A preliminary protocol on Environmental Assessment for Ocean Energy Schemes

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Abstract

This paper contains results of the EU funded project EquiMar (Equitable Testing and Evaluation of Marine Energy Extraction Devices in terms of Performance, Cost and Environmental Impact) on the Environmental Impact Assessment work package and aims to be one of the products of its dissemination. This work concerns the summary of the development of one of the most important end products of the Equimar project, which is the protocol on environmental assessment for ocean energy projects (wave and tidal). Previous to the full detailed protocol a high level document was developed in order to provide a consistent and clear approach to the development of each detailed protocol. These initial documents explain the objectives, strategic needs and principles relevant to each protocol and form the foundation from which the full protocols are being developed within the project. The High Level document is presented herein taking into account the objectives, the reporting of the activity, the contents of the detailed protocol and the principles that contribute to the development of a guidance or best practice. The protocol on environmental assessment is intended to be a balanced approach between scientific, legislative and industry interests in order to optimize effort.

Keywords: Environmental Assessment, wave and tidal energy devices,

1. Introduction

Environmental assessments are conducted 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. 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;
- 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;
- Inform the project development process.

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 (e.g. SEA, ERA) 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:

- A screening report, which identifies the areas of legislation under which the project falls;
- A scoping report, which establishes the boundaries of the investigation, the assessments and measurements required, and any assumptions to be made;
- A baseline report, which identifies the state of the environment at the deployment site and in surrounding areas, prior to any installation or deployment activity;
- A potential environmental impacts report, both positive and negative; consultation report with feedback from stakeholders and general public;
- A monitoring programme report for the deployment, operation, decommissioning and post-decommissioning stages of the project;
- A mitigation measures report to be implemented to reduce or eliminate adverse impacts.

2. Planning and management of the environmental assessment

The environmental assessment is a process that can be conducted at different levels. Environmental Impact Assessment (EIA) is the traditional approach that has been widely used to address environmental impacts of a given project. Strategic Environmental Assessment (SEA) is a more recent mechanism for identifying and assessing the likely significant environmental effects of a plan or programme and its alternatives. SEA and EIA are tools that share a common root - impact assessment, but have different assessment foci: strategies for future development with a high level of uncertainty in SEA; proposals and measures, concrete and objective, for the execution of projects in EIA [1].

SEA is considered a policy-aiding tool that helps organisations, plan developers and authorities to consider the effects of plans and programmes in a structured way and to demonstrate that environmental and other effects have been taken into account during their preparation. SEA application is recent. In Europe, the SEA Directive (2001/42/EC) entry into force in 2004 and thus few examples of its application are available. In UK, the Scottish government conducted an SEA for marine renewables. This document was concluded in March 2007 [2] and covers the entire west and north coast of Scotland to a distance of 12 nautical miles offshore based on where the main wave and tidal resource areas are located. After that (2009), and also in UK, another SEA was delivered for offshore energy (wind offshore, offshore oil and gas and gas storage) was carried out and the results were made available in the internet [3]. Out of the European Community, examples of the SEA process application to offshore energy sector are available for Canada, where the Offshore Energy Environmental Research Association (OEER) was commissioned by the Nova Scotia Department of Energy to carry out an SEA focusing on tidal energy development in the Bay of Fundy [4].

When available, SEA results should be taken into account for an environmental assessment planning of a given project on marine renewable energy.

As referred, the EIA is a more specific tool which intends to evaluate the environmental viability of the project. Projects requiring an EIA should undergo a preparation step which involves several considerations over a wide range of issues including the timing and type of assessment that should be considered during the project phase development. A scheme regarding the timing and type of environmental assessment concerns is presented in Fig.1.

Risk assessment or analysis is a well established management tool for dealing with uncertainty. Environmental Risk Assessment (ERA) is a generic term for a series of tools and techniques concerned with the structured gathering of available information about environmental risks and then the formation of a judgment about them. EIA and ERA are very similar concepts since they have broadly the same goals, which is to inform decision-makers on the frequency and magnitude of adverse environmental consequences. However a major additional aspect provided by ERA is the probability that it gives for a particular impact to occur. A risk assessment framework has already been proposed for large renewable deployments (offshore wind) [5].

3. Baseline characterization[1]

The protocol for the baseline characterization will describe a systematic approach to identify environmental and social factors that may affect site selection as well as monitoring requirements during the deployment phase. The environmental sensitivity is also important, which determines the extent and variety of data gathering from a given site. A rationale for characterising the sensitivity of a site should be

[1] This section of the protocol is closely related to section 6 below “Guidance on monitoring methodologies”.

developed, considering previous experience on marine environmental characterization of offshore energy projects. The protocol will also list 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).

