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Review of education and public engagement programmes

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Deliverable 7.2 Review of education and public engagement programmes

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CONTENTS

1. SAFE WAVE project synopsis

The Atlantic seaboard offers a vast marine renewable energy (MRE) resource which is still far from being exploited. These resources include offshore wind, wave and tidal. This industrial activity holds considerable potential for enhancing the diversity of energy sources, reducing greenhouse gas emissions and stimulating and diversifying the economies of coastal communities. As stated by the European Commissioner of Energy, Kadri Simson, during the Energy Day in the framework of the climate conference (COP25) held in Madrid (2-13 December 2019), "the European experience shows that the benefits of clean energy go beyond reduced greenhouse gas emissions and a healthier environment. Clean energy transition boosts the economy and creates jobs. The European Green Deal is also a growth strategy". In the same framework of COP25 and during the Oceans Day, the European Commissioner for environment, oceans and fisheries, Virginijus Sinkevičius explained that "fighting climate change and protecting marine life biodiversity is a centrepiece of the EU's ocean policy. Due to climate change, our oceans are facing serious challenges, which require an urgent and comprehensive response. But oceans are also a part of the solution". Therefore, ocean energy is one of the pillars of the EU's Blue Growth strategy. Ocean energy could provide clean, predictable, indigenous and reliable energy and contribute to the EU's objective of reaching a share of renewables of at least 32% of the EU's gross final consumption by 2030. As it was underlined by Virginijus Sinkevičius, "Marine renewable energy has an incredible potential. The offshore wind sector is growing strongly enough to compete with traditional energy sources. The emerging technologies such as wave and tidal energy will take the same pathway".

The nascent status of the Marine Renewable Energy (MRE) sector and Wave Energy (WE) in particular, yields many unknowns about its potential environmental pressures and impacts, some of them still far from being completely understood. Wave Energy Converters' (WECs) operation in the marine environment is still perceived by regulators and stakeholders as a risky activity, particularly for some groups of species and habitats.

The complexity of MRE licensing processes is also indicated as one of the main barriers to the sector development. The lack of clarity of procedures (arising from the lack of specific laws for this type of projects), the varied number of authorities to be consulted and the early stage of Marine Spatial Planning (MSP) implementation are examples of the issues identified to delay projects' permitting.

Finally, there is also a need to provide more information on the sector not only to regulators, developers and other stakeholders but also to the general public. Information should be provided focusing on the ocean energy sector technical aspects, effects on the marine environment, role on local and regional socio-economic aspects and effects on a global scale as a sector producing clean energy and thus having a role in contributing to decarbonise human activities. Only with an informed society would be possible to carry out fruitful public debates on MRE implementation at the local level.

These non-technological barriers that could hinder the future development of WE in the EU, are being addressed by the WESE project funded by EMFF in 2018. The present project builds on the results of the WESE project and aims to move forward through the following specific objectives:

1. Development of an **Environmental Research Demonstration Strategy** based on the collection, processing, modelling, analysis and sharing of environmental data collected in WE sites from different European countries where WECs are currently operating (Mutriku power plant and BIMEP in Spain, Aguçadoura in Portugal and SEMREV in France); the SafeWAVE project aims to enhance the understanding of the negative, positive and negligible effects of WE projects. The SafeWAVE project will continue previous work, carried out under the WESE project, to increase the knowledge on priority research areas, enlarging the analysis to other types of sites, technologies and countries. This will increase information robustness to better inform decision-makers and managers on real environmental risks, broad the engagement with relevant stakeholders, related sectors and the public at large and reduce environmental uncertainties in consenting of WE deployments across Europe;

2. Development of a **Consenting and Planning Strategy** through providing guidance to ocean energy developers and to public authorities tasked with consenting and licensing of WE projects in France and Ireland; this strategy will build on country-specific licensing guidance and on the application of the MSP decision support tool developed for Spain and Portugal in the framework of the WESE project; the results

will complete guidance to ocean energy developers and public authorities for most of the EU countries in the Atlantic Arch.

3. Development of a **Public Education and Engagement Strategy** to work collaboratively with coastal communities in France, Ireland, Portugal and Spain, to co-develop and demonstrate a framework for education and public engagement (EPE) of MRE enhancing ocean literacy and improving the quality of public debates.

2. List of acronyms

DAD	Decide, announce, defend
DADA	Decide, announce, defend, abandon
EIA	Environmental Impact Assessment
EPE	Education and public engagement
MRE	Marine renewable energy
MOWC	Multi-resonant oscillating water column
OWC	Oscillating water column
RES	Renewable energy source
WE	Wave energy

3. Executive summary

This deliverable comprises a critical review of selected Education and Public Engagement (EPE) programmes associated with marine energy test site and infrastructure deployments. Information on selected case studies was gathered through a literature view and interviews of key informants. The methods used for EPE in each of the cases were analysed, key challenges faced by such programmes identified, and best practices documented. The knowledge developed in this task and presented in this report will feed into the development of an Educational and Public Engagement Framework within Task 7.4.

4. Introduction

4.1 Background to task

Climate neutrality is a central goal of the European Green Deal (European Commission, 2019), however, societal opposition has the potential to significantly impede the realisation of the infrastructure required for this decarbonisation (Cohen et al., 2014). Such is the significance of the changes required to the energy system[1] needed for the envisaged decarbonisation, that the required deployment of renewable energy infrastructure will not be possible without societal buy-in of some degree. This means that the realisation of the potential for marine renewable energy (MRE), will require the social acceptance (and moreover the social acceptability[2]) for the deployment of installations such as such as wave energy (WE)[3].

Almost everything about the deployment of commercial devices to harvest wave and tidal energy is new. The technologies are new and devices are still largely under development. The potential scale of occupation of marine space (together with offshore wind developments) in nearshore and offshore locations is unprecedented. As a result, public knowledge of wave energy technologies may be limited. However, a lack of knowledge or access to information does not mean that individuals will not form opinions or attitudes towards this technology. Walker (1995) highlighted two decades ago that we must not underestimate "*what the public thinks*" and how attitudes are formed, changed and developed concerning the adoption of renewable energy technologies. In the case of WE, it is especially important that policy makers and practitioners are cognisant of the depth of knowledge and understanding regarding the technology and adopt appropriate tools for engaging the public in its development (Chozas et al., 2010).

[1] Not to mention the wider economy and society as a whole.
[2] We distinguish between 'social acceptance', which often implies acceptance of something imposed, a passive acquiescence so to speak – and 'social acceptability' which carries with it, connotations of an effort to make a project more agreeable to societal stakeholders. Dunphy et al., (2021) suggest that this inherently requires a more participatory approach with earlier involvement of stakeholders.
[3] Colander and Monroe (2011) and O'Hagan *et al.*, (2016) suggest that coordination among regulatory agencies and acceptance from the public are required for the marine renewable energy sector develop from its current nascent stage to a commercially viable energy alternative.

4.2 Objectives

SafeWAVE is very aware of the importance of good relationships with local communities and the need to develop good two-way communication with stakeholders to facilitate the successful scaling of ocean energy device deployments. An important component of its work programme is the development and demonstration of a framework for education and public engagement (EPE), specifically aimed at ocean literacy. This EPE framework is intended to go beyond social acceptance, which is often equated to acquiescence to a fait accompli, and be designed to contribute to the development of projects which exhibit inherent social acceptability.

As an initial step toward the aforementioned framework, Task 7.2 comprises a review of education and public engagement programmes. The aim of this task is to outline methods adopted, explore key challenges, and present best practices. This developed knowledge will subsequently be fed into the development of the EPE framework.

This deliverable is a presentation of this review of education and public engagement. It is intended as a preparatory report, one that gathers information and provides analyses that will inform the framework for the development and implementation of education and public engagement for ocean energy projects in Task 7.4.

