

UNIVERSIDADE DE LISBOA
FACULDADE DE CIÊNCIAS
DEPARTAMENTO DE BIOLOGIA ANIMAL



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**A COMPARISON BETWEEN THE LEGAL FRAMEWORKS
AND ENVIRONMENTAL IMPACT ASSESSMENTS OF
DIFFERENT PROJECTS DEVELOPED IN THE MARINE
ENVIRONMENT: SUNKEN SHIPS, HYDROCARBONS
PROSPECTING AND WAVE ENERGY**

Flávia Catarina Dias Guerra

Dissertação
MESTRADO EM ECOLOGIA E GESTÃO AMBIENTAL

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Orientadores:
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2013

Uma língua é o lugar donde se vê o Mundo e em que se traçam os limites do nosso pensar e sentir. Da minha língua vê-se o mar. Da minha língua ouve-se o seu rumor, como da de outros se ouvirá o da floresta ou o silêncio do deserto. Por isso a voz do mar foi a da nossa inquietação.

Vergílio Ferreira

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Thank you.

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RESUMO

Progressivamente, o Mar assume-se como o bilhete de identidade do nosso país, como sugerido pela Ministra da Agricultura e do Mar. Visto ser considerado desígnio nacional, cada vez mais promotores direccionam os seus investimentos e planos de negócio para este sector. Ora, conforme aumentam os interesses económicos em actividades e projectos marítimos, o potencial empreendedor e a inovação tecnológica, mais desadequados se podem tornar os processos de licenciamento previamente existentes. Acresce que já não se verificavam muitos regulamentos vinculativos *a priori*, particularmente no que diz respeito à avaliação dos impactos destes projectos no meio marinho.

É bastante evidente que as diferentes economias globais estão dependentes dos recursos naturais de que dispõem e escolhem explorar; Portugal não é excepção. Assim, o produto turístico nacional, Sol-Praia, para além de sazonal, vê-se ameaçado pelas evidências de alterações climáticas que testemunhamos, a pesca está em risco devido à redução dos *stocks* pesqueiros, a «hipoteca» a que nos sujeitamos ao dependermos da importação de petróleo, carvão, e mais recentemente, gás natural é considerada uma das causas fundamentais do défice da balança comercial. Actualmente, o posicionamento estratégico na fachada atlântica da Península Ibérica de que gozamos, permite-nos abrir a escotilha a iniciativas de aquacultura, turismo náutico, energia das ondas, exploração de petróleo, de areias, cascalhos e outros. É no sentido de explorar a imensa dimensão marítima Portuguesa que incide a Estratégia Nacional para o Mar 2013-2020 (ainda por aprovar).

Esta ENM salienta a necessidade de cumprimento das respectivas obrigações internacionais, nomeadamente no âmbito da espacialização do mar e leito marinho, da vigilância e da monitorização do ambiente e ecossistemas, num quadro de governação internacional dos oceanos. No entanto, Portugal apresenta graves deficiências relativamente ao controlo de actividades emergentes nas suas zonas marítimas.

O facto dos projectos supramencionados representarem potenciais nichos de futuro investimento massivo, principalmente se se concretizar a aprovação da proposta de Lei de Bases do Ordenamento e da Gestão do Espaço Marítimo (como está previsto), cria um incentivo para que os governantes tentem agilizar os processos de licenciamento, comprometendo os estudos ambientais que lhes deveriam ser subjacentes.

Desde 1987, com a criação da Lei de Bases do Ambiente, projectos públicos ou privados capazes de produzir efeitos significativos no ambiente devem ser sujeitos a uma avaliação de impactos. Esta obrigatoriedade foi posteriormente reforçada com a transposição da Directiva 85/337/CEE para o direito interno pelo Decreto-Lei n.º 69/2000 de 3 de Maio, que passou a

regulamentar a Avaliação de Impacte Ambiental (AIA). A AIA representa um instrumento preventivo de política ambiental e do ordenamento do território que tem como objectivo assegurar que as prováveis consequências sobre o ambiente, de determinado projecto de investimento, sejam analisadas e tomadas em consideração no seu processo de aprovação.

Este Decreto-Lei compreende os Anexos I e II: o primeiro inclui os projectos que se considera que têm efeitos significativos no ambiente e exige a realização de AIA; o segundo, por sua vez, enuncia alguns projectos cuja triagem (determinação se realmente deverão ser sujeitos a AIA) fica a cargo das autoridades nacionais. Estes anexos apresentam graves lacunas no que diz respeito a projectos no meio marinho em áreas de soberania ou jurisdição nacional. Tendo em conta que Portugal poderá estender a jurisdição nacional a uma área correspondente a um total de 4.000.000 km², isto é preocupante, até porque são muitas as actividades consideradas *offshore* que envolvem operações potencialmente prejudiciais ao ambiente marinho.

Três projectos actualmente em curso nas águas sob jurisdição nacional – o afundamento de navios em fins de vida para fins recreativos no Algarve, denominado *Ocean Revival*; a prospecção petrolífera *offshore* também na costa Algarvia; e a produção de energia das ondas através do *Waveroller*, em Peniche – não estão sujeitos ao regime de AIA, uma vez que não constam dos Anexos I ou II do Decreto-Lei n.º 69/2000.

O objectivo desta dissertação foi avaliar se estes três projectos deveriam ou não estar sujeitos a AIA, tendo em conta que actualmente os seus processos de licenciamento padecem de insuficiências técnicas e/ou metodológicas flagrantes. A razão pelo qual é flagrante poderá dever-se não só ao facto de não estarem regulamentados pela lei (não exigindo AIA), mas também porque o seu desenvolvimento (excepto no caso da energia das ondas) acumulou críticas e preocupações públicas. Estas concentram-se essencialmente nos seguintes aspectos: falta de transparência e inconsistências administrativas dos processos de licenciamento; existência de impactos ambientais previstos e não estudados; no facto de as consequências culturais e sociais dos projectos não terem sido tidas em conta, nem a opinião dos grupos de interesse (*stakeholders*) dos projectos; e na falta de acompanhamento científico e monitorização ambiental dos projectos.

Numa tentativa de avaliar se estas insuficiências poderiam ser colmatadas ou ter benefícios associados, caso os projectos fossem sujeitos a AIA, procedeu-se a: 1) uma pesquisa *online*, na tentativa de encontrar projectos internacionais similares e representativos, para comparar 2) os contornos legais associados a cada uma das três tipologias, assim como o tipo de estudo ambiental conduzido (perceber se houve AIA, facultativa ou obrigatória), e 3) para os casos que foram sujeitos a AIA, comparar conteúdos e resultados dos Estudos de Impacte

Ambiental (EIA) identificando os descritores utilizados e os principais impactos previstos.

Os resultados destas análises permitiram-nos concluir que, apesar de haver benefícios em submeter todos os projectos Portugueses a AIA, a necessidade de o serem obrigatoriamente não é geral.

Projectos como o *Ocean Revival* necessitam de estar previstos em legislação que obrigue à realização de AIA, numa fase inicial do processo de licenciamento deste tipo de actividades. Recomenda-se que esta regulamentação deve ser específica para a categoria de recifes artificiais e afundamento de navios.

Também a prospecção de hidrocarbonetos, petróleo e gás natural, deve ser sujeita a AIA, tal como já o é a produção de hidrocarbonetos. Esta última está incluída no Anexo II do Decreto-Lei n.º 69/2000 e, uma vez que ambas envolvem operações danosas de perfuração dos fundos oceânicos (e estão passíveis de desencadear acidentes de derrames), seria expectável que a prospecção fosse regulamentada da mesma forma que a exploração. Contudo, uma vez que as fases de intervenção no meio marinho são distintas, a prospecção e exploração petrolíferas deveriam ser sujeitas a processos de AIA também distintos.

Actualmente, os projectos de energias das ondas são regulamentados por legislação específica, relacionada com a instalação de estações eléctricas. Esta legislação prevê a existência de Análise de Incidências Ambientais no processo de licenciamento, o que não é mais do que um EIA prévio. Portanto, na prática, incluir projectos como o *Waveroller* no Anexo II do Decreto-Lei n.º 69/2000, não traria grandes diferenças práticas para o seu processo de licenciamento, nem para o estudo ou respectivos conteúdos. Daí admitir-se que não há necessidade de o fazer.

Estas recomendações derivam das conclusões retiradas das comparações com casos de estudo internacionais e das práticas de AIA dos países em questão relativamente a cada uma das tipologias de projectos. Além disso, foram construídas de forma a mitigar as insuficiências identificadas especificamente nos casos de estudo nacionais.

