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WP **4 and 5**	Workshop 1 report

Marine Renewables and Environmental Risks Current practices in pre and post consent monitoring

Workshop 1 report

PROJECT COORDINATOR

David Gray (Robert Gordon University)

TASK LEADER

Teresa Simas, WavEC – Offshore Renewables

AUTHORS

Teresa Simas (WavEC, Offshore Renewables) and Julia Heinrichs (WavEC, Offshore Renewables)

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BOX 1. DEFINITION OF TERMS

ADCP – *Acoustic Doppler Current Profiler*

BACI – *Before-After-Control-Impact*

BSH – *Bundesamt für Seeschifffahrt und Hydrographie - Federal Maritime and Hydrographic Agency in Germany*

CBA – *Cost Benefit Analysis*

EIA – *Environmental Impact Assessment*

EIS – *Environmental Impact Statement*

EUNIS – *European Union Nature Information System*

ISO – *International Standard Organisation*

JCP – *Joint Cetacean Protocol*

LCOE – *Levelised Cost of Energy*

MB – *Multibeam*

MRE – *Marine Renewable Energy; defined as offshore wind, wave and tidal energy*;

MSFD – *Marine Strategy Framework Directive*

MSP – *Marine Spatial Planning*

PAM – *Passive Acoustic Monitoring*

ROV – *Remotely Operated Vehicle*

SCANS – *Small Cetacean Abundance in the North Sea and adjacent waters*

SDM – *Survey Deploy and Monitor approach*

SPI – *Sediment Profile Imaging*

SSS – *Side Scan Sonar*

TEV – *Total Economic Value*

TSG-NOISE – *Technical Sub-Group on Noise for MSFD application*

1. Introduction

At a global level, there is an urgent need to develop competitive low carbon energy to meet increasing energy demand whilst reducing the impact of anthropogenic driven climate change. Marine Renewable Energy (MRE; defined as offshore wind, wave and tidal energy) has a key role to play as part of the overall energy mix of the European Union as Member States strive to meet their renewable targets. In order to ensure the timely exploitation of our oceans and future sustainable development of MRE, the path from device demonstration through to commercialisation must be able to proceed as efficiently as possible.

Currently the environmental effects of MRE on the marine environment are significant areas of uncertainty, while the scarcity of data on the environmental interactions of new technologies often means it is characterised as a threat. Consequently project's deployment often requires extensive supporting environmental information, which is costly both in financial terms and time taken to obtain consents. However, the environmental assessment based on risks evaluation has been recognised to help reduce costs and time taken to consent prototype and first iteration devices and arrays, considering the project scale, the environmental sensitivity of the site and the risk profile of the device(s).

RiCORE is a HORIZON 2020 funded project which aims to promote the successful development of the offshore renewable energy in the European Union by developing an environmental risk based approach to the consenting of marine renewable projects. This type of approach has been adopted in Scotland (the Survey, Deploy and Monitor approach – SDM) and its application/adaptation to other EU countries (France, Ireland, Portugal and Spain) is under analysis during the course of the project activities. While it is recognised that each of these countries have their own planning and development legislation, it is also important to realise that a number of elements of the consenting process are derived from EU legislation. This includes, for example, the EIA Directive and Habitats Directive, which may result in regulators and developers having to conduct particular assessments and studies. Offshore wind, wave and tidal

deployments will often require study of the same parameters to determine potential impacts but there can be variation in how these impacts are studied and monitored both before and after consent is granted. The adoption of a risk-based approach could ensure greater consistency in the application of EU legal requirements and, in the longer-term could have a positive impact on knowledge generated as well as costs.

The first step in understanding how a risk-based approach could be applied is to review the pre- and post-consenting requirements, which exist in those selected countries. Pre-consent requirements are interpreted here to include those conditions, information or requests needed to proceed with the licensing process, e.g. level and type of environmental baseline information and project description. Post-consent requirements are those conditions that are usually required as part of the consent granted, following project installation and construction, to operation and decommissioning, e.g. the level and characteristics of environmental monitoring and implementation of mitigation measures.

1.1 Workshop objectives, location and agenda

The objectives of this workshop were:

1. To identify the environmental requirements regarding pre- (workshop Part I) and post- (workshop Part II) consenting of marine renewable energy projects in EU countries to date;

2. To discuss suitable monitoring needs incorporating varying levels of environmental risk.

Part I of the workshop focused on an analysis of pre-consent requirements (such as baseline surveys relating to EIA) in order to establish if monitoring needs are met and if certain methodologies are more appropriate than others. Post deployment monitoring addressed in Part II of the workshop focused on the experience to date regarding post-consent monitoring requirements and current monitoring and research techniques.

Information on costs and benefits from various stakeholder experiences were debated and views on an appropriate level of environmental monitoring were discussed.

The outcomes of the workshop will be used by the RiCORE project team to report on the feasibility of adopting a risk-based management approach, using the Survey Deploy and Monitor (SDM) policy as an example.

The workshop was carried out in Bilbao, Spain on the 21st April 2015 in the context of the Bilbao Marine Energy Week program held at the Bilbao Exhibition Centre Figure 1.

Figure 1. Bilbao Exhibition Centre (BEC).

The workshop agenda was posted on the RiCORE website (see Annex I) and sent to the list of national expert invitees compiled previously by project partners. The invitations were sent to experts from academia, conducting research studies on the several considered receptors of the marine environment (birds, marine mammals, fish and shellfish, benthos, physical environment and other users – socio-economy) and experts from environmental consultancies having experience on EIA process of Marine Renewable Energy developments, particularly on environmental monitoring.

2. Workshop part I: Pre-consent requirements

The first workshop session was opened by the RiCORE project coordinator Dr. David Gray from Robert Gordon University, Scotland, who welcomed participants and

presented the workshop objectives and the context of the workshop with regard to the project's goal (Figure 2).

Figure 2. David Gray welcoming the participants and introducing the workshop.

2.1 Presentations

2.1.1 Evaluation of site sensitivity and baseline characterisation of a project site

Presentation prepared and presented by Dr. Ángel Borja from AZTI-Tecnalia, Spain.

Dr. Borja's presentation (Figure 3) focused on the evaluation of site sensitivity and information needed for baseline characterisation of a project site. He emphasised the need to carry out an EIA process based upon an Environmental Impact Study (EIS), which aims to identify (cause effect relationship), predict (quantify), assess (interpret) and prevent (preventively amend) the environmental impact of a project. There is a need to set protocols in order to guarantee the minimum content that an EIS must cover with a double objective: firstly the protection of the marine environment, by evaluating the sensitivity of sites selected for these activities, and secondly to avoid

unnecessary studies and analysis, focusing on truly important impacts using the baseline characterisation of the project site.

Figure 3. Ángel Borja presenting on evaluation of site sensitivity and information needed for baseline characterisation of a project site.