This work presented in this deliverable follows the approach taken by Dunphy *et al.*, (2021). Key examples of EPE will be identified through a literature search and via the partners' experiences. These case studies will be characterised through a comprehensive desk study coupled with the use of targeted informants. A more detailed description of the methods employed in this task is included in Section 5 of the deliverable.

4.3 Structure

In this report, six case studies of EPE are characterised through a desk study coupled with the use of targeted informants – detailing the nature of the project, its approach to public engagement, outlining challenges faced and detailing particular successes. Four of the sites are associated with the SafeWAVE project and/or its partners, while an additional two cases have been added to add additional perspectives. Following on the initial preliminary sections (1-3), the remainder of this report is divided into five sections as outlined below:

- This introductory section presents an overview of the report, details the background to the work, provides context for the task undertaken, and presents the structure of the document.
- The next section outlines the research methodology undertaken during the task and describes the particular research methods adopted for data collection and analysis.
- The sixth section provides a brief overview of education and public engagement concepts and theories and introduces public engagement on marine renewable energies.
- Section seven presents summaries of six case studies of education and public engagement relating to marine renewable energies.
- The next section considers the EPE conducted within these case studies. Using information sourced from literature reviews and key informants, the experiences of engagement are explored, lessons drawn, and good practices identified.
- The final section comprises a brief conclusion, providing a summary of the key findings and recommendations.

5. Methodology

5.1 Introduction

The work presented in this report aimed to explore education and public engagement practices and to identify good practices and draw lessons from prominent examples of EPE related to the deployment (or proposed deployment) of marine renewable energy infrastructure including that for test sites.

The research approach undertaken was adopted from the work of Dunphy *et al.* (2021), in which we undertook a comparable study on public engagement programme association with carbon capture and storage[4]. This study reported here was based on a case-study approach involving a detailed investigation of particular sites using multiple evidence sources to facilitate illustrative generalisation of lessons learned. Prospective candidate sites were identified through a literature search and recommendations from SafeWAVE partners. The inclusion criteria for the case studies included:

(i) Relationship to SafeWAVE project;

(ii) Social and political context;

(iii) Availability of literature;

(iv) Availability of potential informants.

The cases selected for this report were five cases associated with the project or project partners and two additional cases which offer additional insights (see p. 25). This research for this study comprised an extensive search and review of literature (relevant to the case study projects and their host communities), coupled with in-depth interviews with informants via video conferencing. In so far as practical, attempts were made to engage information representing a diversity of perspectives. The resultant interview notes were then analysed using a thematic analysis method. The following sections provide an overview of the methods used in the study, namely: literature review, in-depth interviews and thematic analysis.

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[4] Within the context of '*REALISE: Demonstrating a Refinery-Adapted Cluster-Integrated Strategy to Enable Full-Chain CCUS Implementation*', a project funded under the European Union's Horizon 2020 research and innovation programme under grant agreement No 884266.

5.2 Literature review

A systematic literature review was conducted to explore perceived best practices in education and public engagement of renewable energy projects generally, and to characterise the selected EPE case studies. The review was used to map evidence on public participation, its successes and shortcomings in wave and tidal energy contexts. Although often dismissed as a precursor to 'real' research (Onwuegbuzie & Freis, 2016), a literature review is not only a preparatory step in the research process, but may serve as a method in its own right (Torraco, 2005).

A combination of commercial and freely accessible bibliography databases was used for the literature search, including Web of Science, Science Direct, JSTOR, and Google Scholar[5]. We adopted a number of synonyms for key terms relating to the role of the public and renewable energy technology found through an initial review of the literature and expert feedback (as detailed in Table 1 below). A 'backward' and 'forward' snowballing strategy was used to complement the database searches. 'Backward snowballing' involves identifying literature contained in bibliographies of those papers already found, while 'forward snowballing' involves identifying literature that cited papers already found (information which can be sourced through the bibliographic databases themselves).

Table 1: Synonyms used to identify literature

Public:	Energy technologies:
- Public/ population/ societal/ community engagement - Public perceptions - Public participation - Public consultation - Consenting processes - Public involvement - Social impacts - Human dimensions - Social acceptance - Social acceptability	- Renewable energy - Renewable energy technologies - Low carbon energy technologies - Low carbon energy transition - Microgeneration - Photovoltaics / Solar PV - Wind energy - Offshore wind - Onshore wind - Marine energy - Marine renewable energy - Wave energy - Tidal energy

[5] www.webofknowledge.com; www.sciencedirect.com; www.jstor.org; scholar.google.com

The list of literature which resulted from the searches was then screened. The first check was for potential usability, that is making sure that '*they cover the topic of interest, are in a language you can read, and are in a publication you respect and can be obtained in a timely manner*' (Fink, 2010, p. 59). The second screen undertaken was a consideration of the quality of the work[6], *etc*.) was undertaken to ensure the articles selected were suitable. Such screening results in a higher quality, more focused literature of a size manageable within study constraints.

The details of the literature were input to the reference management software (Mendeley) used by the research team. The use of such software to manage reference and to automate citing during writing makes for a more user-friending workflow. The literature review was the traditional iterative process of searching, reading, annotating, organising, summarising, analysing, and finally synthesising (after Dunphy et al., 2021).

5.3 Semi-structured interview

To complement the literature review and enable an in-depth investigation into attitudes towards MRE and perspectives on EPE programmes in the case studies, key informants were engaged through semi-structured interviews. An interview has been described as a '*conversation with a purpose*' (Webb & Webb 1936 quoted in Legard et al., 2003, p. 138). And while this true for a casual observer, and perhaps even important for interviewees to feel that way, such a label belies the preparation in advance and work of the interviewer during the 'conversation' and risks minimising the value that can emerge from such engagements.

The aim of semi-structured interviews is to gain an appreciation of the perspective of interviewees about a focal matter. Dunphy *et al.*, (2021) note the importance of allowing sufficient time and scope in the engagement such that the interviewees are allowed (and moreover feel that they were allowed) to give their point of view and to tell 'their story'. Gill *et al.* (2008, p. 292) suggest that building a rapport with the interviewees is important and even argue that doing so in advance '*can have a positive effect of the subsequent development of the* interview'. Legard *et al.*, (2003) describe the interview process as comprising a number of discrete stages, namely:

[6] Including through an initial assessment of the work itself, consideration of the journal quality, author reputation, methodological approach, *etc*.

- Arrival at the interview, which in agreement with Gill *et al.,* (2008) they posit this initial interaction as '*crucial for establishing the relationship between researcher and participant which is a prerequisite for a successful in-depth interview*' (Legard et al., 2003, p. 145).
- Introducing the research, discussing confidentiality, obtaining consent, *etc*.
- Beginning the interview offers an opportunity to set the scene for the interviewee, gather background information, and assess the type of responses, *etc.* all of which can be important for the effective conduct of an interview.
- During the interview the researcher is guiding the interviewees through '*key themes - both those anticipated by the researcher and those which emerge from the interview*' (*Ibid.,* p. 146).
- Ending the interview involves signalling to the interviewees that the interview is almost over and allowing them to disengage from the interview and ensure that they have said all that they wanted to say.
- Post interview, thanking the interviewee, reassuring her about confidentiality and data protection, and moving away from the interview. Legard *et al.*, (2003, p. 146) note this stage '*sometimes sparks some final reflections, or even new information, from interviewees*'. It is not unknown for the most important contributions to come once the recording has been switched off, highlighting the importance of noting such contributions in a timely fashion!