PALAVRAS-CHAVE

Afundamento de navios; Avaliação de Impacte Ambiental; energia das ondas; Portugal; prospecção de hidrocarbonetos; recifes artificiais.

ABSTRACT

Portugal's Environmental Impact Assessment (EIA) law presents serious deficiencies regarding activities and projects that can be licensed within its maritime zones. EIA regulations in Portugal and the European Union mostly apply to terrestrial or land-based projects, thus disregarding developments and activities in the marine environment, in areas of national sovereignty or jurisdiction.

The case studies of sinking ships for recreational purposes, the hydrocarbons prospective drilling and wave energy generation, for example, are not subjected to EIA in Portugal, as they are not listed on Annex I or II of the Decree-Law No. 69/2000.

The licensing processes of these types of projects encompass several publicly identified technical and methodological insufficiencies that could benefit from a mandatory EIA. Therefore, the main goal of this thesis was to determine whether such interventions should or should not be subjected to EIA in Portugal. Consequently, two international comparisons between similar projects were conducted, in terms of: 1) legal dispositions and environmental reporting, highlighting the realization of EIA; and specifically, 2) EIA procedure, contents and results, including identification of the main descriptors and impacts predicted in international Environmental Impact Statements.

From the obtained results a series of recommendations are made on how Portugal could learn from other countries' approach to EIA regarding these types of projects, and promote the harmonization between the legal frameworks of these types of projects and other regulations. The sinking of ships should have specific legislation requiring EIA, and this should be done by creating the project category of artificial reefs and sinking of vessels in Annex I of Decree-Law No. 69/2000. Regarding, hydrocarbons prospecting, it should be regulated in the same way as hydrocarbons production, and also included in Annex I of Decree-Law No. 69/2000. Finally, the wave energy projects are already subjected to Analysis of Environmental Incidences, which can be considered a pre-EIA. So, in practice, including this type of project in the Annex II of Decree-Law No. 69/2000 should not make a considerable difference on the reporting contents and outcomes.

KEYWORDS

Artificial reefs; Environmental Impact Assessment; hydrocarbons prospecting; Portugal; sunken ships; wave energy.

I. GENERAL INTRODUCTION

To ensure a better understanding of this thesis' problematic, one must take a look at Environmental Impact Assessment (EIA) retrospectively. Hereby, a number of essential concepts are revisited, so that the reader can attain some perspective and recognize valuable lessons from previous work.

1. Impact assessment

Public and private projects which are likely to have significant effects on the environment are subjected to a prior assessment of their potential effects, before development consent is granted (EIA Directive 85/337/EEC).

These effects, or environmental impacts, are defined in Portuguese law as sets of favorable and unfavorable alterations produced in environmental and social parameters, over a period of time and area, resultant from the realization of a project, compared with the situation that would occur, in that same period of time and area, if the project was not carried out (Decree-Law No. 69/2000). Such impacts are addressed by means of Impact Assessment (IA) which has dual nature: 1) as a technical instrument, for analysis of the consequences of planned interventions (policy, plans, programs, projects), supplying crucial information to stakeholders and policymakers, and non-planned interventions (e.g., natural disasters and conflicts); and 2) as a legal and institutional procedure, connected with the decision-making of a planned intervention. Regardless of the methodological approach, the main goals of IA are:

- a) Providing information for the decision-making process relatively to the consequences (biophysical, social, economic and institutional) of the proposed actions;
- b) Promoting transparency and public participation;
- c) Identifying procedures and methods for follow-up (monitoring and mitigation) during all phases of planning and completion of the project;
- d) Contributing to an environmental sustainable and safe development.

The practice of IA comprises an array of instruments and tools, based on natural and social sciences, which help to predict the expected future consequences of possible decisions. The context in which these instruments are applied – foundation measures¹ -, largely determines its effectiveness and outcome (Ahmad and Wood, 2002).

Hereupon, international comparisons of EIA procedures baring distinct contexts and case studies have revealed to constitute an extremely useful tool when evaluating and improving performances and/or effectiveness of the given process (Ahmad and Wood, 2002; Androulidakis and Karakassis, 2006; Barker and Wood, 1999; Bassi *et al.*, 2012; Glasson and Salvador, 2000; Marara *et al.*, 2011).

¹ Per definition, features that promote good practice and underpin the successful application of the systemic approaches (legislative and administrative procedures) (Ahmad and Wood, 2002).

2. International overview of EIA

EIA is the more ancient and well-established instrument of IA²; its emergence in the '70s with the US. *National Environmental Policy Act* (NEPA) coincided with the increasing recognition of the nature, scale and implications of environmental change brought by human actions (Morgan, 2012).

Since it was first enshrined in legislation, EIA has been given legal and institutional force and become a requirement in more than 100 countries. It has been adapted to many contexts and circumstances, however, its basic intentions and core elements are widely agreed (Jay *et al.*, 2007). Over the last 15-20 years, the institutionalization of EIA has progressed along with the political recognition of climate change, loss of biodiversity, threats to fresh water sources and water quality, damage to marine areas (Morgan, 2012).

Regarding the European Union, EIA has been introduced in the Member States³ back in July 1988, following the approval of Directive 85/337/EEC by the European Council of Ministers in June 1985. The Directive requires all the projects⁴ listed in Annex I to be subjected to an EIA before approval can be granted. It also required Member States to adopt criteria and thresholds to determine whether projects on the much wider Annex II list should be assessed or not. The initial Directive of 1985 and its three amendments have been codified by Directive 2011/92/EU.

3. The EIA Directive

A central feature of the European EIA process is that it takes the form of a framework law, allowing Member States a certain amount of discretion in the realization of the Directive (Barker and Wood, 1999; Jiricka and Pröbstl, 2009). There are considerable variations in the incorporation of the EIA Directive into Member States' national legislation, and consequently in the extent of "legal harmonisation"⁵; but still EIA does apply to similar projects in all Member States, despite some omissions and/or additions to Annex II projects (Glasson and Bellanger, 2003).

As a matter of fact, the European Commission defined as one of its priorities for 2012 the reviewing of the EIA Directive. The Resolution of the Assembly of the Republic No. 42/2012 came to consider this a priority in order to improve environmental protection in Portugal, through a more coherent and effective application of the environmental assessment principles, and guarantee its consonance with relevant international obligations.

² There are other specific forms of IA, including social impact assessment (SIA), health impact assessment (HIA) and strategic environmental assessment (SEA); to some extent, each tends to have arisen due to a level of dissatisfaction with EIA as it has been practised (Morgan, 2012; Pope *et al.*, 2013)

³ A study mentioned in Morgan (2012) states that 191 out of 193 member nations of the United Nations either have national legislation or have signed some form of international legal instrument that refers to the use of EIA; fewer than 10 appear not to have some form of national legislation that contains reference to EIA or an equivalent process (e.g. 'assessment of environmental effects').

⁴ According to Directive 85/337/EEC (Article 2), projects "likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location are made subject to a requirement for development consent and an assessment with regard to their effects".

⁵ The concept broadly refers to the adoption of legislation by EU institutions which gradually modifies national laws, regulations or administrative actions in the Member States, in order to obtain a degree of homogeneity and to contribute to the better functioning of the common market (Glasson and Bellanger, 2003).

After the publication of a report on the application and effectiveness of the current EIA Directive, in June 2009, followed by a wide public consultation (June 2010), in 2012, a proposal for a new EIA Directive was adopted (to amend Directive 2011/92/EU). It attempts to overcome some known shortcomings of the former EIA Directive, such as implementation gaps, weaknesses due to its essentially procedural character, inconsistencies and overlaps leading to delays and costs.

According to the Commission's observations⁶, there are great differences across EU, prominently, in the way that the screening process⁷ is carried out; consequently, in some Member States a high number of EIAs is performed, sometimes for projects with minor environmental impacts, creating unnecessary administrative burdens. In contrast, other Member States do not require EIA of certain projects with significant environmental impacts escape the EIA requirement.

No doubt that positive benefits and significant improvements to planning design and decision-making resulted from EIA and are widely recognized by many practitioners, organizations and national governments (Leu *et al.*, 1996). It so happens that the influence of EIA appears to be less than its originators anticipated, fact that is often attributed to the difficulties and constraints encountered on implementation (Jay *et al.*, 2007; Knill and Lenschow, 1998; Zhang *et al.*, 2013).

