrangement;
- Data analysis techniques should be considered before data collection procedures are chosen;
- The results should be made available to stakeholders and, wherever possible, to other developers;
- Provide a context for the use of numerical and statistical models in the quantification.

Key Aspects

The protocols to be produced should be a balanced approach between scientific, legislative and industry interests in order to optimize effort. Since the industry is still in an early stage and few case studies are available, there is still a large degree of uncertainty regarding what environmental impacts will result from deployments. The protocols that will be delivered should therefore be considered as guidance or best practice according to the experience available to date. Where possible, information gaps will be identified in order to enable the protocols to evolve as understanding of impacts improves. The concept of adaptive management, which is stressed throughout the document, also encourages the methodologies to be modified / improved as knowledge progresses.

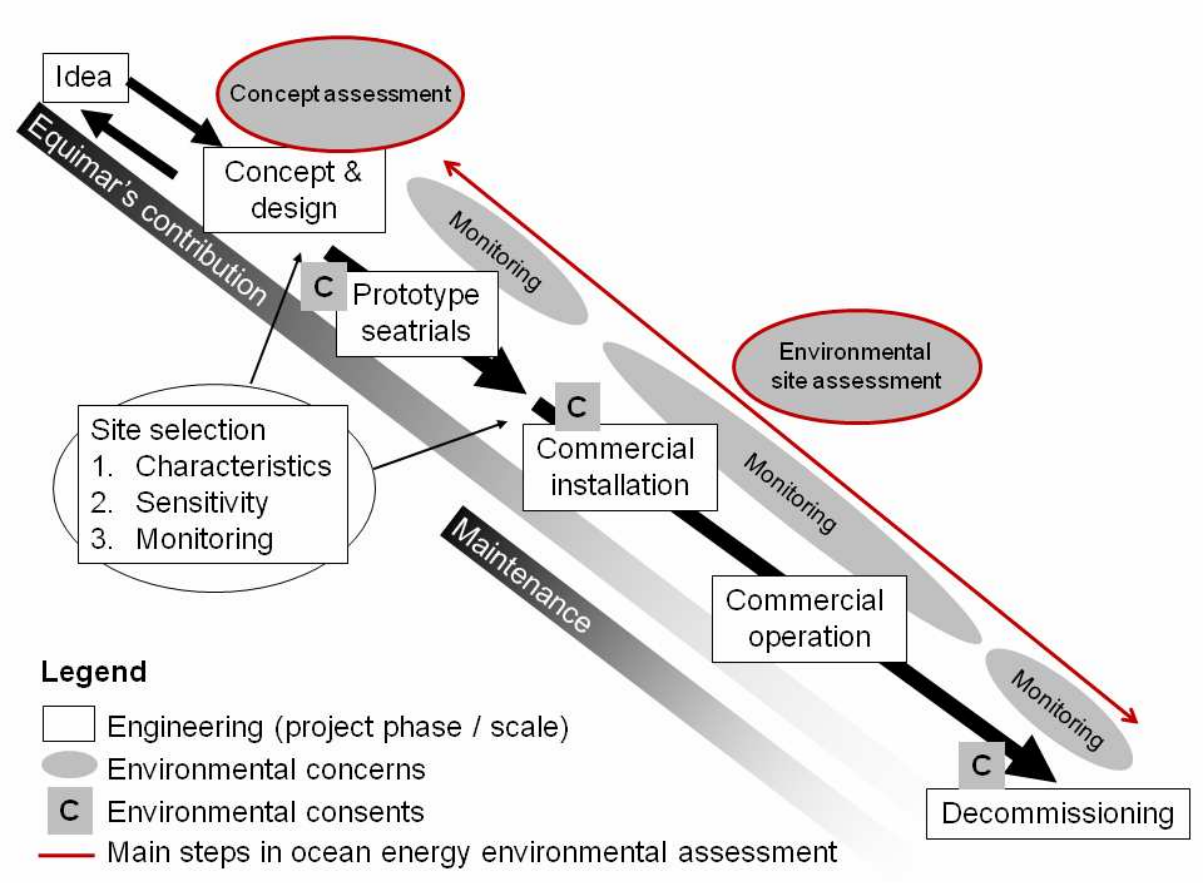

Figure 1. Scope of the environmental assessment: wave and tidal project phase sequence and environmental concerns during the process.