As mentioned above the purpose of these interviews was to complement and supplement understandings emerging from desk-based research. Such interviews offer insights that may not emerge through a wholly literature-based analysis (Dunphy et al., 2021). Potential interviewees were identified through a scoping exercise on the selected case studies, which included a combination of literature review and referrals from SafeWAVE partners associated with particular sites. Subsequently, prospective respondents were contacted by email to introduce the project, to explain the particular study being undertaken, and to invite them to participate. All interviews were held remotely using video conferencing. A total of seven semi-structured interviews were conducted with informants associated with selected case studies. These informants – from France, Portugal, Spain, and the UK – each had specialist knowledge and/or experience of public engagement.

The interviews were carried out via video conferencing, using pre-formed interview schedules of concise, clear and open-ended questions. In addition, as required prompts (arising from the interviewer's thought processes) and probes (eliciting more detail on a topic raised by the interviewee) were used to direct the conversation (Legard et al., 2003, p. 168). Following the approach of Dunphy *et al.,* (2021) these prompts and probes included explorations of approaches to public engagement, stakeholder relations, structure of engagements, issues raised, information sharing activities, lessons learned, and general reflections on their experience. During the interview, extensive notes were taken – this included where relevant non-verbal communication, which proved possible in videoconferencing where it would not be possible in a telephone interview. The video-calls were recorded where permission was provided, and these recordings were used to supplement and enhance the notes. The resultant notes were analysed as described in the following section.

5.4 Data analysis and interpretation

Analysing interview notes involves a qualitative analysis, to interpret what was communicated and theorising from this analysis (Schwandt, 2007). This is an iterative laborious and often time-consuming process. As described by Dunphy *et al.,* (2021) the analysis started with a read-through of the notes taken – this was repeated until the material became familiar to the analyst. Following this initial stage, the text was carefully analysed to capture key information to identify themes relevant to public engagement activities. Emerging information was cross-referenced and linked to that from the literature review, and in so doing resolving inconsistencies filling some knowledge gaps and identifying others. Next the notes were thematically analysed involving the systematic ordering, categorising and labelling (or coding[7]) of text. The relatively small dataset made it possible to code the text by hand and significantly reduced the time required for the iterative analysis and interpretation process. In each case the researcher who interviewed the respondent also analysed the notes.

[7] Saldaña (2013, p. 3) describes a code as '*most often a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data*'

6. Education and Public Engagement

6.1 Public concerns about wave energy

Public responses to renewable energy can be complex and somewhat contradictory. The most likely explanation is that renewable energy is seen through the lens of personal beliefs about the environment and society as a whole (Krohn et al., 1999). Individuals may support or oppose renewable energy based solely on these beliefs, at times without any understanding of the technological aspects of electricity generation (Conway et al., 2010). Renewable energy developments may be seen as a source of clean, renewable power or as industrial installations, and their perceived 'fit' on the landscape may simply be a matter of taste (Krohn et al., 1999; McLachlan, 2009; Wolf et al., 2009). Similarly, climate change beliefs can play an important role in perceptions about WE, and since WE can mitigate the impacts of CO_2 emissions, these beliefs are likely to come into play when considering the desirability of a project (Dreyer et al., 2017). However, even those who share core values on climate change mitigation, for example, may hold opposing views regarding a proposed development, leading to a unique type of debate with environmentalists on both sides of the argument (Warren et al., 2005). 'Green-on-green' conflicts arise when one type of ethical or aesthetic value (*e.g.*, to reduce greenhouse gas emissions) directly opposes another (*e.g.*, to preserve a natural landscape) (Warren et al., 2005).

The main social concerns identified for wave energy are centred on potential visual intrusion, negative impacts on the marine environment, and uncertainty regarding the effects wave energy deployment may have on the local (tourist-orientated) economy. Experience of offshore wind developments suggests that aesthetic perceptions strongly influence individual responses (Warren et al., 2005), and while wave and tidal energy devices have a lower profile above the water level, several studies suggest that concerns still exist about the effect of marine renewables on seascapes and marine environmental quality (Haggett, 2008; Ladenburg, 2009). People tend to associate 'the sea' with familiar shorelines but attach broader meanings to 'marine environments' to include oceans, ecosystems, sea creatures and human influences (Arnold, 2004). Therefore, though developments might be more acceptable when placed out of sight from coastlines, this does not guarantee public support as developments may still be seen as a potential threat to seascapes and marine life (Bailey et al., 2011; Haggett, 2008). In summary, the complex and often emotive relationship between the public and marine areas may pose challenges for marine renewables generally and wave energy in particular (Bonar et al., 2015).

Furthermore, the ecological impacts of marine renewable energy remain unresolved because interactions between devices and ecosystems are complex and dynamic, adding to the difficulty of establishing cause and effect (Lin & Yu, 2012). These will not be fully understood until prototype devices are installed and monitored (Cada et al., 2007). Henkel et al. (2013) argue that greater research is needed on the environmental impacts of marine renewables to ease stakeholder uncertainty and public perceptions, and to address impacts that fall under these measures. Similarly, prospective benefits to the local economy and economic effects are also relevant. Particularly, alternative employment has been one of the most cited opportunities, while fishing grounds has been the most cited perceived impact (Reilly et al., 2015). According to L.D. Jenkins *et al.* (2018), tidal energy in particular may impinge upon historical, traditional, or accustomed fishery grounds (Kerr et al., 2015; H. Todd & Zografos, 2005). Acknowledging and considering these social impacts during planning can be critical to achieving fair outcomes for fishers, and other marginalised coastal communities.

6.2 Why engage with the public?

Several authors have noted that support for renewable energy projects often follows a U–shaped curve, where there is high community support in principle, which then declines during construction and increases again once is in operation[8] (Bailey et al., 2011; Wolsink, 2007). Thus, it appears that much of the opposition to renewable energy developments may be more related to the planning and decision-making processes than to the technologies themselves (Warren et al., 2005). Proposed solutions to this pattern include greater education and public engagement approaches at the planning stage (Krohn et al., 1999).

Good practice in engaging the public is always important. Dunphy *et al.,* (2021) outline an increasing move away from the so-called DAD approach of 'decide-announce-defend' to a more inclusive one of 'consult-consider-modify' (see Halliday, 1993). In this new approach, Wolsink (2007) opines more democratic and open-

[8] In this regard, Mullally *et al.,* (2018, p. 75) observe that some would seek to '*invoke perceived popular support for renewable energy at national level to overrule the local concerns at project implementation stage.'* Such an approach would only serve to make matters more adversarial.

minded decision-making is required. While Aitken (2016) notes that inclusive and open-minded engagement will not necessarily lead to acceptance of individual projects, but argues that good engagement practices are important not only at the individual project level but also for increasing the public support of the industry as a whole.