Notwithstanding previous comments on the success of the EIA Directive's adoption, it is believed that not all countries have introduced planning or development control legislation requiring the routine use of EIA for innovative projects that might have significant environmental impacts. That being said, this thesis arises as an attempt to fill this gap, particularly verified on activities and projects developed in the marine environment.

4. Motivation and purpose

The marine environment is host to a diverse set of highly productive and complex ecosystems, contributing significantly towards biodiversity maintenance, food and energy provision, and the creation of economic and cultural benefits (Barker and Jones, 2013).

EIA regulations apply to "certain public and private projects that are likely to have significant effects on the environment", as stated in the respective Directive. Nonetheless, the emphasis is on terrestrial or land-based proposals, disregarding developments and activities in the marine environment, in areas of national sovereignty or jurisdiction (Budd, 1999; Katsanevakis *et al.*, 2011).

The Portuguese EIA law presents serious deficiencies regarding activities and projects that can be licensed within its maritime zones. For instance, offshore⁸ activities are not covered, even though there are many potentially damaging operations which occur within the marine environment. The sinking of ships for recreational purposes, the hydrocarbons prospective drilling and wave and sea current energy generation, for example, are not subjected to Environmental Impact Assessment as they are not listed on either the Annex I or II of the Directive 2011/92/EU or of the DL No. 69/2000 (which still transposes to Portugal's domestic legislation the Directive 85/337/EEC). These three types of projects are currently

⁶ [http://europa.eu/rapid/press-release MEMO-12-809 en.htm](http://europa.eu/rapid/press-release_MEMO-12-809_en.htm), September 12th 2013.

⁷ The mechanism which determines if EIA is required for projects listed in Annex II of the EIA Directive.

⁸ "Offshore" means situated in the territorial sea, the Exclusive Economic Zone or the continental shelf of a Member State (Directive 2013/30/EU on safety of offshore oil and gas operations).

being implemented in Portuguese waters without the legal obligation of carrying out a full Environmental Impact Assessment. The potential impacts of sunken ships and hydrocarbons prospecting in particular have caused public outcry.

The main goal of this thesis is to determine whether such interventions in the marine environment should or should not be subjected to EIA in Portugal. So as to reach well-founded conclusions a number of important objectives were outlined:

- 1) Acknowledge the national legal framework of EIA and licensing of projects tourism-oriented and/or economically advantageous in Portugal;
- 2) Recognize gaps in the licensing and EIA procedure for projects in the marine environment;
- 3) Compare international legal dispositions and EIA requirements for the three types of projects currently underway in Portugal;
- 4) Identify the main affected descriptors and impacts predicted in international EIA and associated with each type of projects, in order to infer about the national case studies;
- 5) Determine how Portugal could learn from other countries approach to EIA, regarding these types of projects (acknowledging the respective impacts and differences in context);
- 6) Propose guidelines that foster the harmonization between the legal frameworks of these types of projects, and existing and emerging regulations.

5. State of the art

Some authors have already gathered information about the background of these types of projects in the international arena. The following segments intend to expose some of their considerations, by providing a state of the art, which will further support the main research (Chapter II) of this thesis.

5.1 Sunken ships

One of the major reasons why ships, planes, and other large structures are finding their way to the bottom of the sea is to enhance tourism-driven economic development, by providing new destinations for recreational SCUBA diving (Pendleton, 2005). Alternatively, the scuttling of ships in coastal waters may be seen as something akin to dumping, polluting the marine environment with toxic materials (asbestos, PCBs, bilge water, oils) and heavy metals (from paints) that alter the ecosystem (Monfils *et al.*, 2006; Pendleton, 2005; Rodrigues, 2008; Self, 2010).

The U.S. Federal government, for instance, has deliberately dumped 560,000 tons of recyclable steel, aluminum and copper at sea over the past decade via the U.S. Navy and U.S. Maritime Administration (MARAD) ship disposal programs (Self, 2010). The increase in scale and pace of sinking ships to create artificial reefs⁹, accompanied by plans on strategic placement, marketing and, the costly preparation of the vessels, embody Self's (2010) paradigm of *pollution economics*.

⁹ The OSPAR *Guidelines on Artificial Reefs in relation to Living Marine Resources* (1999) define artificial reefs as "a submerged structure placed on the seabed deliberately, to mimic some characteristics of a natural reef. It could be partly exposed at some stages of the tide".

Notably, in the OSPAR Maritime Area¹⁰, back in 2009, 56 artificial reefs had been constructed (Figure 1), or were being planned, due to their potential for socio-economic and environmental benefits (OSPAR Commission, 2009):

- Enhanced production of living marine resource stocks, through habitat creation;
- Compensation for habitat loss (e.g. port construction) or restoration of biological communities, following habitat damage;
- Protection of existing resources from human activities (e.g. bottom trawling, destructive/illegal fishing techniques);
- Increasing or altering biodiversity;
- Mitigation of some impacts from other activities (e.g. caged fish aquaculture), by absorption of excess organic matter and thereby improving water quality;
- Promotion of tourism and recreational activities (angling and diving), which may also divert existing tourist pressure from sensitive natural ecosystems;
- Concentration or attraction of target species for angling and diversion of angling pressure away from sensitive natural ecosystems;
- Research and educational opportunities.

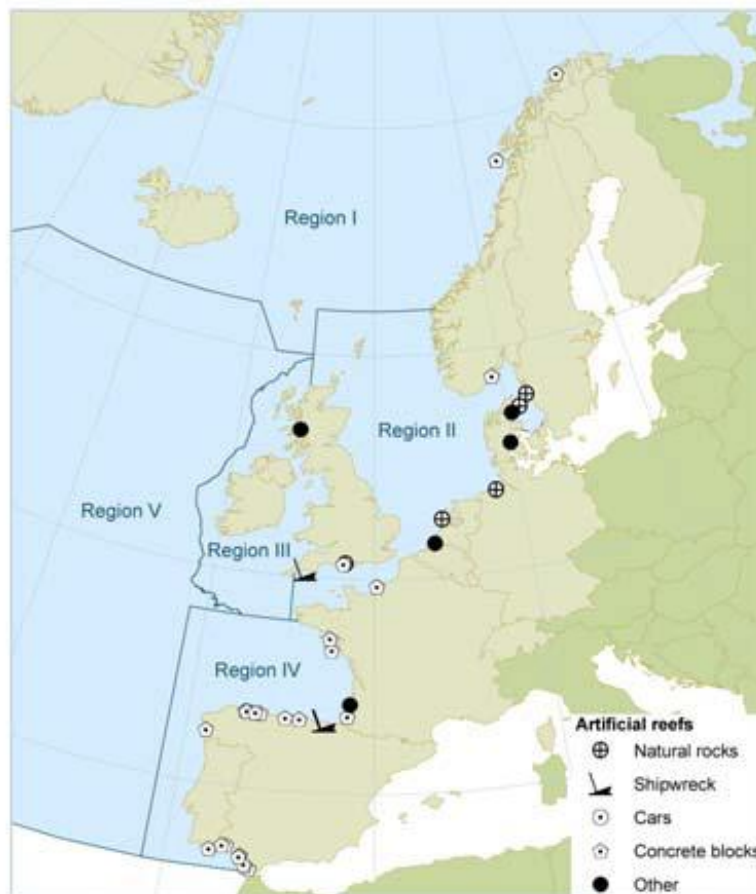


Figure 1 Location of artificial reefs in the OSPAR area (OSPAR Commission, 2009)

¹⁰ Under the Convention for the Protection of the Marine Environment of the North-East Atlantic (the “OSPAR Convention”), 1992. It entered into force on 25 March 1998 and was ratified by Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, Netherlands, Norway, Portugal, Sweden, Switzerland and the United Kingdom and approved by the European Community and Spain.

On the other hand, there are identified negative impacts to artificial reefs such as: changes to wave and currents, which can lead to erosion; displacement of and alterations to biological communities, including introduction of invasive species; and exposure to pollution.

In terms of alternatives to the “ships to reefs” projects, from a perspective of waste management and congruently with the Basel Convention¹¹, the recycling and dismantling of end of life ships (Rodrigues, 2008) are considered better environmental and economic options (Self, 2010).

The Convention on the Law of the Sea (UNCLOS), 1982, gives a framework for the determination of the rights and obligations of States relating to the oceans. The International Maritime Organization (IMO)¹² also encompasses instruments directed towards the protection of the marine environment, such as the London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1972) and the MARPOL Convention for the Prevention of Pollution of Ships (1973)¹³.