To make a good baseline characterisation of a project and to take adequate management decisions the following steps were identified: to analyse the suitability and sensitivity of the site, then create a conceptual framework based on the project, identify the main activities that can produce harm as well as the main ecosystem components affected, select indicators that convey meaningful information and can be measured reliably (cost-effective indicators), define methods of measuring threshold attainment (reference conditions, boundaries, etc.) and lastly calculate indicator changes to measure the impact (if possible use methods already developed to assess the status).

2.1.2 Overview of pre-consenting environmental requirements across Europe

Presentation prepared by Dr. Anne Marie O'Hagan (University College Cork, Ireland) and Dr. Teresa Simas (WavEC, Offshore Renewables, Portugal) and presented by Dr. Teresa Simas.

The presentation (Figure 4) gave an overview of pre-consenting environmental requirements across Europe. Firstly the current situation of marine renewable energy consenting was reviewed. In general there is a lack of dedicated consenting for ocean

energy and pilot projects, although dedicated legal procedures are more common for offshore wind energy. The requirement for an EIA with regard to ocean and wind energy projects varies across Europe (compulsory vs case-by-case basis), even though some requirements are universal (compliance with EIA Directive – 85/337/EEC and Habitats Directive – 92/43/EEC). Integrated maritime governance (SEA, MSP) is not fully implemented in all European Union member states. However, it can be very helpful to inform decision making and consenting processes in the maritime space.

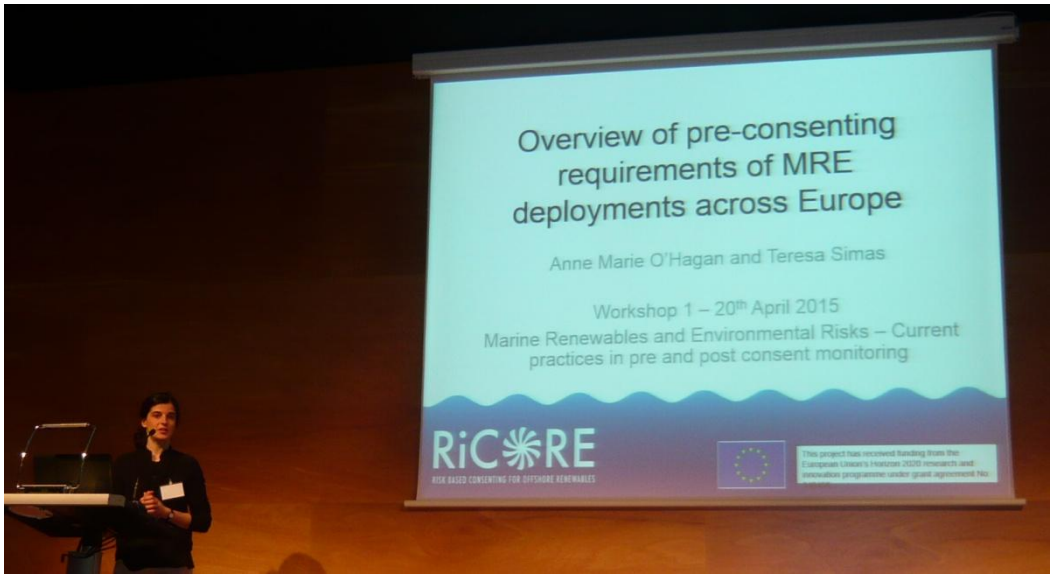


Figure 4. Teresa Simas presenting on pre-consenting requirements for MRE deployments across Europe.

A short overview of pre-consent requirements was presented for France, Ireland, Portugal, Spain and UK. Across these countries the screening process of ocean energy projects is usually used to decide whether an EIA is required and this decision is usually made on a case-by-case basis. During this process, general information like project characteristics, physical features and human uses of the site are usually required information. Three questions were raised at the end of the presentation: 1) Should pre-consenting include more information about the environmental characteristics of a site? 2) What level of detail should be considered? 3) Can lessons be learned from other marine developments? These questions were presented to promote the debate

within the breakout session groups, one for each of the considered environmental receptors, which followed these presentations.

2.2 Breakout session discussions on pre-consenting environmental requirements

The participants were divided into groups based on their expertise in the following relevant marine receptors (Figure 5; see Annex 2): marine mammals, birds, fish and shellfish, benthos/habitats, physical environment and other users (socio-economic receptors) to discuss and answer the following questions:

a) What are the current pre-consent monitoring requirements for site characterisation?

b) What effective methodologies and practices would meet the (recommended) one-year site characterisation survey for pre-consenting?

A facilitator and reporter were assigned to each group among the participants which roles were, respectively, to facilitate the discussions giving the opportunity to each group participant to share experience and express opinions and to take note on such opinions and perspectives along the discussion. At the end of the breakout session each facilitator has presented a summary of the group discussions and a final sum up of the groups summaries were made by Finlay Bennet of Marine Scotland at the end. The summaries made by each reporter are presented below for each group.

Figure 5. Breakout session on pre-consenting requirements.

2.2.1 Marine mammals and noise

a) What are the current pre-consent monitoring requirements for site characterisation?

Although overlap exists in the two topics (marine mammals and noise) these were discussed separately in places, as noise does/may influence other species (e.g. diving sea birds and fish) as well as marine mammals.

Marine Mammals

There are no standard approaches across the member states or across MRE devices. The principal interest is in abundance and distribution of marine mammals (in particular, noting the seasonal patterns in occurrence). Distance sampling can be applied to line transect data in order to obtain relative abundance. Requirements are greater in the United Kingdom, for example, demographic information, such as number of calves present, may be requested. In general conventional pre-consent monitoring methods include: Line transects (aerial and/or boat-based surveys) and

Passive Acoustic Monitoring (PAM; towed array on vessel and/or static devices). Distance sampling can be applied to line transect data in order to obtain relative abundance.

Noise

Some EU countries just follow the MSFD, whereas the United Kingdom, Germany and the Netherlands have additional requirements. To accomplish the MSFD, each Member State shall provide data about impulsive and continuous noise generated by the MRE devices. In cases where member states do not carry out pre-consent monitoring, it is likely that they are failing to comply with the MSFD.

b) What effective methodologies and practices would meet the (recommended) one-year site characterisation survey for pre-consenting?

Concerning data collection and analysis in general, all data collection (pre- and post-consent) should be founded on a suitable standardised experimental design that should be preceded by a power analysis. It is considered that abundance and distribution were only part of the issue with respect to monitoring potential impacts on marine mammals. Other issues that should be considered, but are acknowledged to be a challenge in monitoring are changes in: vital rates, physiology, behaviour, diving profiles and sound production of animals, for example. Also it is worth noting that the regulator might consent to a MRE development, but in some cases up to two years go by before the devices are in the water, this time could be used to gather additional baseline characterisation. Furthermore the intensity of surveys becomes important, especially for boat-based and aerial surveys (which are more costly than static PAM, for example), as this impacts statistical power.