There is a growing expectation of civic participation in decision-making. Dunphy *et al.*, (2021, p. 12) observe that "*Stakeholders (including societal stakeholders) impacted by decisions relating to infrastructure development, land use plans, pollution licences, etc. now expect transparency and accountability relating to such decisions, and demand increased public consultation*." The literature identifies three main motivations for public engagement on energy projects:

- Normative: public engagement should involve those individuals who have a stake in decisions affecting their local area to promote fairness in the distribution of benefits and procedures used to make decisions (Gross, 2007; Heffron & McCauley, 2017; Szulecki, 2018) (*e.g.*, communities impacted by decisions; voters in the case of publicly funded projects; *etc.*);
- Substantive: public engagement can improve the quality of decision-making by recognising that residents possess specialist knowledge about their areas that may be unknown to outside experts (Haggett, 2008);
- Instrumental: public engagement may be used with a specific goal to raise public awareness, increase risk or product acceptance, or foster trust in experts, developers or government (Whitmarsh et al., 2011). This rationale remains common despite criticism from an energy and social justice perspective (Dwyer & Bidwell, 2019; Kerr et al., 2014)

As Smith, Stirling and Berkhout (2005 quoted in Dunphy et al., 2021) observe:

'*Under a normative view, participation is just the right thing to do. From an instrumental perspective, it is a better way to achieve particular ends. In substantive terms, it leads to better ends.*'

These motivations are likely to have material relevance on the scope and types of engagement used. Major infrastructure projects for meeting national emissions targets may involve limited negotiation except on supplementary issues (Bayle, n.d.). In some cases, engagement may happen mainly to meet regulatory requirements and for instrumental reasons rather than serving a material purpose or encouraging active engagement (Devine-Wright, 2011b; Innes & Booher, 2004). Project goals equally draw attention to tensions between local and wider priorities in energy policy. Haggett (2011) notes that climate change often appears removed from everyday life but fears of local impacts are not, so while national discussions often stress emissions reduction and energy security, communities and stakeholders may be more concerned about personal and local risks and benefits. Affected groups may also be sceptical about the need for local sacrifices to achieve global emissions goals (Ellis et al., 2007; Velasco-Herrejón & Bauwens, 2020). In contrast, projects addressing local energy insecurity and poverty are likely to be more negotiable, particularly with community-driven developments. Where this occurs, normative and substantive rationales may feature more prominently and lead to more emphasis on soliciting opinions and knowledge, and tailoring projects and engagement to local needs (K. Jenkins et al., 2016; Miller et al., 2015).

6.3 Levels of public engagement and participation

Public engagement refers to the process whereby those people directly affected by a proposed project are involved in the earliest stages of decision making of a renewable energy development (Soma & Haggett, 2015). Formats of public engagement are numerous, ranging from the distribution of information through brochures, to consultation and meetings with comprehensive dialogues. Different methods of engagement are used for different reasons. One framework to engagement distinguishes between “top-down” and “bottom-up” participation and communication approaches, the former initiated by the government, the latter initiated by communities themselves (Richardson & Razzaque, 2005). Other models distinguish between the substantive and procedural dimensions of participation, though these are often intertwined (Richardson & Razzaque, 2005).

Aitken *et al.* (2014) argue that tools for public engagement can be summarised in three broad approaches:

- Awareness-raising: This layer of engagement is essentially concerned with information provision. The desired outcome is likely to be greater public acceptance or legitimacy for the project. However, too often it involves one-way communication with community feedback (implicitly or explicitly) very often considered unwelcome by process leaders.

- Consultation: Different levels of and forms of public feedback into decision-making processes. The aim is to gain an insight into public opinion and to create a socially acceptable or appropriate policy or project. This approach sees citizens being able to advise and contribute to planning, but still hold very little real power.
- Empowerment: More participatory forms of public engagement, which give greater control to participants. The aim here is to work with the public, enabling them to play key roles in decision making, building social capital, and enhancing democracy.

Another important concern in engagement exercises is *who* is being engaged. There is widespread recognition that ‘the public’ should not be viewed as homogenous and that individuals’ roles, interests, values and experiences all influence responses to developments (K. Jenkins et al., 2016; Walker, 1995). Engagement activities must consequently recognise this diversity and pay close attention to marginalised groups (Devine-Wright, 2011b; Haggett, 2011)

Devine-Wright *et al.* (2005) argue that there is no simple formula to enhance public support (Devine-Wright, 2005; Walker, 1995). However, the literature highlights that when deciding on the exact needs and challenges for specific locations, social acceptance is most likely to be achieved through transparent, extensive and ongoing public participation that is structured by clearly defined roles, which are focused on building trust and developing good relationships between all concerned (Aitken et al., 2014).

6.4 Approaches to public engagement on wave energy

Engaging the public is not as straightforward as it might sound. Just talking with people will not automatically result in trust and support and increased social acceptance. The different calls for public engagement frequently suffer from not clarifying who exactly the public is, and which part of the public should be represented (Aitken et al., 2014; Haggett, 2011). This has led to misunderstandings in practice, especially the confusion of the people with a context-dependent stake (stakeholders) and the general public (citizens), who both are involved to represent social concerns, even though they may represent completely different fractions of a society (Soma & Haggett, 2015; Wüstenhagen et al., 2007). Stakeholder engagement is not just about ‘talking with people’ but is based on a broader understanding of particular factors to which attention needs to be paid. Good public engagement depends on having the insights to choose the right strategy for the particular policy issue. Knowing the appropriateness of the different public engagement approaches to specific contexts can be critical to the extents to which outcomes are socially acceptable (Soma & Haggett, 2015).

Three distinct types of justice have been frequently discussed in the literature on public engagement of renewable energy technologies: procedural, distributive, and recognition justice. Distributive justice refers to the balance of costs and benefits especially concerning the local level because costs are often born primarily by those in proximity of the project, while benefits manifest globally (Haggett, 2011). For the case of WE, providing community benefits to compensate for perceived negative impacts can be key to achieving public acceptance (Cass & Walker, 2009; Walker et al., 2010), particularly those affecting fisheries, recreation and navigation. These compensations can take the form of a direct monetary payment to those affected (*e.g.*, through their industry association) or alternative livelihood options. Community ownership can also be one way by which local communities may benefit from renewable energy projects. In 1972, following an appeal to the Westminster parliament, the Shetland Islands Council was granted a share in the development of its emerging oil industry and authority over certain aspects of its operation (Johnson et al., 2013). As a result, the Shetland Islands benefitted greatly from the new developments as community shares in oil revenue were recycled into the local economy (Johnson et al., 2013). Though the nature of the marine energy industry is notably different, it has been suggested that this model could be repeated quite well with marine renewables (Johnson et al., 2012, 2013).

Procedural justice refers to how fair the decision-making process is perceived to be by stakeholders. Previous studies on land-based and offshore wind have shown that the public values an open, fair development process (Firestone et al., 2012). Transparency and dialogue are key elements of procedural justice (Heffron & McCauley, 2014). By providing access to information and allowing for full participation by stakeholders on equitable terms, this type of justice can be increased (Gross, 2007; Ottinger et al., 2014)(Ottinger, 2013). Project developers often take informal approaches to stakeholder engagement particularly where there are perceived problematic issues or potential 'showstoppers'. Developer-led approaches tend to consist of public meetings and open days, media campaigns and interviews as well as dedicated meetings with key stakeholders that will be directly impacted upon by the project in question (O'Hagan *et al., 2016)*.

L.D. Jenkins *et al.* (2018) argue that WE may benefit from examining the concept of recognition justice. Recognition justice is the idea that less influential actors should be empowered and ideological opponents should be respected (Heffron & McCauley, 2014). With respect to WE development, recognition justice does not dismiss unrelenting or emotionally charged opposition as irrational, but carefully examines the raised concerns for insight (Taebi *et al.,* 2012). Recognition justice may be viewed as an extension of procedural justice (Ottinger *et al.,* 2014). While procedural justice focuses on providing a transparent, accessible process for discussion, recognition justice extends the consideration for stakeholders by listening to and responding to marginalized (Kerr *et al.,* 2015) or uncompromising constituents.

In summary, early engagement with stakeholders can play a key role in obtaining a successful public consenting outcome. Learning about and addressing potential issues can avoid costly and time-consuming problems. This involves the development of an information system that guarantees that citizens will be informed promptly about the scope and time duration of the project, the expected performance of the infrastructure and the impact that it will have on their regular life. And, as important as the previous, provide the citizens with a channel for participation, to a certain extent, in the decision-making process (Heras-Saizarbitoria *et al.*, 2013). To this end, the active consultation, discussion and negotiation with main stakeholders, as well as the proactive provision of full and detailed information to the local community, aiming at promoting a meaningful social involvement, may be crucial for the successful promotion and diffusion of WE.