According to article III of the London Convention, “Dumping” means: (i) any deliberate disposal at sea of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea; (ii) any deliberate disposal at sea of vessels, aircraft, platforms or other manmade structures at sea. On the other hand, the same Convention allows - in principle - the dumping of decommissioned offshore installations¹⁴, provided that:

- Land-based alternatives have been carefully considered, but ruled out;
- Material capable of floating debris or otherwise contributing to pollution of the marine environment has been removed to the maximum extent;
- A dump-site is selected so that a dumped installation poses no serious obstacle to fishing or navigation;
- A dumping permit is issued by the responsible national authority.

Portugal is a contracting party of all mentioned Conventions and their Protocols, and although there is not any work done on intentionally sunken ships or the lack of EIA, there is published research discussing artificial reefs, especially in the Algarve region. It has been mainly focused on fisheries (Santos and Monteiro, 1997; Whitmarsh *et al.*, 2008), benthic communities (Falcão *et al.*, 2009), environmental aspects (Vicente *et al.*, 2008), and more recently, the stakeholders (Ramos *et al.*, 2011)

¹¹ Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989).

¹² It is a specialized agency of the United Nations which is responsible for measures to improve the safety and security of international shipping and to prevent marine pollution from ships. It also is involved in legal matters, including liability and compensation issues and the facilitation of international maritime traffic.

¹³ Careful attention has been given to distinct between the operational discharges by vessels (MARPOL) and dumping of wastes from vessels (London Convention).

¹⁴ "Offshore installation" means any man-made structure, plant or vessel or parts thereof, whether floating or fixed to the seabed, placed within the maritime area for the purpose of offshore activities; "Offshore activities" means activities carried out in the maritime area for the purposes of the exploration, appraisal or exploitation of liquid and gaseous hydrocarbons (OSPAR Convention).

5.2 Prospective oil and gas drilling

The offshore gas and oil sector is a key driver of the offshore economy. According to Barker and Jones (2013), it has been getting growing attention towards its impacts, associated with activities such as flaring, drilling, construction, transportation and discharge - which have all a negative impact on marine ecosystems.

Environmental impacts occur throughout the lifecycle of these activities¹⁵, during exploration, production and decommissioning phases. Exploration includes seismic surveys and the drilling of exploratory wells, whilst production comprises the drilling of production wells, and the construction, placement and operation of infrastructures (e.g. platforms and pipelines)¹⁶. Decommissioning, the final phase of an oil and gas field development, involves activities such as plugging of wells and removal of infrastructure. It must be noted that the transportation of oil and gas by pipeline or tanker also has the potential to cause impacts outside the area of production.

Within the OSPAR area, the major oil and gas developments are in the North Sea, therefore, environmental pressures from offshore hydrocarbons operations are greatest in this region (Hickman, 2012)¹⁷. However, oil and gas production has peaked and is now declining in this area, whilst, due to the rising global demand and increased access to the Arctic resources, production is expected to increase in Region I (Arctic waters) (OSPAR Quality status report, 2010).

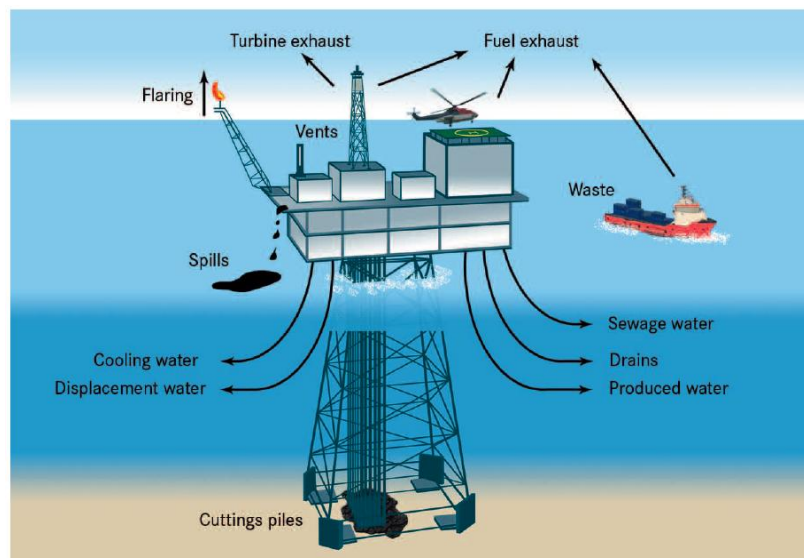


Figure 2 Sources of substances' release during offshore oil and gas production (OSPAR Quality Status Report, 2010)

Routine operations of production platforms leads to the release of oil, chemicals and naturally occurring radioactive materials to the sea, especially through discharges of produced

¹⁵ Chapter 7 Offshore Oil and Gas Industry in OSPAR Quality Status Report 2010.

¹⁶ "Exploration" means drilling into a prospect and all related offshore oil and gas operations necessary prior to production-related operations; 'Production' means offshore extraction of oil and gas from the underground strata of the licensed area including offshore processing of oil and gas and its conveyance through connected infrastructure (Directive 2013/30/EU).

¹⁷ <http://www.theguardian.com/environment/2012/oct/25/oil-companies-north-sea-spills?intcmp=122>, September 12th 2013.

water and partly from drill cuttings¹⁸ (Figure 2). Other pressures from oil and gas activities include emissions of volatile organic compounds, methane, sulphur dioxide, nitrogen oxides and carbon dioxide into the atmosphere. In addition, the seabed is physically disturbed when pipelines, cables, subsea structures and platforms are installed. The construction of offshore installations, drilling and surveys during exploration are also sources of underwater noise (OSPAR Quality status report, 2010).

IMO and the European Union have developed environmental measures relevant to the offshore industry; respectively, the Conventions and Protocols already mentioned in the “Sunken ships” section, and the recent Directive 2013/30/EU on safety of offshore oil and gas operations. The new rules (initially proposed to take the form of a regulation) intend to make sure that the highest safety standards will be followed by oil and gas platforms across Europe. It proposes also to ensure an effective and prompt reaction should an accident occur; with the objective of minimizing the possible damage to the environment and the livelihoods of coastal communities. The new directive aims to cover the whole lifecycle of all exploration and production activities, from design to the final removal of an oil or gas installation¹⁹.

Although, theoretically, not requiring any environmental assessment, the exploration phase is acknowledged in Article 5 of the given Directive: “The drilling of an exploration well from a non-production installation shall not be commenced unless the relevant authorities of the Member State have previously ensured that early and effective public participation on the possible effects of planned offshore oil and gas operations on the environment pursuant to other Union legal acts, in particular Directive 2001/42/EC or 2011/92/EU as appropriate, has been undertaken”.

Portugal is currently struggling²⁰ with consequences of insufficiencies of its current 19-year old oil legislation²¹; Directive 2013/30/EU was not yet transposed into domestic legislation, but it is not clear if it will alter existing EIA provisions.

EIA’s management response to the challenges posed by this type of project in the marine environment, mostly for the production phase, has been argued by Barker and Jones (2013) and Salter and Ford (2001; and 2000). Their results indicate that, although EIA has become an established component of regulatory provisions for offshore management of hydrocarbons’ production, and strives to promote accountability within the industry, little is known about the contribution that EIA has made to date.

5.3 Wave energy

Fossil fuels and nuclear sources constitute the majority of the global energy supply. However, in addition to resource limitation, there is their associated aggravating environmental burden (Salter and Ford, 2001).

Nowadays, pursuing clean energy sources in replacement of petroleum-based energy, research and exploitation of marine sources is growing at an exciting rate worldwide (see

¹⁸ Drilling fluids are generally recycled and are only disposed of once spent, but a small amount binds to rock fragments (cuttings) and is disposed of with the rest of the solid material removed from drilled rock.

¹⁹ http://ec.europa.eu/energy/oil/offshore/standards_en.htm, September 12th 2013.

²⁰ <http://www.change.org/petitions/say-no-to-oil-rigs-in-the-algarve-diz-n%C3%A3o-%C3%A0s-plataformas-de-petr%C3%B3leo-no-algarve>, September 12th 2013.

²¹ Decree-Law No. 109/94 of April 26th.

Figure 3) (Lin and Yu, 2012). Technological developments in offshore engineering and the rising cost of traditional energy means that offshore energy resources will be profitable in the next few years (Frid *et al.*, 2012). By providing proper measures in the deployment, operations and maintenance, marine wave power can represent a promising renewable electricity resource with great sustainable potential (Lin and Yu, 2012).