However, existing documents may offer guidelines for pre-consenting, for example: Stuk4, which is a methodology driven report, focusing on offshore wind[1] or the 2nd

[1] http://www.bsh.de/en/Products/Books/Standard/7003eng.pdf

Report of the Technical Subgroup (TSG-Noise) on underwater noise in response to Descriptor 11 of the MSFD[2].

There is growing support for a gradient monitoring design. This has the advantage of monitoring the impact of the MRE device at source with monitoring stations/locations at intervals from source. Furthermore, using the gradient approach may assist in teasing apart the influence of natural inter-annual variation in marine mammal occurrence and the potential impact of the MRE device; however, this would require that monitoring was undertaken out-with the perceived impact zone. This approach will be of similar value to inter-annual variation in noise. Furthermore static PAM arrays could be used in this system for monitoring both noise and cetaceans (providing no masking effects). These data would be valuable for noise propagation monitoring through numerical models to improve the understanding of potential displacement of cetacean species during periods of noise-generating activities associated with MRE devices.

Marine mammals

A one-year pre-consenting period is insufficient if suitable baseline information (quantity and quality) is not available. When there is no or a low volume and/ or quality of data a precautionary approach should be applied resulting in a grading of high sensitivity. Additional information (beyond presence/absence data) should be a requirement in order to assist in identifying the importance of the habitat to a species. For example, demographic data such as, whether or not calves are present, could be an indicative sign of a calving ground. Evidence to suggest that areas of importance (e.g. breeding, calving, foraging grounds) would likely result in a higher sensitivity grading. Furthermore large (spatial) scale databases can be valuable in support to (or absence of) more localised data; in particular, the importance of the Joint Cetacean

[2] https://circabc.europa.eu/sd/a/6b168331-711a-4ec5-9be3-26600c43808d/MSFD%20Monitoring%20Guidance%20Underwater%20Noise%20Part%20II%20Specifications%20IGR%200516.pdf

Protocol (JCP) and Small Cetacean Abundance in the North Sea and Adjacent waters (SCANS I & II) initiatives were highlighted.

Concerns were raised regarding the limitations of focusing on relatively small areas given the home range/geographical range of marine mammals versus the potentially long propagation range of low-frequency sound. Detailed knowledge (e.g. fine spatial and temporal scale data) typically is more focused on coastal areas. One needs to be aware that applying the same knowledge to pelagic cetaceans (e.g. those with specific migration routes or potentially larger/uncertain home ranges) may not be suitable; consequently this gives further support for the need to consider monitoring areas that are out-with the perceived impact zone. The use of propagation numerical models, combined with recorded data could help assessing these areas. Furthermore, cumulative impacts need to be considered and accounted for (e.g. multiple activities associated with different developments occurring within the same region). It is also important to bear in mind that the methodologies and approaches may differ for different species based on their ecology. Lastly, there is the potential for an artificial reef/refuge forming on or around the MRE device(s), which may influence the movement and/or feeding patterns of marine mammals (i.e. resulting in changes to/impacts on the ecosystem) this should also be considered at the pre-consent phase (notably, the potential impact of this will likely bridge several of the marine receptors of interest – e.g. benthos, shellfish, fish, birds).

Further novel and evolving methodological approaches were discussed, including:

- Satellite images to identify migration patterns for large whales; however, despite being cost efficient this approach is not developed sufficiently at present;

- Active Sonar for monitoring habitat use and collision risk with wave and tidal devices; it has been trialled at SeaGen (Northern Ireland) but it does have limitations (e.g. limited range[3]);

[3] http://seageneration.co.uk/files/SeaGen-Environmental-Monitoring-Programme-Final-Report.pdf

- Telemetry studies, well used in pinnipeds in particular; however, sample size is limited (cost of tags and opportunity to capture individuals), which makes population-level extrapolation difficult. In addition, most marine mammals have large home ranges, and may well leave the area of interest (which is somewhat confounding).

Noise

The pre-consent recommendations made in the 2nd report by the TSG-Noise on underwater noise should be used as a minimum of standards[2]. According to these recommendations, pre-consent has to involve the monitoring of background level/ambient noise at different periods of the year (because of seasonal changes in weather conditions and vessel traffic, for example). Ideally, data would be collected on a monthly basis for one year and for at least 3 consecutive days. The acoustic characterisation of the site should be required: for this, data need to be gathered on bathymetry, temperature, salinity, wind, rainfall, shipping lanes, etc. to allowing for accurate extraction of (seasonal/circadian) trends in ambient noise in the area. These data should be used to create a sound propagation model that can be compared to the pre-consent monitoring data to ensure that the model is performing satisfactorily. The subsequent step would use existing data on the relevant MRE devices to build on the model to predict the possible impact (construction and operational stages). It is acknowledged that for some MRE devices, data are scarce so confidence intervals for noise levels may initially be broad, but these will be tightened as more data become available. Data over a longer timeframe would be preferable (e.g. two/three years) as there may be inter-annual variation in ambient noise that would not be possible to characterise in one year. However, a conservative sound propagation model could be used to reduce this period to one year.

The MSFD requests acoustic records and these will need to be integrated into the EIA beyond the area of deployment. Furthermore, traceability and calibration of the PAM

system is needed to ensure data comparability across MRE developments; this also requires that data are made available across developments to better inform the overall process (from pre-consent onwards). Also a standardisation of terminology should be developed when referring to acoustic measurements, scales, etc.

Lastly, it should be considered that the variation in the generated noise spectra would propagate differently; this will have varying impacts on marine mammals, depending on species (e.g. porpoise use higher frequencies, through to baleen whales using lower frequencies). It is important to note that certain noise generating activities associated with MRE developments have also been shown to impact on other species such as fish, seabirds and turtles.

2.2.2 Birds

a) What are the current pre-consent monitoring requirements for site characterisation?

In France there are no specific standards concerning pre-consent requirements. Generally two years of data are provided for bird populations in the installation area and mitigation measures are designed in an early stage of the project approval to avoid a high mortality rate of birds.

In Germany very prescriptive requirements for pre-consenting are established, which involve not only the parameters that are evaluated but also the methodologies that need to be used during the surveys.

In the United Kingdom two years of baseline information are needed to feed into the licensing process (environmental statement). The surveys need to address population numbers taking into account the Habitats Directive and an additional spatial coverage around the site area of about 4 km is usually required.