7. Summaries of case studies

(1) Wave Hub, UK

Overview

The Wave Hub is a 'plug-in-and-test' facility under construction 16km from Hayle Bay, near the north coast of Cornwall, UK. The project is funded by the South West Regional Development Agency (SWRDA) and is intended to be a final pre-commercial facility. This development will enable wave-energy developers to test new technologies before commercial deployment (McLachlan, 2009). The project is the most significant development of its type in the UK and has gained a high media profile, so it has provided an opportunity to look at public reactions to emergent wave technologies (Bailey et al., 2011).

Research by Bailey et al. (2011) indicate that communities near the Wave Hub generally support the project or are aware of it. The main reasons for support are general concerns about climate change, prospective benefits to the local economy and the lack of appreciable visual, environmental and economic effects. The main concern raised against the project is the possibility of reducing wave swells at well-known local beaches. Other concerns include impacts on marine mammals, fish stocks and ecosystems, fishing incomes (resulting from the safety zone), navigation, and possible impacts on the tourism sector (West et al., 2009).

The proposal was submitted to the Department for Business, Enterprise and Regulatory Reform (BERR) in June 2006, with local consultation activities taking place from 2004. The project gain consent in September 2007 (McLachlan, 2009). To address project concerns, the SWRDA issued numerous press releases outlining the potential benefits of the proposal for the local area. Furthermore, one novel element of this case was the creation of internet discussion forums proposed by surfing websites that included discussions between supporters and opponents (McLachlan, 2009). Furthermore, the strategic mitigation phase of the project looked at the potential impacts of the Wave Hub on the fishing community and created as a result a monetary fund for the development of fishing activities in the Cornish north coast (O'Hagan et al., 2016).

Project summary

Funding: SWRDA – South West Regional Development Agency

Owner: Department for Business, Energy and Industrial Strategy (UK)

Operator: Wave Hub Limited

Location: Hayle, Cornwall, UK

Commission date: 2010

Capacity: 30 MW

Status: Project

Cost: £28 million

Engagement strategy

Information days, flyers and open-door policy in the offices in Hayle, Cornwall.

Factors Influencing Social Opposition

Possibility of reducing wave swells at well-known local beaches.

Impacts on marine mammals, fish stocks and ecosystems, fishing incomes (resulting from the safety zone)

Impacts on navigation.

Possible impacts on the tourism sector.

(2) OWC Mutriku, Spain

The OWC Mutriku, located in the Basque Country, northern Spain, is Europe's first commercial wave plant. The plant is part of the NEREIDA MOWC project, implemented by a European consortium led by the EVE, the Energy Agency of the Basque country. This project was intended to demonstrate the successful incorporation of OWC technology with Wells turbine power. The project aimed at demonstrating the viability for future commercial OWC projects (Heras-Saizarbitoria et al., 2013). The port of Mutriku is one of the oldest in Gipuzkoa. In the past years its inhabitants have devoted themselves to whale fishing and the derived industries. Mutriku harbour stands in a small and narrow natural bay. The area is regularly lashed by Biscay storms, which for years have damaged the piers in the harbour (Torre-Enciso et al., 2009). To address this problem, the Basque Administration approved a project to build up a breakwater of 440 m, approximately. With the initial project defined, and as part of an overall strategy of developing renewable energy sources the Basque energy board took the advantage of construction of this infrastructure and installed an ocean energy plant (Torre-Enciso et al., 2009). The designed plant has 16 chambers, and the upper hole of each chamber has an 18.5 kW nominal power turbo generator attached to it, reaching an aggregate power of 296 kW. The turbines are Wells fixed flux type, which are very robust and simple (Torre-Enciso et al., 2009). With an installed capacity of 296 kW and an estimated renewable power production of 600,000 kW h per year, the Mutriku facility represents a technological innovation that has faced social acceptance. The plant project technically overlapped the construction of a dam at the port. Though the dam was designed to protect the fleet of local fishing boats, the project did not gather a unanimous consensus of the stakeholders involved. Various groups opposed the dam, in particular, environmental groups so-called Berdeak (ecologists), Independienteak (independent groups) a platform called Hobetu leikez ("It can be improved", in Basque). However there also exists a platform in favour of building the infrastructure—Mutriku bizirik ("Mutriku alive"). Ecologist groups assert that they are not against the plant but against the chosen location which was close to a tourist marina. Moreover, neighbours of the project expressed that "they" or "his town" had been used as an "experiment", or "guinea pig" (Heras-Saizarbitoria et al., 2013). Once the project was installed, noise pollution became one of the most prominent social controversies in Mutriku. Noise became a notable problem due to a storm that lasted two or three days. The issue was addressed by technicians. However, groups against the project publicly denounced the noise by sharing videos that generated concern. The noise became known as the "dragon" and therefore the OWC plant later became "Mutriku's dragon". To address this reaction, project developers proceeded to accept the responsibility for the error by failing to inform the public about the possibility of an acoustic problem and opted to send every villager an education brochure and held a conference to inform the public about the project's characteristics. Furthermore, sound insulation for the stell doors of the entryway was installed (Heras-Saizarbitoria et al., 2013).

Project summary

Technology: Oscillating Water Column
Owner: Energy Agency of the Basque country (EVE).
Operator: BiMEP
Location: West coast of Gipuzkoa
Commission date: 2010
Cost: €6.5m
Capacity: 296 kW
Status: In operation

Engagement strategy

Administered brochures and a talk with local inhabitants to provide information on the characteristics of the technology.

Factors Influencing Social Opposition

Noise pollution.

(3) Pentland Firth and Orkney Waters Pilot, Scotland, UK

The Pentland Firth and Orkney Waters (PFOW) is an area under pressure from new marine activities and especially from marine renewables. The zone was identified as an environment of exceptionally high wave and tidal energy (BERR, 2008).

In 2011, the Scottish Government ordered the preparation of a non-statutory pilot spatial plan for the PFOW to inform the licencing process for new developments. It was selected for the pilot because of the high level of existing and proposed marine MRE development in a relatively pristine area of coastal waters where traditional activities and habitats protection are already important (Marine Scotland, 2015). Main traditional activities include community-based fisheries, shipping, and eco-tourism (Johnson et al., 2016).

The most significant move towards the commercial deployment of wave and tidal energy devices took place in 2009 when the Crown Estate Commissioners (CEC) invited bids for seabed leases in the PFOW area, allowing developers to nominate their desired sites (Crown Estate, 2011). The results of the invitation were announced in March 2010 when nine commercial developers were successful in bids for eleven sites (six wave and five tidal) with the aspiration to deliver 1.6 GW of installed capacity by 2020.

All the sites and proposed leases are subject to the developers obtaining licences from Marine Scotland for their power generating stations. The action of CEC in agreeing to lease (subject to licence) seabed areas for wet renewables at this stage has proved controversial. It pre-empted planning and raised questions about the process employed to allocate space currently used by others and the distribution of benefits from subsequent energy activities.

Initially, there was limited consultation with other users and significantly the allocation took place just in advance of government legislation and procedures for MSP coming into force (Johnson et al., 2012). This resulted in a very angry meeting held between The Crown Estate Commissioners (TCE) and the Orkney fishermen in March 2011. Fishing is an important component of economic and social infrastructure for the group of islands. The result of the meeting was a more open consultation policy and additional fisheries research (Johnson et al., 2016).

Consultation with stakeholders is now mandated in many jurisdictions and is included as a provision of the Marine (Scotland) Act 2010. Individual developers are required to consult publicly about their device deployment plans as part of the development licencing process and their EIA. In 2010, consultation of the PFOW area which included information meetings held by TCE and developers were well attended (Johnson et al., 2016). However, in 2012 there has been a significant decline in interest attracting virtually no attendance. This phenomenon was described as 'consultation fatigue' during a workshop held to consider the social science needs of plan research (Kerr et al., 2014).