Sea waves generate high forces at low velocities and hydraulic systems seem to be the most appropriate to absorb the energy in such conditions (Rusu and Soares, 2013). In this manner, extracting the wave energy and transforming it in electricity implies the use of convertors (WEC).

In contrast to wind and solar energy, marine wave energy is potentially more readily assimilated into electric power grid system, given its constancy and predictability (Rusu and Soares, 2013). On the other hand, its scientific basis is scarce, which may preclude an informed decision-making process based on its actual environmental effects (Fird *et al.*, 2012; Lin and Yu, 2012). For example, there has been growing debate concerning the nearshore implementation of wave energy farms, and their impact at the level of shoreline (Carballo and Iglesias, 2013; Rusu and Soares, 2012; Palha *et al.* 2010).



Figure 3 Global wave energy resources²²

Since it has a long coast and a considerable stretch of ocean immediately to the west, Portugal is amongst the European countries with the highest potential in terms of wave energy (Rusu and Soares, 2013). Carballo and Iglesias (2013) state that an EIA is a prerequisite for any such projects. However, this is not the case in Portugal²³.

²² <http://aw-energy.com/pt-pt/energia-das-ondas/recursos-globais>, September 11th 2013.

²³ Portugal has specific regulation for this type of projects under DL No. 225/2007, which embodies a set of measures related to renewable energy, provided in the national strategy for energy (under Resolution of the Council of Ministers No. 169/2005 of 24 October). In this manner, such projects require an Analysis of Environmental Incidences: which constitutes a prior assessment of environmental impacts of actions, plans or projects over a Special Area of Conservation (SAC) or a Special Protection Area (SPA) that is, areas that are part of the Natura 2000 Network.

6. Structure of the thesis

The present thesis consists in three chapters; the present General Introduction (I) provides background to the reader, in order for one to become acquainted with the general concepts and state of the art of the fields of expertise, underpinning the scientific paper (Chapter II).

Since the scientific paper is intended for publication in *Environmental Impact Assessment Review*, an international scientific journal, it follows the publication's guidelines. It comprises an Introduction, which addresses the application of EIA in Portugal, gives some background on the Portuguese three case studies and states the main objectives of the research. The adopted methodology on case selection, approach and statistical analysis is described in the Methodology section, followed by the Results of data collection and analysis. Finally, the Discussion of the results' significance and the conclusions are presented, offering both substantiated arguments on the need or not for Portugal to subject the given projects to EIA. This chapter obviously reflects most of the research conducted in this master thesis.

The last chapter, the Final Remarks and Future Perspectives (III) summarizes the findings of this thesis and its contribution to previous knowledge, and elaborates on possible future research in this field.

II. A COMPARISON BETWEEN THE LEGAL FRAMEWORKS AND ENVIRONMENTAL IMPACT ASSESSMENTS OF DIFFERENT PROJECTS IN THE MARINE ENVIRONMENT: SUNKEN SHIPS, HYDROCARBONS PROSPECTING AND WAVE ENERGY

Abstract

The Portuguese Environmental Impact Assessment (EIA) law presents serious deficiencies regarding activities and projects that can be licensed within its maritime zones. The sinking of ships for recreational purposes, the hydrocarbons prospective drilling and wave energy generation, for example, are not subjected to EIA in Portugal, as they are not listed on either Annex I or II of the Decree-Law No. 69/2000.

This research paper aimed to determine whether such interventions should or should not be subjected to EIA in Portugal. Consequently, two international comparisons between similar projects were conducted, for the three types of projects: 1) at country level, between legal provisions and the type of environmental study developed, highlighting either or not EIA was performed, and 2) at case-specific level, in terms of case-studies that were subjected to EIA, to compare Environmental Statements (ES) and their contents. Additionally, the main descriptors and predicted impacts for each type of project were identified in the ES.

The obtained results allowed a series of suggestions on how Portugal could learn from other countries approach to EIA, regarding these types of projects, and guidelines to promote harmonization between the legal frameworks of these types of projects and other regulations. The sinking of ships should have specific legislation requiring EIA, under Annex I of the Decree-Law 2000 on a new category of artificial reefs and sinking of vessels. Relatively to the hydrocarbons prospecting, it should be regulated in the same way as the hydrocarbons production, thus included in Annex I of Decree-Law No. 69/2000. Finally, wave energy projects are already subjected to Analysis of Environmental Incidences, which can be considered a pre-EIA. So, in practice, including this type of project in the Annex II of Decree-Law No. 69/2000 should not make a considerable difference on the reporting contents and outcomes.

As concerns over environmental issues grow, communities and governments recognize the importance of anticipatory and participatory mechanisms in their decision-making processes. As a result, the Impact Assessment community has the opportunity to build on these foundations, and in particular to shift EIA thinking away from the licensing obligation and closer to the critical decisions within organizations and sustainability.

Keywords

Artificial reefs, Environmental Impact Assessment, hydrocarbons prospecting, Portugal, sunken ships, wave energy

1. Introduction

Environmental Impact Assessment (EIA) is a well established environmental management tool around the world, as evidenced by its widespread use in the legal frameworks of most countries, and its presence in international law¹ and lending institution standards².

EIA requirements were introduced in many European Union (EU) Member States by Directive 85/337/EEC (on the assessment of the effects of certain public and private projects on the environment), in the Commission's first move to institutionalize a preventative weighting and estimation of possible negative environmental effects of future projects EU-wide (Jiricka and Pröbstl, 2009). The EIA legislation was then modified by Directive 97/11/EC, regarding particularly the extent of projects that require EIA under Annex I or II³, and then also in 2003, and 2009. There is currently a proposal for a new EIA Directive, amending Directive 2011/92/EU (which codifies the three previously stated amendments). It attempts to overcome great differences across EU, prominently, in the way that the screening process⁴ is carried out. Procedural dissimilarities of this type may result in a high number of EIAs being performed in some Member States, sometimes for projects with minor environmental impacts, creating unnecessary administrative burdens⁵. On the contrary, in other Member States, it may be the case that certain projects with significant environmental impacts escape the EIA requirement.

One of the major objectives of the EIA process is to provide project licensing, or planning permission, with sound, relevant and social responsive technical and scientific knowledge on the likely environmental effects of particular development proposals (Pinho *et al.*, 2007). A recognized threat to environmental protection provisions, including EIA, is governments trying to stimulate economic growth and create employment in response to the current financial crisis, which is also verified in Portugal⁶.

Many governments are promoting a major expansion of physical infrastructure, encouraging resource development projects, and generally, seeking to speed decision-making about development projects (Jay *et al.*, 2007; Morgan, 2012; Pope *et al.*, 2013; Sheate, 2012). Additionally, even though EIA regulations apply to public and private projects that are likely to have significant effects on the environment (Directive 85/337/EEC), the emphasis is on

¹ The Convention on Transboundary Environmental Impact Assessment, the Convention on Wetlands of International Importance, the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, the United Nations Framework Convention on Climate Change, the United Nations Convention on the Law of the Sea and the Protocol on Environmental Protection to the Antarctic Treaty.

² The institutionalization of EIA has progressed steadily over the last 15–20 years, gaining particular momentum from rising political recognition of the problems associated with climate change, loss of biodiversity, threats to freshwater sources and water quality, damage to marine areas and other forms of global environmental change (Morgan, 2012).

³ Mandatory EIA: all projects listed in Annex I are considered as having significant effects on the environment and require an EIA; Discretion of Member States: for projects listed in Annex II, the national authorities have to decide whether an EIA is needed.

⁴ The mechanism which determines if EIA is required for projects listed in Annex II. This is accomplished on the basis of thresholds/criteria or a case by case examination; the national authorities must take into account the criteria laid down in Annex III of the EIA Directive.

⁵ http://europa.eu/rapid/press-release_MEMO-12-809_en.htm, September 12th 2013.

⁶ Expresso, August 4th 2012. Economia do Mar, "Green way to invest in the sea" (In Portuguese), pg. 15.

terrestrial or land-based proposals. In this manner, developments and activities in the marine environment, in areas of national sovereignty or jurisdiction, are often disregarded (Budd, 1999; Katsanevakis *et al.*, 2011). Both EIA and Strategic Environmental Assessment (SEA) should be even more important when considering promising projects, such as: aquaculture, nautical tourism, wave energy, and exploration of oil, sands and gravel.