In The Netherlands an EIA is always required for offshore wind projects. Marine Spatial Planning is in place for offshore wind and selected areas are identified. Two years of survey are required as baseline information before approving the project taking into account the Habitats Directive. In The Netherlands the legislation does not allow, by

principle, any birds to be killed and thus the developer needs to take action if population numbers are in danger of decline. In the concrete case of declining populations a shut-down system must be implemented to prevent large numbers of birds being killed.

In Portugal general requirements exist for pre-consenting MRE device(s), which establish the characterisation of marine flora and fauna of the site. To date, only one project (a single device) has been installed offshore and this is the main reason why legislation is not yet prepared to deal with this topic. Legislation in Portugal is much more developed for wind parks on land, where bird populations are already well characterised and more information is available.

In Spain there are neither formal specific requirements (in the legislation) nor informal ones (requested by the authorities).

The possibility of reducing the pre-consent monitoring from two to one year was not considered to be possible due to the inter-annual variability expected for this group of species. Three years would be ideal but the participants understand that it may become very expensive for the developer and thus two years has been accepted as the best cost-benefit option.

b) What effective methodologies and practices would meet the (recommended) one year site characterisation survey for pre-consenting?

For impacts prediction, two questions need to be answered: a) What do we know about the site? and b) What can we do to better know the site?

Prescriptive objectives for sea-bird pre-consent monitoring should be based on the data that need to be attained to provide information on population condition rather than on methodologies to acquire those data. However, guidelines should be available for developers on best practices and methodologies to serve specific monitoring

objectives in order to get the specific data to evaluate the level of population conditions.

Boat surveys for counting species is the most commonly used technique for obtaining the abundance and distribution baseline characterisation of a site.

2.2.3 Fish and shellfish

a) What are the current pre-consent monitoring requirements for site characterisation?

In France an MSP approach has been followed for wave, tidal and offshore wind developments to minimise conflicts. After that, 3-4 rounds for developing offshore wind parks will be launched. There are some guidelines to carry out the EIA, which requires 2 years monitoring, except for fish and shellfish where 3 years are required. It is possible to deploy projects in Natura 2000 areas, but the consultation with several institutions is then required.

In Germany, standards and protocols are regularly updated for baseline studies before deployment which should have a minimum duration of 2 years. The Federal Maritime and Hydrographic Agency (BSH) guidelines specify very clearly the pre-monitoring requirements. These are very demanding standards where methods are depicted. These baseline studies are independent from the Marine Spatial Planning done in Germany.

In Portugal there are no specific pre-consenting requirements for fish and shellfish although a baseline characterisation needs to be carried out for the site before deployment, based on desk studies and information collected previously.

In Spain the approval of a project at sea is made on a case-by-case basis and thus no specific requirements for fish and shellfish are established.

b) What effective methodologies and practices would meet the (recommended) one year site characterisation survey for pre-consenting?

Desk based studies are needed in collaboration with information from other local users of the marine space in order to have a broad idea of which species and ecological habitats can be found in the deployment area, in order to evaluate the potential impacts of the proposed MRE development.

Once this has been done, a combination of different sampling techniques can be undertaken in order to do the characterisation: trawls, telemetry, acoustics, etc. Initially a side-scanner survey would help in the identification of existing habitats avoiding the need to use destructive and time consuming methodologies to collect data. After using the side-scanner, fishery surveys shall be properly planned and combined with acoustic sensors and telemetry to obtain complete data sets. Technology should be used to improve data collection and enable the coverage of larger areas. The use of remote sensing acoustics is underlined as a methodology suitable to reduce costs and take care of the time and space variability of fish species (seasonality, vertical migration, etc). Electromagnetic fields can also be monitored through the use of telemetry methods and video imaging methodologies, which are helpful to monitor biomass increase, if properly planned. Fish and shellfish vertical migration should also be surveyed. Furthermore the need of a common database is underlined, in order to share information gathered by different organisations.

2.2.4 Benthos and habitats

a) What are the current pre-consent monitoring requirements for site characterisation?

Firstly, it is important to clarify that the following pre-consent monitoring requirements for site characterisation are described not in a legal context, but in an academic expert context. In countries where the monitoring requirements are not specifically described in the legislation, the appropriate authority shall consult experts for indicators to be included in the corresponding EIA.

Secondly, it is important to have access to specific information or, if it is not available, to collect new data to characterise the site before the project is deployed, when the site is still unaffected by it. Thus it is important to ensure that the available data will actually fulfil the required level of detail in order to examine the consequences of the project implementation. If the acquisition of new data is required, it was agreed that the sampling strategy at this stage need to focus on covering spatial patterns considering local variability. Thus it is preferable to cover more sampling sites with a single sample than fewer sites with several replicates per site. It was however noted that the post-consent sampling strategy should reversely focus on replicate samples per site in order to run hypothesis testing. Thirdly, site characterisation should focus on filling knowledge gaps in three main levels: physical, biological and socio-economic. The following main parameters need to be considered for each of these levels:

- **Physical**: depth, currents, tide, waves, turbidity, substrate type, sediment grain-size, organic matter content and redox potential, slope, geomorphology, pollutants (whenever necessary).

- **Biological**: macrofauna/macroflora characterization on the basis of quantitative samples (using grab or core samples and sediment profile images for soft bottom, photo and video for hard bottom) including classification of habitats at least at Level 4 in EUNIS and specifying alien/vulnerable habitats and/or endangered species (note however that the EUNIS classification system may not always apply to the specific area under concern). The following information should be included: species identification (at least to genus level), using traditional and novel tools (i.e. metabarcoding); abundance/coverage per taxa and per sample; synthesis descriptors such as species richness, diversity and other as appropriate, including, whenever appropriate multimetric indices. At this point, it is important to emphasise that the methodology for storing the data should be standardized in order to reduce time, effort and budget and ensure replicability. Control areas or baseline areas, always more than a single one, should be included in the biological characterisation.

- **Socio-economic**: other uses description such as shellfish areas, aggregate extraction areas, disposal of dredged material, shipping, oil/gas extraction, submarine cables, archaeological remains and ecosystem services.

b) What effective methodologies and practices would meet the (recommended) one year site characterisation survey for pre-consenting?

The one-year site characterisation monitoring should include available data collation. The next step will be the physical characterisation of the site, which can be made through the use of Acoustic Doppler Current Profiler (ADCP) during at least 1 month for hydrodynamic conditions characterisation, Multibeam (MB) or Side Scan Sonar (SSS) for seabed mapping, Remotely Operated Vehicles (ROV) to take videos or photos for habitat survey and sediment samples collected with grabs and sediment profile imaging (SPI) for sediment analysis. The macrofauna characterisation can be made through sample collection considering a sampling area of 0.1 m^2 and a 1 mm mesh for sample processing. Sampling frequency should at least cover one sample period in early autumn for northern hemisphere (after the growing season), with several samples in total (no replicates needed). The number of samples depends on the dimension of the study area, but should cover most of the area for a better site characterisation. For macroflora characterisation, 2 sampling periods should be selected, one during the winter and another during the summer. The number and length of transects should be specified and be representative of the benthos variability in an area. Habitat modelling could be optional to cover extensive areas.