Project summary

Funding source: Scottish Government
Operator: Marine Scotland

Location: Orkney Islands

Commission date: March 2011

Capacity: Aspiration of delivering an installed capacity of 1.6 GW

Status: Project

Engagement strategy

- Consultation held by Marine Scotland and TCE

Factors Influencing Social Opposition

- Fishing restrictions
- Noise and habitat change

(4) Biscay Marine Energy Platform, Spain

Biscay Marine Energy Platform (BiMEP) is an infrastructure site located off the coast at Armintza designed to test prototypes of ocean energy collectors and auxiliary equipment on the open sea. Its operation started in 2015 providing technology to test the technical and economic viability of different concept designs, particularly for wave and wind resources.

BiMEP occupies a 5.3km^2 marked area excluded for navigation and maritime traffic, located at 1.7km from shore. Each berth is connected to the onshore substation via a dedicated three-phase submarine cable in series with a land three-phase line, both at 13.2 kV. The onshore electricity substation houses electrical protection systems, measurement systems and transformer, allowing the berths to be connected up to the national power grid. The project was promoted by the Ente Vasco de Energía (EVE) and is currently owned 75% by this entity and 25% by the E.P.E. Institute for the Diversification and Saving of Energy (IDAE).

After a detailed analysis of the project's environmental impacts, the Spanish Ministry for Environment, Rural and Marine Affairs adopted in June 2009 the decision for the BIMEP not to be subject to the full Environmental Impact Assessment process. The analysis of the Environmental document concluded that no significant environmental impacts would be found as a result of the implementation of the BiMEP project. Besides, most stakeholders consulted about the potential affection of the BiMEP did not envisage significant impacts on habitats, protected species or environment as a result of the implementation of the BiMEP.

Recent developments that envisage offshore wind energy technologies have raised concerns about new and different environmental impacts in comparison to those described in the Environmental Impact Study (EIS) undertaken in 2008. This is particularly important since the BiMEP project is inside an Especial Protection Area for birds declared under the Birds Directive (Directive 2009/147/EC). A public consultation was carried out for this EIS. Some amendments and comments were requested by different stakeholders during the public process. A new EIS was approved by the Ministry of Agriculture, Fisheries and Food and Environment of the Spanish Government in May 2018.

Project summary

Technology: Marine energy, Wave, Offshore wind

Project Manager: Ente Vasco de Energía (EVE)

Tech Developer: BiMEP

Location: Basque coast of Armintza, Spain

Commission date: January 2008

Capacity: 20MW

Status: Test Site

Engagement strategy

Consultation with stakeholders was carried out by the General Directorate for Environmental Quality and Evaluation. Stakeholders mainly included fishermen guilds (cofradías[9]) and environmental NGOs.

Factors Influencing Social Opposition

- Restricted navigation in site area.

Fear possible wind energy technology to be installed on the site.

[9] Spanish *cofradias* (fishing guilds) are institutions with an old tradition that in some cases dates back many centuries. Their aim is to assure collective economic exploitation of fishing resources in coastal area. The *cofradias* are organised democratically and both the crew and the boat owner have representatives in the executive bodies.

(5) SEM-REV TEST SITE, FRANCE

The test site is located 20km off the coast from Le Croisic, in Pays de la Loire, comprises a 1km^2 designated maritime zone marked by cardinal buoys. The site is equipped to measure sea and weather conditions (wind, swell and local parameters), and test floating technologies such as marine energy, wave, wind energy and offshore wind. SEM-REV is currently hosting two prototypes, the FWT FLOATGEN and the WEC WAVEGEM.

Electric infrastructure connects the system to the Enedis medium-voltage network via an 8MW 25km-long cable. The substation was built at Le Croisic and a research centre located at Penn-Avel controls the test devices and receives and analyses all data. The testing team is comprised of 15 to 20 people.

Support for this project comes from CAPEX: Investment of €19m (VAT included) – 100 % Public funding; CPER Region Pays de la Loire (2007-2013). French Government ANR (2014-2019); and OPEX: Co-funding on collaborative research projects, Services, subsidies.

Preliminary consultation with sea users (fishermen, local authorities and associations) and environmental impact studies was carried out to seek approval under the French "Water Act". Stakeholders were categorised in statutory regulators, strategic and community stakeholders. A core group of stakeholder representatives was formed to ensure through communication during the consultation process. A preliminary plan that included the project's technical information was presented to stakeholders at each event of the consultation time frame (Mouslim et al., 2009). Permits and authorizations were obtained to temporarily occupy a restricted sea zone. The power exploitation permit was granted by the Ministry of Energy. During the consultation the project's location was defined, so that its position had a minimal impact on navigation and fishing. SEM-REV researchers are often asked to present during public council meetings and fishermen associations. Day to day, communication with stakeholders is held on a case-by-case basis. Researchers regularly answer to emails, letters and attend to people visiting the office.

New offshore wind technologies are planned to be tested on the site. An information centre at Le Croisic will be installed by the University and managed by the council so that the local population is aware of the technical characteristics of the new devices and any social and environmental impacts.

Project summary

Owner: Public

Tech Developer: Ecole Central de Nantes (ECN)

Location: 20km off the coast of Le Croisic

Commission date: January 1st, 2009

Capacity: 8MW

Water depth: 31 to 36m

Status: In operation

Cost: €19m

Engagement strategy

Initial consultation with stakeholders.

Informative talks with the population at Le Croisic share information about the deployment of new technologies.

Factors Influencing Social Opposition

- Restricted navigation in the site area.
- Noise at the substation.

(6) Aguçadoura Test Site, Portugal

The Aguçadora test site is available for technology developers for research and project demonstration (TRL 6 - 8) of floating offshore wind and wave energy conversion devices, offshore aquaculture technologies, underwater robotics and ocean observation. The site has an onshore monitoring station and an electrical substation.

The site occupies a 3.3km^2 area, located at 5km from shore, near Póvoa de Varzim north of Porto in Portugal. Each berth is connected to the onshore substation via a 3MW offshore electrical cable and Land station, both at 6.6 kV.

Test site started with an AWS wave power device in 2003, then introduced a 3-Pelamis Wave Energy Converter farm in 2008, then installed a floating offshore wind 2MW prototype named Windfloat and finally, a Demogravi3 prototype was deployed in 2017.

The project was originally conceived by the Portuguese renewable company Enersis, which developed and managed the project until it was bought by the Australian infrastructure company Babcock & Brown in 2005.

The project is supported by WavEC which is a non-profit organisation that provides modelling and performance installation for developers as well as support for environmental monitoring and public engagement.

The main social concern affecting the acceptability of the site was the excluded navigation which affected local fishermen. WavEC was in charge of negotiating with fishermen organisations, and, to compensate for the possible economic losses, the developers offered the possibility of engaging in environmental monitoring procedures and or lease their boats to carry out activities related to the management of the project.

Regular meetings are held with fishermen when changes to the technologies are introduced. Public dissemination and a consultation processes are due as part of Environmental Impact Assessments. To date, no relevant concerns have been raised following this procedure.

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Project summary

Project Manager: EDP and WavEC
Operator: Different developers
Location: Aguçadoura
Commission date: 2003
Capacity:
Pelamis 2.25 MW
Demogravi3 2MW
Water depth: 50m
Status: Test site
Cost:
Windfloat 18.9 M€
Demogravi3 26.8 M€

Engagement strategy

Public dissemination of the Windfloat project was done in 2011. This is a government-led process in which developers are not involved.

Factors Influencing Social Opposition

Restricted navigation in the site area.