In Portugal, EIA was already established since 1987, with the publication of the Base Law of the Environment, Law No. 11/87, April 7th (Articles 30 and 31). Nonetheless, it was only the Decree-Law No. 69/2000⁷ that approved the legal regime on EIA, transposing to internal law, the Directive No. 85/337/EEC, with alterations by Directive No. 97/11/EC. EIA is responsibility of the Ministry of Agriculture and Sea along with the Ministry of Environment, Spatial Planning and Energy, through the EIA competent authorities: the *Regional Development and Coordination Commissions* (CCDRs: Norte, Centro, Lisboa, Alentejo and Algarve); and the *Portuguese Environmental Agency* (APA) performs duties as national competent authority⁸ of EIA and SEA, developing methods of environmental impact assessment, coordinating the activities of the CCDRs and performing EIAs for major projects (included in Annex I of the EIA Directive);

In the national arena, the EIA procedure consists in the identification of projects (screening), the determination of the scope (method, level of detail) which is facultative, the compilation of an Environmental Impact Statement (EIS, containing relevant information about the project, its effects on environment and possible mitigation measures to prevent these), consultation of relevant stakeholders and the publishing of information about the project, as well as the decision of the assessment process (Jiricka and Pröbstl, 2009; Mealha, 2010).

The Portuguese EIA law presents serious deficiencies regarding activities and projects that can be licensed within its maritime zones. For instance, offshore activities are not covered, even though there are many potentially damaging operations which occur within the marine environment. The sinking of ships for recreational purposes, the hydrocarbons prospective drilling and wave and sea current energy generation, for example, are not subjected to Environmental Impact Assessment as they are not listed on either the Annex I or II of the Directive 2011/92/EU or of the DL No. 69/2000.

The licensing processes of the following national projects in the marine environment present some technical or methodological insufficiencies; but whether or not this can be remedied by Environmental Impact Assessment, remains to be investigated.

- I. Artificial reefs project for recreational diving activities with sinking of decommissioned warships in Portimão, Algarve (MUSUBMAR): SUBNAUTA promotes an initiative with the objective of “fomenting biodiversity and, at the same time, create an exceptional diving site”. The project consisted in sinking four ships, donated by the Portuguese Navy, which constitute a large and unique artificial reef – the *Ocean Revival*, composed by “a representative fleet from the Army and with ideal conditions for proliferation of the marine life”. Licensing by 14 separate authorities was preceded by a “Characterization study of a marine zone for the effects of the creation of an artificial reef aimed at

⁷ Rectified by Declaration No. 7-D/2000 (June 30th), altered by the DL No. 74/2001 (February 26th), modified by the DL No. 69/2003 (April 10th), altered by DL No. 197/2005 (November 8th) and, recently, by DL No. 60/2012.

⁸ Article 7 of DL No. 69/2000 states the full responsibilities of the national competent authority of EIA.

underwater eco-tourism”, “Analysis of Environmental Incidences” (AEInc), “Study of Archaeological prospecting” and “Planning of Sea Signposting”. Following a prior identification request by SUBNAUTA, the Institute for Nature Conservation and Forests (ICNF), the competent authority of AEInc, requested an “Analysis of Environmental Incidences”⁹ as part of the licensing process, and so did the competent licensing authority (Administration of the Hydrographic Region of Algarve). *Ocean Revival* then received 14 favorable opinions¹⁰, including from the ICNF (former ICNB);

- II. Offshore hydrocarbons prospecting, in the East coast of Algarve (concession blocks “Lagosta” and “Lagostim”), stems from a concession by the Portuguese Government and the Spanish company REPSOL, back from 2011; the German RWE and Partex Oil&Gas (*Fundação Calouste Gulbenkian*, Portugal) will also be participating. Though Portugal’s oil legal framework dates back to 1994¹¹ (i.e. before the new legislation on EIA was published in 2000), EIA legal requirements only apply to oil production – not oil prospecting – and in relation to its “General Plan of Development and Production”. In the prospecting stage¹², only a Preliminary Evaluation License is required (from *Directorate General for Energy and Geology* - DGEG). The contents of this license, according to DL No. 109/94, do not comprehend environmental studies;
- III. Wave and sea current energy generation: recently in August 2012, the pioneer project *Waveroller*, carried out by the Finnish AW Energy and Portuguese Eneólica, installed in the sea offshore from Peniche, a platform of three modules capable of producing 300 KWh. The final assembly works and preparation of future structure’s fixation, 3 miles from Almagreira beach 15-30 meters deep, were in charge of the Shipyards of Peniche (ENP). This project, arising from the SURGE initiative (“*Simple Underwater Renewable Generation of Electricity*”) -, obtained a Conditionally-Favorable Decision on Environmental Issues, on August 2011, by the CCDR Lisboa, AEInc competent authority for this case. An “Analysis of Environmental Incidents” is required, under DL No. 225/2007), by its licensing authority (DGEG). This specific project was also recognized for public interest by Dispatch No. 13492/2011.

⁹ It constitutes a prior assessment of environmental impacts of actions, plans or projects over a Site of Community Importance (SCI) or a Special Protection Area (SPA) (DL No. 49/2005).

¹⁰ From various organizations: The Algarve Tourism Region (RTA), The Tourist Board of Portugal – Declaration of Interest for Tourism (TP), The Water Institute (INAG), Task Group for Maritime Affairs (EMAM), Institute of Heritage Management (IGESPAR), National Institute of Biological Resources (IRNB/IPIMAR), Institute of Ports and Maritime Transport (IPTM), Portuguese Environment Agency (APA), Armed Forces Chief of Staff (CEMA), Institute for Nature Conservation and Biodiversity (ICNB), National Maritime Authority (AMN), National Ministry of Defense (MDN), General Directorate of Fisheries and Aquaculture (DGPA) and Secretary of State for the Sea (SEM).

¹¹ DL No. 109/94, the Warnings of July 21st 1994 and March 12th 2002, Dispatch No. 82/94, Ordinance No. 790/94 and DL No. 197/2005.

¹² “Exploration” involves all office, laboratory and field work executed in the concession area with objectives leading to discovering or evaluating the existence of oil or gas; Field work is considered geological and geophysical surveys, exploratory wells and sampling (according DL No. 109/94).

The main purpose of this paper is to investigate whether or not there is a need for any of these types of projects to be subjected to EIA, and thus included in Annexes I or II of the DL No. 69/2000. Ultimately, it should be assessed: (1) how Portugal could learn from other countries' approach to these types of projects, in terms of EIA realization; (2) the benefit of subjecting the national case studies to EIA; and (3) the possibility of harmonization between these projects' legal frameworks and other regulations.

For this, we have compared legal dispositions and EIA requirements for similar projects in other countries, and identified the main affected descriptors and impacts they were expected to cause to the marine environment, as explained in the next section.

2. Methodology

The research followed three main stages: (1) selection of similar and representative international case studies; (2) review through a specifically selected checklist of legal provisions and reporting on environmental assessment; and (3) checklist approach (an adapted EIA evaluation model) to infer about case-specific procedures and contents of Environmental Statements. Further comparisons were conducted, specifically for descriptors and impacts, of the three types of projects: sinking of ships for recreational purposes, hydrocarbons prospecting and wave energy generation. The resultant matrices, from the four assessments, were then statistically treated, using cluster analyses.