2.2.5 Physical environment

a) What are the current pre-consent monitoring requirements for site characterisation?

Information on the resource (wave, tidal or wind) has been referred to as one of the pre-consent requirements. Data on wave climate and hydrodynamics (sea) as well as on seabed composition (sediments) and weather data are needed for environmental

pre-consenting of a project. Two approaches should be considered for pre-consenting monitoring requirements: information to understand direct/local impacts (near field impacts) of the developments and information to help understand what would be the effects of the development in the region or adjacent area (diffuse impact; far field impacts). The indicators and monitoring strategies are different for these two approaches.

b) What effective methodologies and practices would meet the (recommended) one year site characterisation survey for pre-consenting?

The following methodologies have been indicated as effective for the physical environment characterisation regarding hydrodynamic, sediment dynamics and weather (wind) conditions:

- Wave riders and floating buoys;
- Bottom mounted sensors (pressure) and acoustic sensors and profilers;
- Remote sensing (satellite) could be valuable;
- Radar could be used in clearer shallow water up to 500 m and there is potential for high resolution mining photography.

The ideal situation for the physical environmental characterisation is to have model simulations validated with real data. To do this, long series of data are needed and one year of raw data collected from the site may not be enough for systems with a high variability range regarding hydrodynamic and weather conditions such as the Mediterranean Sea. In Spain a set of 3 years of data with 75% of good quality data is recommended as the minimum prerequisite; waves produce good time series but for wind and currents good data are more difficult to obtain. Therefore, one year of data may be enough providing there are good reference sites (i.e. with enough available data) to calibrate the models. The need for more than one year data is also dependant on site location; if it is close to coastal areas with beaches far field effects such as beach profile alterations provoked by wave energy removal, should be considered.

2.2.6 Socio-economic receptors

a) What are the current pre-consent monitoring requirements for site characterisation?

As the "other marine users" group consists of a very broad number of individuals/activities and/or entities time was spent on identifying and characterising these receptors. These include commercial fisheries and aquaculture, existing utilities and maritime operations (including cable exclusion zones, oil and gas pipelines and other infrastructure, mining operations, shipping navigation, desalination), marine protected areas, air traffic (commercial, military), military (air/radar, submarines, communications), landscape (visual impact, including golf interests), leisure activities and recreation (including fishing, amenities, diving, yachting, surfing), cultural heritage, archaeology, socio-economic factors, government agencies and taxpayers.

For most of these receptors, pre-consent monitoring is involved with establishing a baseline, using desktop reviews of available information, buying in of additional datasets and plugging gaps with additional surveys. Many of the existing datasets already have over 2 years of data. Some differences have been identified in European Union member state approaches such as difficulties experienced in serial, consecutive applications rather than parallel processes. Additionally, there are tensions due to envelope restrictions – regulators want the envelopes to be as tight as possible, but this conflicts with technology-neutral sites, and photomontages have to show the worst case scenario. At this developmental stage of the industry, the developers and the consenting authority need to work together with regard to the consenting envelope to ensure that the consenting authority has project definition and that the developers have flexibility to progress commercial arrays.

b) What effective methodologies and practices would meet the (recommended) one year site characterisation survey for pre-consenting?

From the developers' point of view, simplification of the process was discussed with regard to the benefits of having the simultaneous licensing of inshore and offshore elements. Additionally, the difficulties experienced with serial, consecutive applications in some EU member states could be alleviated by the "one-stop shop" approach.

As regards other users information and consultation, these should start early in the process taking into account the type of stakeholders and the size of the impacted area since it might be different among them. Ideally project site selection should employ a MSP approach to identify the best areas for development and inform initial site selection away from areas of strong stakeholder constraints and environmental sensitivities. The MSP exercise may actually speed up licensing marine renewable energy developments since specific areas more suitable for each type of resource (wave, tidal and offshore wind) may be identified.

Figure 6. Break for lunch at the Bilbao Exhibition Centre.

3. Workshop part II: Post-consent requirements

3.1 Presentations

3.1.1 Survey Deploy and Monitor (SDM) approach developed in Scotland

Presentation prepared and presented by Dr. Finlay Bennet from Marine Scotland

This presentation focused on the description of the Survey Deploy and Monitor (SDM) approach. A draft of the SDM licensing policy guidance was developed as a result of the findings of the 2007 Marine Renewable Energy Strategic Environmental Assessment undertaken by Marine Scotland. The SDM policy was defined as a tool, to provide regulators and developers with an efficient risk-based approach for taking forward wave and tidal energy proposals, facilitating a phased/staged development approach (avoiding sensitive environments). With the growing and competing demands for marine resources, it aims to reduce the complexity of marine management and ultimately improve the regulatory framework for MRE.

The presentation provided a review of the SDM policy in order to set the basis for its further development to all relevant technologies in the MRE sector, including the adaptation of the policy to new technologies (i.e. floating wind) and its insertion into RiCORE partner member state policies.

The general approach of the SDM policy encourages a more flexible, fit for purpose application process based on three main factors, which assess the overall project risk: environmental sensitivity – how important is the development site with regard to ecosystem, wildlife use or marine historic environment; scale of development – a single device or small array or large development; and device risk – are regulators having to consider a turbine type which could be considered high risk because of a lack of knowledge about impacts, or is it a structure that should be considered as low risk. These three factors are each categorised as high, medium or low and then integrated into a single project risk assessment. The final project environmental risk will also be

expressed as low, medium or high and will be used to guide the requirements for pre-application site characterisation and assessment of the environmental interactions of the devices. Rather than a "one size fits all" approach, it is a risk management process with the purpose of applying an appropriate and proportionate approach to licensing, which depends upon the circumstances surrounding the development proposal.

3.1.2 Overview of post-consenting environmental requirements across Europe

Presentation prepared by Anne Marie O'Hagan (University College Cork, Ireland) and Teresa Simas (WavEC, Offshore Renewables, Portugal) and presented by Teresa Simas.

In this presentation, post-consenting requirements were firstly defined as the conditions usually attached to the consent, which must be adhered to following deployment up to decommissioning. Post consent conditions are usually set in the approval license and may be divided into standard conditions, which apply to all proposals such as navigational lighting, contingency and decommissioning plans, and specific conditions usually linked with mitigation measures, monitoring activities and particular aspects of health and safety. Project specific monitoring conditions should be set carefully. They should not be used as a way of gathering marine data nor used as a way of shortcutting the consent process. They should be set considering the existence of adverse effects, based on the scientific data available for the site. It is worth noting that lessons can be learned with regard to a single device project in one location, but monitoring requirements and or results may not be wholly scalable to arrays or larger projects. Examples of post-consent monitoring requirements for different projects were presented namely: the tidal project SeaGen deployed in Strangford Lough, Northern Ireland; the wave energy project WaveRoller deployed in Peniche, Portugal; the Fife offshore wind turbine offshore demonstrator project in Scotland; the offshore wind farm at Egmond aan Zee in The Netherlands.