8. Learning from the EPE case studies

8.1 Introduction

Each of the EPE case studies studied for this report was subject to a specific complex entanglement of external and internal factors that ultimately contributed to their success. All case studies expressed that, at all times, certain stakeholders will support MRE projects and others will oppose these. Aspiring to reach a consensus can be naïve and misguided. However, approaches to public engagement can define the extent to which stakeholders feel aggravated or whether they develop acceptability of the project (Bailey, 2021). Despite this, there are a number of commonalities that contributed to fostering public engagement and increasing social acceptability in each case. These include, but are by no means exclusive to, factors such as the importance of early and informed engagement, identifying key stakeholders, formal and informal activities to engage the public during the deployment and production phases, and hiring local people to take key responsibilities for the project operation.

8.2 Lessons learned

The following pages outline the challenges of conducting education and public engagement. It uses examples from the case studies to present instances of best practice and examples where approaches may have been improved. They are by no means exhaustive, but they do cover a broad range of experiences associated with dealing with local stakeholders.

8.2.1 Early engagement of all stakeholders

Experience from the case studies demonstrates the importance of engaging with stakeholders early to mitigate potential social issues. Raising awareness and communicating from the beginning of the project can be critical for fostering understanding and support particularly from communities neighbouring proejct sites: "*Bad practice is to go ahead without speaking to anyone, you want to avoid this because otherwise the deployment process will be very tough*", explained a local manager of a test site. As might be expected this is not sector-specific phenomenon, Dunphy *et al.*, (2021) made a similar finding in a study on carbon capture and storage.

Wave energy developments are only 'beginning to appear' on the desk of regulators, and the suitability of the existing process to wave energy has not been fully established yet (Simas et al., 2015). Early engagement with the public allows process leaders to explore the values, needs, and opinions of all stakeholders. Integrating these insights into the project design allows for a more robust project framework overall, and opens space for adaptation if the need should arise (Feenstra et al., 2010).

Early engagement can also be crucial to dispel myths about the project. Even though public attitudes towards wave energy projects have been positive (Devine-Wright, 2011a), case studies show that these are often perceived as a way to hide agendas that advance other infrastructure projects that may have greater social and environmental impacts such as a mine or a nuclear plant. For instance, in the case of the OWC Mutriku, environmentalist groups believed that the road constructed for accessing the plant was also designed to provide access to a mine site in the future. Furthermore, this project as well as the BiMEP project in Armintza were seen as a strategy from the government to deflect attention from the nuclear project at Lemoniz which has caused major public contestation (Ruiz del Olmo, 2000). Early exchanges with stakeholders can provide timely technical information about the project as well as reveal public concerns and expectations that may extend beyond the scope of the development.

Furthermore, prompt public engagement can also increase the perception of transparency about the project design and planned deployment process. Levels of uncertainty about environmental and social impacts can be acknowledged from the beginning of the projects to set a realistic picture of the project's possible shortcomings. For instance, the operator of OWC Mutriku raised the importance of communicating the probabilities of higher noise levels in the neighbouring population of a new Oscillating Water Column (OWC) project. '*Frustration comes when you feel deceived*' he added.

In sum, early and open channels of communication with the public can help to build mutual trust between developers and the community, reinforcing the notion that projects benefit when stakeholders across all groups are involved in the process. Ideally, the local community should be involved in the process of location selection, permitting, and policy-making, as soon as a project is proposed (Brunsting et al., 2011). An avenue should be opened as early as possible for interested stakeholders from the local community to take some degree of involvement, and if possible, ownership in the project. This can be financial, but very often adopting a partnership approach to public engagement (where local concerns can, and are seen to, be taken seriously) can foster significant goodwill (Dunphy et al., 2021).

8.2.2 Identifying key informants can be a successful method for gaining public support

In all infrastructure projects, there are many different and sometimes divergent interests. Accordingly, the perspectives of the various stakeholders, who individually or collectively have a vested interest in the success of a project and/or the environment in which it operates must be considered (Olander & Landin, 2005). A negative perception by stakeholders can severely obstruct the construction of a project. Therefore, adequate acknowledgement of stakeholder concerns is vital to avoid conflicts and controversies about the implementation of an MRE project.

Identifying individuals that act as representatives of relevant stakeholder groups can be crucial when planning and deploying marine renewable technologies. Such gatekeepers play roles from monitoring and listening to 'bridge-building' and 'advocacy' to encourage trust, create communication channels, and promote information sharing (Szarka et al., 2012). Furthermore, leaders can usually influence the attitudes and behaviour of other stakeholders. For instance, the Agucadora test site developers organised a meeting to inform local fishermen about technical changes to the site. The first reaction of attendees was of dissent towards the modifications proposed. However, when developers thought that the conversation 'was stuck' in a negative cycle, a leader of the guild intervened proposing that fishermen could act as service providers for the project, leasing their boats for monitoring and surveillance of the site. After this intervention, fishermen attitudes towards the project shifted to the endorsement of the new project changes. Subsequent meetings focused on the terms and types of services and not on whether the technology should be deployed. Another example was provided by the operator of OWC Mutriku who highlighted the importance of communicating the with Mayor of the town before making contact with other stakeholders. Reaching out to the Mayor, the respondent argued, was important to understand the local context of the site. Once the Mayor understands the project, she can provide access to communication channels to reach other stakeholders.

"Find the right person" an interviewee stated, *"try to understand issues from her perspective. Once concerns have been addressed it will be less likely for formal complaints to be raised against the project in the future"*. One way of identifying

stakeholders effectively is to reach already established organisations on the site. These entities are already aware of who are the key stakeholders, the gatekeepers and importantly, public opinion leaders.

8.2.3 The importance of attaining consent through informal and formal processes

Consultation with stakeholder groups regarding MRE development is generally regarded positively by developers. For instance, for The Pentland Firth and Orkney Waters (PFOW), workshops during consultation events that involved a range of sectoral, NGO and wider publics helped to debate key issues and raise awareness of the planning process of the pilot. At the same time, consultations have been identified as a possible barrier by some stakeholders because, as an informant stated, "*when you consult people about everything, then you can't do nothing (sic)*". To date, almost all device deployments have been at wave energy test centres where operators consider a consultation as part of their hosting arrangements. However, the process is often resource and time-consuming. For projects that are financed by public funding as well as for future commercial wave farm developments, this process might not be a problem. But long consultation processes can represent an obstacle for smaller developers who may be less well resourced. There are also fear that investors may be put off by perceived delays caused by stakeholder consultation processes (O'Hagan et al., 2016).

Consultation processes are increasingly being required by regulators when evidence shows possible negative social and/or environmental impacts. Nonetheless, experience from the case studies showed that often formal and informal informative talks and discussions can be sufficient to attain communities' consent for the project deployment. For instance, the main concern raised by inhabitants of Mutriku about the OWC was a noise that was generated by the plant during construction. This led to environmental groups to request a referendum to stop the project from completion. The major of the town organised two meetings to discuss the noise and other matters. During these meetings, attendants asked questions about the project to understand the reasons behind the noise and ways to reduce it. Community members were satisfied with the information received during the meetings and the appeal for a referendum was dropped.

Another example was the case of BiMEP where a major public concern was the navigation restriction that affected local fishermen. The zone where the project was installed was considered an important fishing area and therefore fishermen were worried about economic losses caused by the project. The developer approached the fishermen's guild and following almost a year of negotiations, a seventeen-year compensation scheme was agreed based on an estimated yearly fishing production loss. This type of arrangement was also established for the Agucadora project who offered fishermen to engage in environmental monitoring procedures.

Furthermore, a three-month exhibition about the technical characteristics of the project was installed in the local cultural centre of the town of Armintza, which was the closest population to the BiMEP site. During this time, people could get acquainted with the plant technical characteristics and ask questions through a suggestions box that was installed as part of the exhibition.