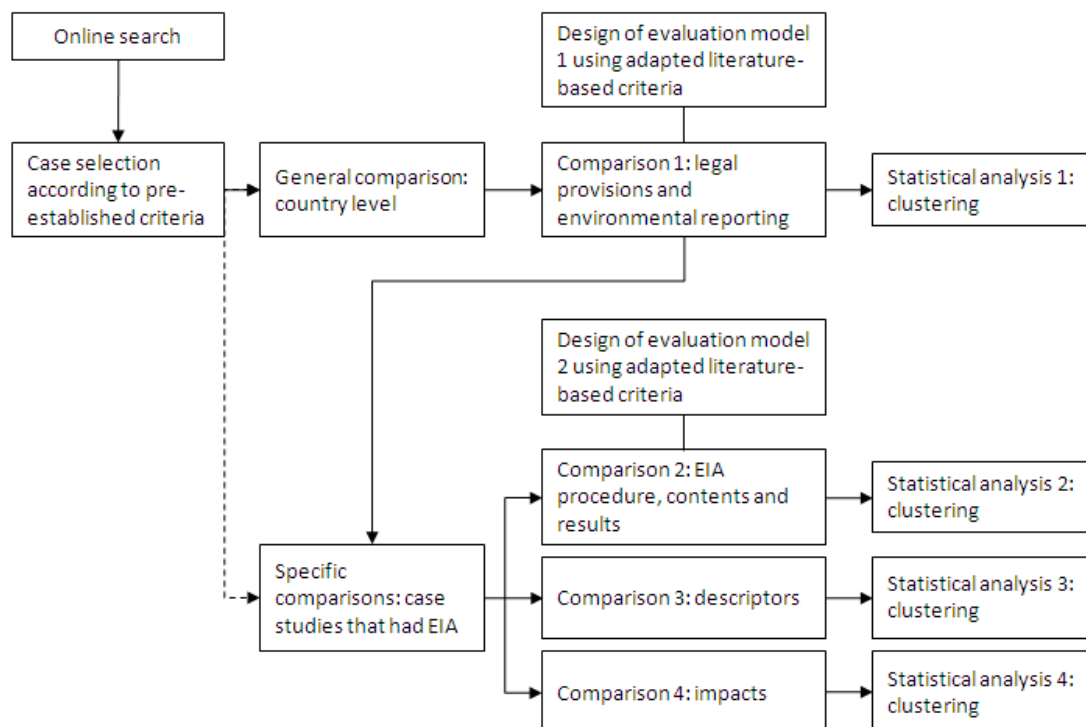


Figure 1 Methodology

2.1 Case selection

International comparisons of EIA systems bearing distinct contexts, concepts and case studies have revealed to constitute an extremely useful tool when evaluating or rather improving performances and effectiveness of the given process (Ahmad and Wood, 2002;

Androulidakis and Karakassis, 2006; Barker and Wood, 1999; Bassi *et al.*, 2012; Glasson and Salvador, 2000; Marara *et al.*, 2011). By verifying the existence of specific legal requirements supporting the need for an EIA (or, conversely, neglecting it) in distinct jurisdictions, it is expected that one shall settle on the possible benefit from a subjacent Environment Impact Statement for the Portuguese projects.

In order to identify other countries in which analogous projects had been implemented, an online search was conducted, using varied sources of information such as websites and online archives, national and international journals, communications and notes from some EIA competent authorities or technicians that were somehow involved in the different projects. In selecting the case studies, the following criteria were taken into account: (i) availability of project information; (ii) Existence and access to environmental reporting documents (Environmental Statements, Non-Technical Summaries or equivalent); (iv) Specific legal frameworks disclosure (online availability and transparency on EIA obligation); (v) Similarity with the Portuguese case studies and their characteristics; and (vi) Availability of English versions of existing project documentation.

To ensure updated results and proximity to observed current conditions, only projects and reports from the year 2000 to the present were considered. Consequently, this research included projects on sinking of ships for recreational purposes (S), hydrocarbons prospecting (H) and wave energy generation (W), from a total of seven countries/states: the United Kingdom (S, H, W), Ireland (H, W), Denmark (H), Malta (S), USA (S, H, W), Brazil (S, H) and Australia (S), making nineteen international projects overall – seven cases of vessels' sinking, eight hydrocarbons prospecting operations and four wave energy developments, summarized in Table 1.

Table 1

Overview of the projects identified on the online search (S = sunken ships; H = hydrocarbons prospecting; W = wave energy)

Country/State	Type of Project	Date and designation of the Project
United Kingdom (UK)	S	2004: Ex-HMS Scylla, Whitsand Bay, Cornwall
	H	2009: The Falkland Islands, North Falkland Basin (Desire)
	H	2009: The Falkland Islands, North Falkland Basin (Rockhopper)
	H	2005: The Falkland Islands (Desire)
	W	2011: European Marine Energy Centre, Orkney, Scotland
Ireland (IR)	H	2012: Kish Bank basin, Dalkey Island
	W	2011: Atlantic Marine Energy Test Site, Belmullet, County Mayo
Denmark (DN)	H	2000: License 3/97 Fylla, Greenland
Malta (MT)	S	2009: Ex-P31 Patrol Boat, Comino
	S	2007: Ex-P29 Patrol Boat, Cirkewwa
United States of America (USA)	S	2006: Ex-USS Oriskany, Pensacola, Florida
	H	2011-14: Beaufort Sea and Chukchi Sea, Alaska
	W	2012: Reedsport, Oregon
	W	2003: Kaneohe Bay, Oahu, Hawaii
Brazil (BR)	S	2003: Victory 8B, Guarapari, Espírito Santo
	H	2011: BM-S-61, BM-S-62, BM-S-68, BM-S-69 and BM-S-70, Santos Bay
	H	2009: BM-ES-37, 38, 39, 40 and 41, Espírito Santo Bay
Australia (AU)	S	2011: Ex-HMAS Adelaide, Newcastle, New South Wales
	S	2009: Ex-HMAS Canberra, Victoria

2.2 Research approach: a comparative assessment of EIA application

Because not all identified projects were subjected to EIA (either it was legally required or voluntarily presented), two different sets of evaluation criteria, both derived from literature and modified to meet the objectives of this study, were applied respectively as follows: (1) at country level, to compare the legal provisions and the type of environmental study and report developed for each type of project; and (2) at case-specific level, in terms of case-studies that were subjected to EIA, to compare environmental statements and their contents.

In order to determine how Portugal could learn from other countries' approach to these types of projects, a comparison of the countries' legal provisions and environmental reporting (further designated Countries' Comparison) on similar projects was conducted.

The evaluation criteria for the Countries' Comparison were adapted from Ahmad and Wood (2002), Glasson and Salvador (2000) and Marara *et al.* (2011). This evaluation model touched briefly on some fundamental components of an effective EIA system, according to Leu *et al.* (1996): environmental policies, regulations and guidelines, environmental administrative framework, EIA implementation, role of actors involved, status of EIA reports, EIA compliance monitoring and enforcement, and international interactions. That said, the checklist was divided into four sections: the first and the second sections addressed, correspondingly, (i) the legal requirements and (ii) the administrative frameworks for the development of the projects. The review of these provisions, along with their extent, paved the way to comprehend the dissimilarity of the projects' level of environmental concern (Section iii) and guidelines (Section iv). These guidelines included screening and scoping, temporal and spatial frameworks, procedures for review and decision-making, public notification and follow-up (key elements that were further contemplated on the next comparison).

The Countries' Comparison allowed a better understanding of the degree of detail which we could work with, in the comparison of case-specific EIA procedure, contents and outcomes (further designated EIAs Comparison). Therefore, only projects that had EIA (mandatory or not) were considered in the EIAs Comparison, which aimed to highlight the possible benefit of subjecting the national case studies to EIA, by comparing similar international projects' EIAs. This comparison was, as suggested by Leu *et al.* (1996), performed in terms of five dimensions: procedural compliance, completeness of EIA documents, methods to assess impacts, influence on project decisions and weight of environmental factors. So, our comparative appraisal categories were based on checklist models used by Androuridakis and Karakassis (2006), Barker and Wood (1999) and Bassi *et al.* (2012). The EIAs Comparison model comprised three sections: (i) EIA procedure, (ii) Contents and (iii) Documentation. These showed if the evaluation criteria based on Leu *et al.* (1996) apply or not, and therefore assisted in assessing how different EIA contexts may resemble one another.

In order to obtain more in-depth information, a preliminary thorough review of the EIA reports and further documentation on the projects (such as Terms of Reference, Environmental Planning Statements, Environmental Statements and monitoring reports available online) was performed (Appendix I). This shows results on: EIA report format, publicity of EIA decisions, existence of public participation, validity of concerns, mitigation measures, project modifications by EIA findings and whether or not EIA was considered an effective planning instrument. The gathered information contributed to meliorate the evaluation criteria used for the EIAs Comparison, and also gather information on the weight of

environmental factors and their influence on projects decisions. Therefore, the ecological, social and economical and physical descriptors were identified, as well as the predicted impacts and their significance (-1, 0 or +1; respectively, negative, neutral and positive impacts).

2.3 Statistical analysis

Cluster analyses were applied to the qualitative appraisals (Countries' Comparison, EIAs Comparison, Descriptors and Impacts) to understand if there were differences between project types, countries or specific case studies, in terms of the given evaluation criteria for each model of comparison described in section 2.2.

This multivariate analysis aims to create different subsets or groups (clusters) so that the requirements of homogeneity and heterogeneity are fulfilled. For homogeneity to exist within a cluster, data in the same cluster should be as similar as possible, while for heterogeneity, on the other hand, data in different clusters should be as different as possible (Mok *et al.*, 2012).

For each resultant matrix (from the Countries' Comparison, the EIAs Comparison, Descriptors and Impacts), the Euclidean distance and the Ward Hierarchical distribution were applied using R software v. 2.14 (R Development Core Team, 2011). In order to separately explore possible clustering, sequences of nested clusters were constructed by means of dendrograms, representing the groups of patterns and similarity level at which groupings change.