3.2 Breakout session: discussions on post-consenting environmental requirements

The same breakout groups as in the morning session were established based on marine environment receptors: marine mammals, birds, fish and shellfish, benthos/habitats, physical environment and other users (socio-economic receptors) to discuss and answer the following questions:

a) What are the current post-consent monitoring requirements for the different receptors?

b) What post-consent methods / practices are likely to be more/less appropriate for the purpose of profiling risk under the application of environmental risk assessment approaches such as the SDM policy?

The same facilitator and reporter as the morning sessions were assigned to each group and at the end of the breakout session each facilitator presented a summary of the group discussions. At the end a final round up of each of the groups' conclusions was presented by Finlay Bennet. The summaries made by each reporter are presented below for each group.

3.2.1 Marine mammals and noise

a) What are the current post-consent monitoring requirements for the different receptors?

Monitoring approaches are the same as for the pre-consent phase (see above). Requirements vary by MRE type of devices and member states.

In the United Kingdom and Ireland a Marine Mammal Observer is required when noise-generating activities are to be undertaken. Guidelines vary with respect to pre-monitoring times and acceptable distance from noise source. In the United Kingdom and Ireland PAM (e.g. using specific software like PAMGUARD) is not a requirement for

post-consent, but regulators may request it if the area is an important habitat and/or an area with a high density of cetaceans. In particular, this may be requested for harbour porpoise as their cryptic nature makes them difficult to detect visually. Collision risk is often the major concern regarding wave and tidal MRE devices. Active sonar, video cameras, telemetry tagging (for pinnipeds) have been used in some MRE developments, but are generally regarded to be in their infancy with respect to both mitigation and monitoring.

b) What post-consent methods / practices are likely to be more/less appropriate for the purpose of profiling risk under the application of environmental risk assessment approaches such as the SDM policy?

Pre-consent data should feed into the post-consent process to allow for streamlining of approaches. For example, the pre-consent assessment may highlight the presence of a particular species allowing for a more effective/streamlined survey design. Furthermore it is essential that, where applicable, the methods used in the pre-consent process are the same as in the post-consent phase in order to effectively compare these data to quantify if there is an impact (temporal and/or spatial) on marine mammals. For both marine mammals and noise a higher level of monitoring should occur during the period of installation. At present, the post construction monitoring phases is too short (e.g. 3 years in UK) given the life time of MRE projects, which can be greater than 25 years. Thus it may be advantageous to extend the period of monitoring, but reduce the intensity of monitoring over time as more knowledge becomes available. Suitable statistical power analyses would be required to address this.

Marine mammals

Concerning monitoring approaches there should be fixed stations for PAM. They should be deployed for one month, recovered, the data analysed and further regular reports produced.

Noise

As with pre-consent it is recommend as a minimum requirement that the TSG-NOISE recommendations[2] apply for post-consent too. However, these exist for specific frequencies and therefore need to be developed further. In addition, sound propagation models need to be reviewed and validated as new data on sound exposure levels are available. Progressing through the lifecycle of the device, noise characteristics may evolve, improve or worsen, and the behaviour or distribution of receptors may evolve, which may lead to redesigning monitoring strategies. Furthermore, a high spatial and temporal resolution is required to effectively monitor noise propagation.

Additional references were cited:

- Good Practice Guide for Underwater Noise Measurement (Robinson et al., 2014);
- Underwater Acoustic Monitoring at Wave and Tidal Energy Sites: Guidance Notes for Regulators (Lepper et al., 2014);
- Marine energy - Wave, tidal and other water current converters - Part 40: Acoustic characterisation of marine energy converters (IEC, 2015).

3.2.2 Birds

a) What are the current post-consent monitoring requirements?

In France requirements are based on mitigation measures (for risk of collision) that inform the monitoring design. In Germany very prescriptive requirements are established and in the United Kingdom no specific standards are defined in the legislation. In the Netherlands there are post-consent requirements based on collision assessment (collision rates for a number of years) and avoidance behaviour. Usually ship surveys are required. In Portugal and Spain requirements are established on a case-by-case basis, depending on the project scale and dimension.

b) What post-consent methods / practices are likely to be more/less appropriate for the purpose of profiling risk under the application of environmental risk assessment approaches such as the SDM policy?

A framework guidance is needed, targeting the monitoring of specific species at the sites. Collision rates, avoidance behaviour and displacement are the potential direct effects of MRE projects on seabirds and these are the indicators used to quantify the disturbance level of populations (e.g. feeding and breading rates and population numbers).

3.2.3 Fish and shellfish

a) What are the current post-consent monitoring requirements?

In France a 5-year monitoring period is established for MRE followed by a less demanding programme. In Germany, fish and shellfish monitoring is fully described in the BSH standards and should stand from 3 to 5 years depending on the sensitivity of the area and on the monitoring results. In Portugal, monitoring requirements are set in a case-by-case basis; in one recent MRE project in Portugal 2 years monitoring, post-consent was required. Similarly, the practice in Spain follows a case-by-case analysis for the establishment of monitoring requirements, which are set according to project and site characteristics; as an example, 3 to 5 years are required for the Bimep test site. In all cases a reduction in the monitoring frequency can be foreseen if the results do not show significant impacts, highlighting the need for the implementation of an adaptive management process when monitoring MRE activities.

b) What post-consent methods / practices are likely to be more/less appropriate for the purpose of profiling risk under the application of environmental risk assessment approaches such as the SDM policy?

The methods and the survey areas need to be the same as those used during pre-consenting. If not considered effective, methods should be adapted. However, the importance of having a long time series of data was highlighted and thus the time frame would be different from pre-consenting, although they should be calibrated. After 2 years of monitoring, if the impacts are considered irrelevant, the continuation

of the monitoring programme should be reviewed in order to adapt it accordingly. However, it was agreed that it should be maintained for a minimum period of 5 years. Demersal species colonising the equipment should be monitored during a period of 3 to 5 years. It is also important to consider the cumulative impacts of biomass increase, which depends on the size of the project and on the existing habitat. The creation of a public common database (with raw data and metadata) was highlighted in order to improve the knowledge of the expected impacts. Monitoring methods could be standardised at a European level. An ISO norm could be created to decrease the variability of monitoring processes across member countries. Lastly, the post-consent monitoring needs to be able to check the efficiency of the mitigation measures established in the EIS.