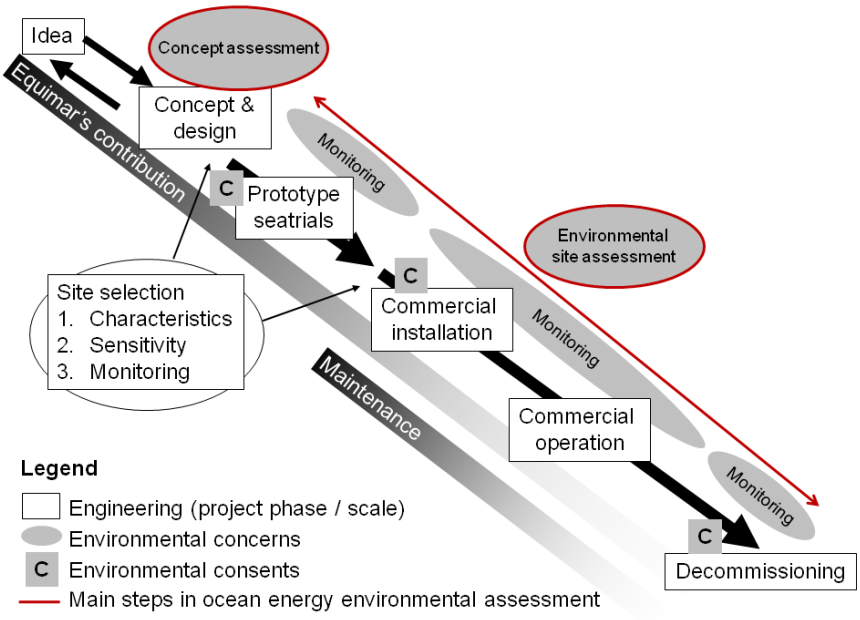

Fig. 1 – Scope of the environmental assessment: wave and tidal project phase sequence and environmental concerns during the process.

Several recommendations are going to be considered under the protocol development. Site specificity is an important factor that should determine the way baseline characterisation should be conducted. Thus data gathering should utilise any established protocols that are appropriate to the site. Furthermore, 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. It is also important that collected data 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.

4. Potential impacts and mitigation

This section of the protocol will present the list of the potential impacts (environmental and socio-economic) described so far to be related with wave and tidal energy schemes. The options to minimize or mitigate those impacts will be listed as well. As far as possible, the protocol will address impacts of single devices and potential impacts of large scale projects (farms) as well as the mitigation measures that can be applied during the project phases. The possible environmental benefits gained during the project deployment will also be considered and information gaps and issues for future research will be identified. Some of the principles that should be taken into account in the environmental impacts identification step were already identified and are listed below:

- 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 ;
- 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.

5. Tools for identification and evaluation of impacts

A number of tools and methodologies have been identified and developed to conduct environmental assessments. Some of them (e.g. checklists and Geographical Information Systems), can be used in several EIA steps. Results of other methods or techniques can be integrated or added to the environmental assessment (e.g. Environmental Risk Assessment and Life Cycle Assessment).

This section of the protocol will list and briefly describe the most suitable tools and methodologies to be applied in the environmental assessment using, wherever possible, examples of its application on marine renewable projects. The list of tools and methodologies concern the most sensitive components to the potential impacts of ocean energy projects referred in the previous section.

6. Guidance on monitoring methodologies

This section of the protocol will address the purposes of the environmental monitoring considering monitoring planning, monitoring considerations during project phases (installation / decommissioning, operation and monitoring after decommissioning). A number of principles concerning environmental monitoring of the devices were already identified (below) and should be developed in the protocol:

- Should quantify the presence and extent of key impacts of the device deployment and supporting activities on the identified environmental sensitive issues;
- 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;
- Should provide a context for the use of numerical and statistical models in the quantification.

7. Public participation

This section of the protocol will provide a context for the public participation in the environmental assessment of a marine renewable project. A guidance for the identification of the target audience will be presented as well as the most suitable techniques that can be used to approach the public in general. The possible conflicts are going to be identified and the way to incorporate the results of the public participation in the decision making will be discussed.

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References

[1] M. R. Partidário. (2007). Strategic Environmental Assessment - Good Practices Guide - Methodological Guidance. Portuguese Environment Agency (APA). 63p.

[2] The Scottish Government. (2007). Scottish Marine Renewables: Strategic Environmental Assessment. Environmental report. Available at: http://www.seaenergyscotland.co.uk/ScopingConsultation.htm

[3] Department of Energy and Climate Change (DECC). (2009). Future Leasing for Offshore Wind Farms and Licensing for Offshore Oil & Gas and Gas Storage. UK Offshore Energy Strategic Environmental Assessment. Non-Technical Summary. 24p.

[4] New Brunswick Department of Energy. (2009). Bay of Fundy Ecosystem Partnership's Strategic Environmental Assessment. New Brunswick Joint Response. 10p.

[5] Ram B., 2009. An integrated risk framework for large scale deployments of renewable energy. Proceedings of the ASME, 28th International Conference on Ocean, Offshore and Artic Engineering, OMAE. Msy 31 – June 5, 2009, Honolulu, Hawaii, USA.