Another case of public concerns addressed through formal meetings was the SEM-REV test site. When the substation was built, people living at Le Croisic raised worries about noise disruptions and the possibility of local people's health being affected by electromagnetic waves. These issues were addressed during a public meeting in the town hall where project researchers provided information on these impacts. Following the meeting no other concerns were raised until ten years later when the substation started to produce a louder noise than usual. The noise issue was fixed six months later. Researchers admitted that reparations took longer than expected and that this should be avoided in the future.

Informal activities can also play an important part of becoming embedded within the community. The Wave Hub in the UK organised "information days", distributed flyers door-to-door and exercised an open-door policy for the development's offices. This allowed anyone interested in the project to come and speak with the project staff at any given time. For their part, SEM-REV employees have become engaged with local clubs *e.g.,* scuba diving. These activities have allowed the project's staff to provide informal information about the plant to the community, and address concerns that local marine users have about the project.

A common consensus among case studies was that the information provided during these interactions had to be credible, in an "easy to digest" format and evidence-based. "*You should not be trying to convince but to inform by being as transparent as possible*" an interviewee added. Furthermore, communication about the project requires a constant attention and tailoring strategies that adapt the information to the specific cultural and other contextual requirements of the project (Hund et al., 2004). The endeavour of actively engaging the public might require time and economic resources but can be an effective way of attaining the public's consent in the long term.

8.2.4 The way in which the project is framed can increase place-related distinctiveness

Positive attitudes to MRE are often linked to the idea that test sites for renewable projects can enhance the distinctiveness of the area, putting villages on "the map worldwide". Distinctiveness, according to Twigger-Ross *et al.* (2003), can be regarded as a key principle of identity processes that guide how individuals relate to particular places. Lessons learned from the case studies point to the relevance of framing the MRE developments as part of a broader solution to climate change, which can be a significant factor affecting social acceptability.

An informant highlighted that "*Mutriku is now on the map because of the OWC plant*". Mutriku's tourism office was installed as an aftermath of the OWC project and the leisure port. The office often organises university and school visits to learn about the plant. Local people are in charge of the tours, leaving technical aspects to the plant operator. Besides, inhabitants feel pride when the town is portrayed in TV programmes and magazines as a world reference for renewable energy testing, "*People feel that they are being pioneers in the use of new technologies*" added the plant's operator. This was also the case for the Agucadora project, where nearby inhabitants perceive the project with curiosity and enthusiasm. SEM-REV also organised a public tour of the site. The plant was visited by 100 people, and it was so successful that they have decided to plan an annual visit.

Similarly, the Wave Hub offered an element of novelty to the otherwise most deprived county in England. The project has been able to base its relations on the prospect of bringing a major blue economy growth to the Cornish industry (Bailey, 2021). Demonstrating existing successful MRE projects and describing how a proposed test site will contribute to wider efforts to mitigate climate change and offers a more positive and constructive way to engage with local stakeholders (Feenstra et al., 2010).

8.2.5 Design flexibility can be key when accessing the ocean space

Design flexibility is an important determinant of the social acceptability of MRE projects. Ocean users rely upon access to ocean space, leading to "competing claims" (P.

Todd, 2012). Wave energy competes with other users, such as fishing and navigation for sailing boats as seen in previously.

The concept of design flexibility was often raised by respondents who asserted that small changes in the project could have a significant positive impact on how public perceive MRE project deployments. In the case of Mutriku, inhabitants had a positive attitude towards the construction of a dike that could protect boats arriving from sea which would also include the OWC plant. Nonetheless, the project design involved a larger dike than expected, which had the potential of removing the local beach and having a major effect on the town's visual landscape. Though this worry was widely raised by residents in Mutriku, the original project was not be modified since it was already been tendered and the EIA approved. A respondent explained that paying compensations to companies would have signified an important financial loss that the government could not afford.

At the same time, Mutriku offers a positive example of design flexibility. Soon after the noise episode, the OWC design was modified so that the sound could be attenuated. The original OWC had an open design that was subsequently covered, leaving only small windows that faced the open sea and not the town. A sound level meter was also installed to monitor the noise.

BiMEP's test site design was also successfully designed after formal and informal interactions with marine users. The project was originally envisaged as a square form. However, the shape was adapted to facilitate navigation of sailboats and other vessels which resulted in today's particular configuration. Similar to BiMEP, the SEM-REV test site location was defined after a public consultation with fishermen. These meetings ensured minor navigation and fishing disruptions resulting from the wave energy project.

Test sites can be very useful spaces to evaluate project design changes for future developments. Early stakeholder engagement was key to identify relevant design changes before the project was submitted for funding, licensing, and approval. This can be particularly important when project design may require major changes as a result of consultations, which otherwise will require additional assessments, and, perhaps, new consents (O'Hagan et al., 2016). Based on previous experiences, it is now understood the importance of locating OWC projects at a distance from centres of population so that noise does not become a public concern. Furthermore, test sites can help identify models that are visually appealing and that cause fewer interferences with other economic activities at sea.

8.2.6 Hiring local population can be an important factor for increasing trust

Hiring people from nearby populations to work on the project can be a key factor affecting social acceptability. People from the local community understand the culture and the context in which the project is located. This has facilitated the dissemination of information and the early detection of concerns which has been significant for increasing local stakeholders trust in the project. The operator of OWC plant was born in Mutriku. As a PhD in Engineering, he is not only is an expert in the technology but also understands culturally appropriate ways of providing information to the Mayor and local inhabitants on the status of the project. He stated that people often come to his office showing curiosity about the plant. For its part, BiMEP hires local people to undertake the 24hrs surveillance of the site, which has provided a number of jobs for the area. Finally, Agucadora's local employees have been decisive in looking for appropriate locations to deploy new technologies and establishing relationships of trust with stakeholders such as fishermen "When I speak with intonation from the north then they say oh ok yes, you are one of us", explained a study participant.

9. Conclusions

In summary, improved mechanisms of consultation and engagement of stakeholders can be important to dispel any myths generated about the project and develop the trust required for societal and other stakeholders to hold a positive attitude towards the new renewable energy technology from the outset. However, even though advice given by regulatory authorities and experienced developers advocate for "early and often" stakeholder engagement, in practice, stakeholders are often consulted only when the lease has been awarded which can be a stage where it can be difficult to present alternative proposals to the project has been leased (Simas et al., 2015). Any MRE project must begin by winning the support of the key stakeholders within the community, which gives the entire project more credibility. Otherwise, as the old political adage goes 'when you're explaining, you're losing' – the potential goodwill of those stakeholders to the project. This, as we mentioned earlier could include the shift from the traditional Decide-Announce-Defend (DAD) model of engagement to what Halliday (1993) describes as a 'consult-consider-modify' approach (Dunphy et al., 2021).

This new approach requires more democratic decision-making, rather than technocratic and corporatist-style deliberation, as well as open-mindedness that facilitation of multiple perspectives, rather than single, closed-ended projects (Wolsink, 2007). Therefore, following lessons outlined for this document, it is good practice to first hold informal consultation processes to agree on the most appropriate site for the proposal, followed by a more formal consultation where observations and comments are formally received from all stakeholders. Good practice consultations put the host community's needs and hopes at the heart of engagement activities, so that it's not just about the technology and the decarbonisation agenda. Many MRE installations are located in peripheral areas, near communities that may suffer from a lack of job opportunities, poor infrastructure, and low incomes

We give the final word to one of our interviewees:

"Engagement techniques that focus on community concerns – and which are transparent, realistic and honest in what they can deliver – fall into my category of good practice and ones that don't fall into my bad practice category."

(Bailey, 2021)

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