3.2.4 Benthos and habitats

a) What are the current post-consent monitoring requirements?

In the different expert countries, there are no established post-consent monitoring requirements at the moment. Therefore the discussion focused on proposals for post-consent monitoring requirements which should include:

- The same components monitored or considered during the pre-consenting process at physical, biological and socio-economic level;
- The assessment of the seabed changes around the structure, using remote sensing techniques whenever available, such as MB or SSS, but always including ground-truth samples (or samples collected on site using grabs or imagery techniques) namely for the study of the resident biological communities;
- The analysis of physical properties of the sediments (soft bottom), collected with grabs/corers and, whenever possible, sediment profile imaging techniques (SPI), in order to cover more spatial detail than that obtained from grab/corer sediment samples;

- The starting of monitoring activities before the construction phase, for baseline information of the site, using a Before-After-Control-Impact (BACI) approach to detail change of spatial patterns in the area of concern;

- The need to consider the different project phases (pre-construction, construction, operation and decommissioning) in the monitoring programme as well as spatial scales (control areas versus impact area) and temporal scales. For the latter, a gradual diminishing effort may be suitable e.g. each 3 months in the first year, each six months during the second year and during the third year a single sampling occasion; for the operational years, sampling frequencies every 2 or 3 years would be sufficient;

- The use of more than one control area out-with the impacted area;

- The selection of sampling stations located at a gradient distance from the devices (namely according to offshore measurements at the FINO1 platform in Germany[4]), and taking into account the hydrodynamic conditions (downstream of the site[5]);

- The use of at least 3 replicates or, ideally, 5 replicates per sampling site collected and processed using the same techniques as previous samples (pre-consenting phase or baseline characterisation surveys);

- The analysis of the re-colonisation of the submerged structures, measuring the biomass or % of coverage and biodiversity. It is important to mention that the type (e.g. design and materials) of the submerged structures will determine the type of artificial habitats available for the species colonisation and the experimental and sampling design to be implemented as well.

[4] http://www.fino1.de/en/

[5] Aumüller et al., 2013. Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment (StUK4). Bundesamt für Seeschifffahrt und Hydrographie (BSH), Federal Maritime and Hydrographic Agency Hamburg und Rostock (www.bsh.de)

b) What post-consent methods / practices are likely to be more/less appropriate for the purpose of profiling risk under the application of environmental risk assessment approaches such as the SDM policy?

After analysing the SDM policy requirements, the benthos breakout group was not able to answer this question. As far as we know, SDM policy and post-consent methods are in a different context, because SDM policy refers mainly to the pre-consenting process and is specific for each project and each site characterisation.

3.2.5 Physical environment

a) What are the current post-consent monitoring requirements?

Participants were not aware of any specific and/or established legal requirements for the post-consenting monitoring, which seemed to be set on a case-by-case basis, according to project characteristics and affected receptors (seabed, beach profile, wave and tide regimes, currents, air, dunes, water quality – contaminants).

b) What post-consent methods / practices are likely to be more/less appropriate for the purpose of profiling risk under the application of environmental risk assessment approaches such as the SDM policy?

The discussion focused on important receptors and parameters to monitor rather than on monitoring methods or practices. To analyse the physical environmental a good baseline characterisation should be available in order to monitor the impacts of the project e.g. scouring effect, sediment dynamics, new water and wind circulation patterns and consequent change in pollutants distribution and concentration, shadow effects. Standards for the physical monitoring are needed both on site and off site. Indirect measurements include the analysis of satellite images. Models may also be very useful to upscale project effects and indications on the sustainable level of change for the physical environment need to be addressed.

3.2.6 Socio-economic receptors

a) What are the current post-consent monitoring requirements?

Monitoring of the socio-economic receptors tends to end once the installation is in accepted and in place. It is not likely that specific post-consent monitoring requirements are established for the socio-economic receptors. For fishing there is no direct monitoring aside from monitoring fish stocks, standard conditions and incident-driven, emergency plans. However, the responses of military organisations to complaints could result in a request to completely remove a project. And regarding the landscape, small scale test installations may not have a significant visual impact, but full scale ones may have.

b) What post-consent methods / practices are likely to be more/less appropriate for the purpose of profiling risk under the application of environmental risk assessment approaches such as the SDM policy?

There is a need for the industry to demonstrate the flaws and benefits of offshore renewable energy. However, to date there is no business case of sustaining environmental benefits to the community. A review of the CBA (that is normally conducted during the pre-consenting phase) may help on validating or identifying real benefits and flaws and calculations could be done to determine the TEV to demonstrate that the proposed social and environmental benefits of a project have actually been delivered. It was proposed that these evaluations could be done at the end of the first, third, and fifth year of project operation. The threshold for consenting should then decrease (if benefits are higher than flaws) but the level of control imposed should increase. In addition there is a need for a review after consenting to establish whether further changes to legislation are required to reflect actual experience. It would also be beneficial to apply lessons learned from other developments – this requires publicly available information and is a regulatory task.

4. Conclusions

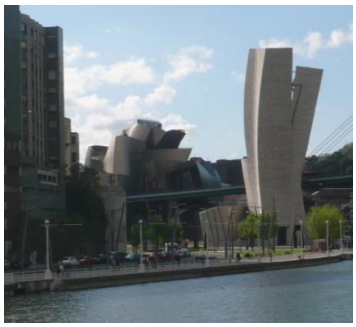
The information requirements for the pre- and post-consenting phases of MRE projects tend to be established on a case-by-case basis for most of the Member States represented at the workshop. However, in countries where more MRE projects have been installed (UK, Germany and Netherlands) there are more prescriptive requirements (in both pre- and post-consenting phases) with regard to monitoring parameters, duration and methodologies to be used. It is also evident that the duration of the monitoring activities during pre-consenting is the only prescriptive requirement to ensure sufficient data collection for some receptor baseline characterisation, especially in the countries where several MRE parks have been deployed. Prescriptive requirements during post-consenting are in general oriented to impacts quantification (e.g. collision rate, population numbers and distribution) and thus mainly related with monitoring methodologies and techniques to be used for some of the receptors.

A consensus seems to exist among participants from all groups regarding the need to have more than one year data for the pre-consenting phase of MRE projects. However, concerns from developers should be taken into account regarding the length and costs of the monitoring activities since they can strongly affect project feasibility. Therefore, it would be important to focus monitoring activities, limiting them to what is really necessary to understand project impacts.

For some receptors, in some Member States, there is an established requirement for the developers to present at least two years of baseline data (e.g. birds and fish). Although for some sites this amount of data may not be enough. As mentioned above a compromise should be established between data utility/significance versus data collection and processing costs, considering the early stage development of the industry and the role of cost optimisation on projects' feasibility.

A number of effective methodologies have been identified to characterise the considered marine environmental receptors during pre- and post-consenting. These are strongly dependant on the existing physical (e.g. soft bottom vs hard bottom sites) and biological (e.g. species composition) conditions as well as environmental sensitivity of the sites. The need to apply the same monitoring methodologies before and after MRE project deployment has been highlighted for several receptors as a matter of an appropriate evaluation of the MRE impacts significance. The need to use the same sampling points and more than one control site has been also identified as a good practice for several receptors.

The outcomes of this workshop will be used by the RiCORE project team to report on the feasibility of adopting a risk-based management approach, using the Survey Deploy and Monitor (SDM) policy as an example, and will be an important input for project Deliverable 4.2 and 5.2.



Photos of the Bilbao City

5. References

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6. List of annexes

Annex 1 ***– Workshop Agenda previously circulated among all workshop participants.***

www.ricore-project.eu

Event hosted in the framework of
BILBAO MARINE ENERGY WEEK
http://www.bilbaomarinenergy.com/index.aspx

Workshop 1
Marine Renewables and Environmental Risks – Current practices in pre and post consent monitoring

20th April 2015 – Room A1, 5th Floor, Bilbao Exhibition Centre, Bilbao, Spain

AGENDA

Workshop PART I: Pre-consent requirements

08h30 – 09h00: Registration

09h00 – 09h15: Welcome and introduction to the RiCORE project. **David Gray** (Project Coordinator) – The Robert Gordon University, Scotland.

09h15 – 09h35: Evaluation of site sensitivity and information needed for baseline characterisation of a project site. Dr. **Ángel Borja** - Head of projects at AZTI-Tecnalia Spain.

09h40 – 10h00: Overview of pre-consenting environmental requirements across Europe. **Anne Marie O'Hagan and Teresa Simas** – University College Cork and WavEC Offshore Renewables.

10h00 – 10h30: *Coffee break and preparation for the first breakout session*

10h30 – 11h30: Breakout session: division of the participants into groups to consider relevant marine receptors such as marine mammals, birds, fish and shellfish, benthos/habitats, physical environment and other users (socio-economic receptors) to discuss and answer the following questions:

1. What are the current pre-consent monitoring requirements for site characterisation?
2. What effective methodologies and practices would meet the (recommended) one year site characterisation survey for pre-consenting?

11h30 – 12h30: Presentations of conclusions from each breakout group and open discussion among all participants (10 minutes per group).

12h30 – 14h00: *Lunch*

Workshop PART II: Post-consent requirements

14h00 – 14h10: Introduction to Part II. **David Gray** (Project Coordinator) – The Robert Gordon University, Scotland.

14h10 – 14h30: Survey Deploy and Monitor (SDM) approach developed in Scotland. **Finlay Bennet** – Marine Scotland.

14h30 – 14h50: Overview of existing post-consenting requirements across Europe: what is currently undertaken and/or planned? **Anne Marie O'Hagan and Teresa Simas** – University College Cork and WavEC Offshore Renewables.

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 646436.

www.ricore-project.eu

Event hosted in the framework of
BILBAO MARINE ENERGY WEEK
http://www.bilbaomarinenergy.com/index.aspx

Workshop 1
Marine Renewables and Environmental Risks – Current practices in pre and post consent monitoring

20th April 2015 – Room A1, 5th Floor, Bilbao Exhibition Centre, Bilbao, Spain

14h50 – 15h10: Breakout session: division of the participants into groups to consider relevant marine receptors such as marine mammals, birds, fish and shellfish, benthos/habitats, physical environment and other users (socio-economic receptors) to discuss and answer the following questions:

1. What are the current post-consent monitoring requirements for different receptors?
2. What post-consent methods / practices are likely to be more/less appropriate for the purpose of profiling risk under the application of environmental risk assessment approaches such as the SDM policy?

15h10 – 15h30: *Coffee break*

15h30 – 16h30: Breakout session continuation

16h30 – 17h30: Presentations of conclusions from each breakout group and open discussion among all participants (10 minutes per group).

17h30: Workshop summary, next steps and close.

Annex 2 ***– Participants list.***

Name	Country	Institution / Company	Role	Receptor group
David Gray	UK	RGU	Open discussion facilitators	
Finlay Bennet	UK	Marine Scotland		
Ángel Borja	Spain	AZTI	Facilitator	Benthos/habitats
Antoine Carlier	France	IFREMER	Participant	
Brendan O'Connor	Ireland	Aquafact	Participant	
Covadonga Orejas	Spain	IEO	Participant	
Iratxe Menchaca	Spain	AZTI	Reporter	
Richard Wakefield	UK	Atkins	Participant	
Victor Quintino	Portugal	Universidade de Aveiro	Participant	
Didier Grosdemange	France	IN VIVO	Participant	Fish and shellfish
Inês Machado	Portugal	WavEC Offshore Renewables	Facilitator	
José Lino Costa	Portugal	Universidade de Lisboa - MARE	Participant	
Juan Bald	Spain	AZTI	Reporter	
Katja Mintenbeck	Germany	Alfred Wegener Institute	Participant	
Andy Webb	UK	HiDef Aerial Surveying Limited	Participant	Marine mammals
Erica Cruz	Portugal	WavEC Offshore Renewables	Participant	
Mónica Silva	Portugal	Universidade dos Açores	Participant	
Ross Culloch	Ireland	UCC	Reporter	
Eric Delory	Spain	PLOCAN Canarias	Facilitator	Marine mammals (acoustics)
Noelia Ortega	Spain	CTN - Marine Technology Center	Participant	
Andy Grinnall	UK	RGU	Reporter	Other users / Socio-economy
Clodagh McGrath	Ireland	DP Energy	Participant	
Dorleta Marina	Spain	bimep	Participant	
Ian Broadbent	UK	RGU	Facilitator	
James Massey	Ireland	RPS	Participant	
Joaquín Hernández	Spain	PLOCAN Canarias	Participant	
Nuno Oliveira	Portugal	ISG	Participant	
Pierre Mascarenhas	France	E-Cube	Participant	
Edwin Mooney	Ireland	Department of Environment	Participant	Physical environment
Lyndsay Bloice	UK	RGU	Reporter	
Matthias Delpey	France	Centre Rivages Pro Tech	Participant	
Pedro Liria	Spain	AZTI	Facilitator	
Vicente Gracia	Spain	LIM/UPC	Facilitator	
Aonghais Cook	UK	BTO	Participant	Seabirds
Karen Krijgsveld	Netherlands	Bureau Wardenburg	Participant	
Mark Trinder	UK	MacArthur Green	Facilitator	
Ricardo Tomé	Portugal	STRIX (company)	Participant	
Sylvain Michel	France	Agence Aires Marines Protégées	Participant	
Teresa Simas	Portugal	WavEC Offshore Renewables	Reporter	