For statistical purposes, impacts' categories which were not referred to in some projects' EIA reports (Not Available, N/A) were classified as neutral impacts (as suggested by some international EIS), since cluster analyses do not apply to data categorized as N/A (the original table can be consulted in Appendix II).

3. Results

The results emerging from the review of documents gathered from the online search (Table 1) had to be contextualized with the countries' legal requirements on EIA for each type of project. These were collected from the projects' EIS and are shown in Table 2.

Table 2

Summary of the countries' specific legislation determining the obligation to conduct EIA (Yes = EIA is mandatory; No = EIA is not mandatory)

Table 2.1

For similar international sunken ships projects

Country/State	Legal provisions for EIA
UK	Yes. Category: Artificial Reefs, under Marine Works (EIA) Regulations, 2007.
Malta	Yes. Category: Coastal; Sub-Category: Sinking of Vessels and Construction of Artificial Reefs - Category II project in terms of the EIA Regulations, 2007
USA (Florida)	No. U.S. Navy applied for approval from Environmental Protection Agency (EPA). U.S. EPA has the authority to grant a risk-based disposal approval, provided the risks from the PCBs are acceptable. The Navy conducted risk assessments to estimate potential human health and environmental impacts for the future ex-ORISKANY artificial reef.
Brazil	No. The Victoria-8B's programmed sinking was included in the Marine Artificial Reefs program according to environmental licensing from the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), required by the Espírito Santo's Environmental State Institute (IEMA). There wasn't EIA but several minor reports supported the program's execution; authorization was given by IBAMA, who proposed an environmental monitoring plan for the sinking site as a condition of the project.
Australia	No. As the area is not zoned under any Environmental Planning Instrument, it is regulated by the Environmental Planning and Assessment Act (Part 5): as no significant adverse impacts are likely as a result of the activity, a Review of Environmental Factors was prepared. An Artificial Reef Permit under the Environment Protection (Sea Dumping) Act is required (ship cleaning and preparation and implementation of a Long Term Monitoring and Management Plan). Additional permits may also be required under relevant State or Territory legislation.

Table 2.2

For similar hydrocarbons prospecting international projects

Country/State	Legal provisions for EIA
United Kingdom (The Falkland Islands)	No. The Falkland Islands law governs petroleum exploration and exploitation on the islands' continental shelf. The licensing system for offshore exploration and production activities is applicable to the entire Falkland Islands. The Offshore Minerals Ordinance 1994 (PART VI 'Miscellaneous and General') provides the regulatory framework for requiring and undertaking an EIA or EIS; it may be required if it is considered by the Governor that the environment might be substantially affected by the activity.
Ireland	No. There was an Environmental Risk Assessment and an Environmental Area Assessment to support the application for a lease/license/permission under the Foreshore Act 1933 (as amended).
Denmark (Greenland)	No. Environmental and land use legislation do not apply for oil and gas exploration and production in Greenland. Exploration license: the licensee shall initiate technical and environmental studies as a basis for evaluations regarding a possible exploitation; Exploitation license: following the issuance of this license, the licensee shall submit, to Mineral Resources Administration, a development plan, an EIA and an abandonment plan.
Alaska (USA)	No. The project given EIS analyzes a range of management alternatives to assist National Marine Fisheries Service and Bureau of Ocean Energy Management (BOEM) in carrying out their statutory responsibilities for these activities within the five year period of 2012 through 2017 - issuance of permits and authorizations under the Outer Continental Shelf Lands Act (seismic surveys). A geological and geophysical (G&G) permit must be obtained from BOEM in order to conduct G&G exploration activities for oil, gas and sulphur resources when operations occur on unleased lands or on lands leased to a third party. NMFS issues incidental take authorizations (ITAs), under the Marine Mammal Protection Act; given the potential for these activities to "take" marine mammals, oil and gas operators may choose to apply for an ITA.
Brazil	Yes. Resolution CONAMA No. 23/94 provides specific regulations for the environmental licensing of drilling and production of hydrocarbons. The National Environmental Policy requires: Environmental Control Report for drilling activity, Environmental Feasibility Study for long-term tests, Environmental Assessment Report for production in fields where already there was production and Environmental Impact Study and Environmental Impact Report for fields where there has not been production.

Table 2.3

For similar wave energy international projects

Country/State	Legal provisions for EIA
United Kingdom	Yes. Under EIA Directive 85/337/EEC as amended by Directive 97/11/EC, wave and tidal energy developments are listed in Annex II as "Industrial installations for the production of electricity, steam and hot water (unless included in Annex I)". These provisions were transposed in part into Scottish legislation: the Electricity Works (EIA) (Scotland) Regulations 2000 (as amended) and the EIA (Scotland) Regulations 1999 (as amended). Projects listed under Annex II of the EC Directive 97/11/EC require an EIA if it generates over 1 MW of electricity, the application for these must be accompanied by an ES as required by the Electricity Works (EIA) (Scotland) Regulations 2000. Screening requires the developer to present a document to the regulator (Marine Scotland - Licensing Operations Team) for comment which should further determine whether or not a statutory ES or an Appropriate Assessment are likely to be required.
Ireland	Yes. The required consents for the project include both a foreshore lease and a foreshore license from the Irish Government's Dept. of the Environment, Community and Local Government for all installations between the high water mark and the 12 nautical mile limit. The EIA is submitted under the European Communities (Foreshore) Regulations 2009.
USA (Oregon)	Yes. Under provisions of the Federal Power Act, test sites usually do not need a Federal Energy Regulatory Commission's license, but the ones that will generate energy for the grid do.

Table 3 presents the evaluation criteria concerning the Countries' Comparison for each type of project. For this appraisal, all of the nineteen projects (Table 1) were considered, and they are represented by 16 cases (independent variables) from 7 different countries/states.

Table 3

Countries' Comparison concerning legal requirements and type of environmental report for each type of project (S = sunken ships; H = hydrocarbons prospecting; W = wave energy)

	PT (S)	UK (S)	MT (S)	USA (S)	BR (S)	AU (S)	PT (H)	UK (H)	IR (H)	DN (H)	USA (H)	BR (H)	PT (W)	UK (W)	IR (W)	USA (W)
(i) Legal Basis																
Party of related Conventions	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0
Existence of related Acts, Laws or Ordinance	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
Existence of specific regulations and/or guidelines	0	1	1	0	0	0	1	1	1	0	1	1	0	1	1	1
Legislation anyhow conditions this type of projects	0	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1
Legal provision for EIA	0	1	1	0	0	0	0	0	0	0	0	1	0	1	1	1
Existence of EIA	0	1	1	0	0	1	0	1	0	1	1	1	0	1	1	1
Existence of any other environmental report	1	1	1	1	1	1	0	0	1	0	0	1	1	1	1	1
Public involvement and participation	0	0	1	1	0	1	0	1	0	1	0	1	1	1	1	1
Compliance monitoring and enforcement	1	1	1	1	1	1	0	1	0	0	0	1	1	1	1	1
(ii) Administrative Framework																
Public competent authority	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Coordination with national planning bodies	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1
Other environmental report is a licensing process obligation	1	0	1	1	1	1	0	0	1	0	0	0	1	1	1	1
(iii) Environmental Reports																
Prior to the implementation of the project	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1
Includes alternatives and/or no action strategy	1	0	1	1	0	0	0	1	0	1	1	1	0	1	1	1
Indicates impact mitigation measures	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	0
Includes environmental management or monitoring plans	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1
Considers cultural, social and economical issues	0	1	1	0	0	1	0	1	1	1	1	1	0	1	1	1
Subsequent monitoring report	0	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0
(iv) Guidelines																
General and/or specific guidelines from a national environmental agency	0	1	1	0	1	0	1	1	1	0	1	1	1	1	1	1
Promoter asked for guidelines	1	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0
For procedures	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1
For report preparation	1	1	1	1	0	0	0	1	0	0	0	1	1	1	1	1
For compliance monitoring and enforcement	1	1	1	0	1	1	0	1	0	0	0	1	1	1	1	0

(PT = Portugal; UK = United Kingdom; MT = Malta; USA = United States of America; BR = Brazil; AU = Australia; IR = Ireland; DN = Denmark; 1 = presence; 0 = absence)

This comparison revealed the number of occurrences of each dependent variable (evaluation criteria presented in Table 3), thus determining which of the 23 procedures or provisions were most frequently considered (Figure 2).

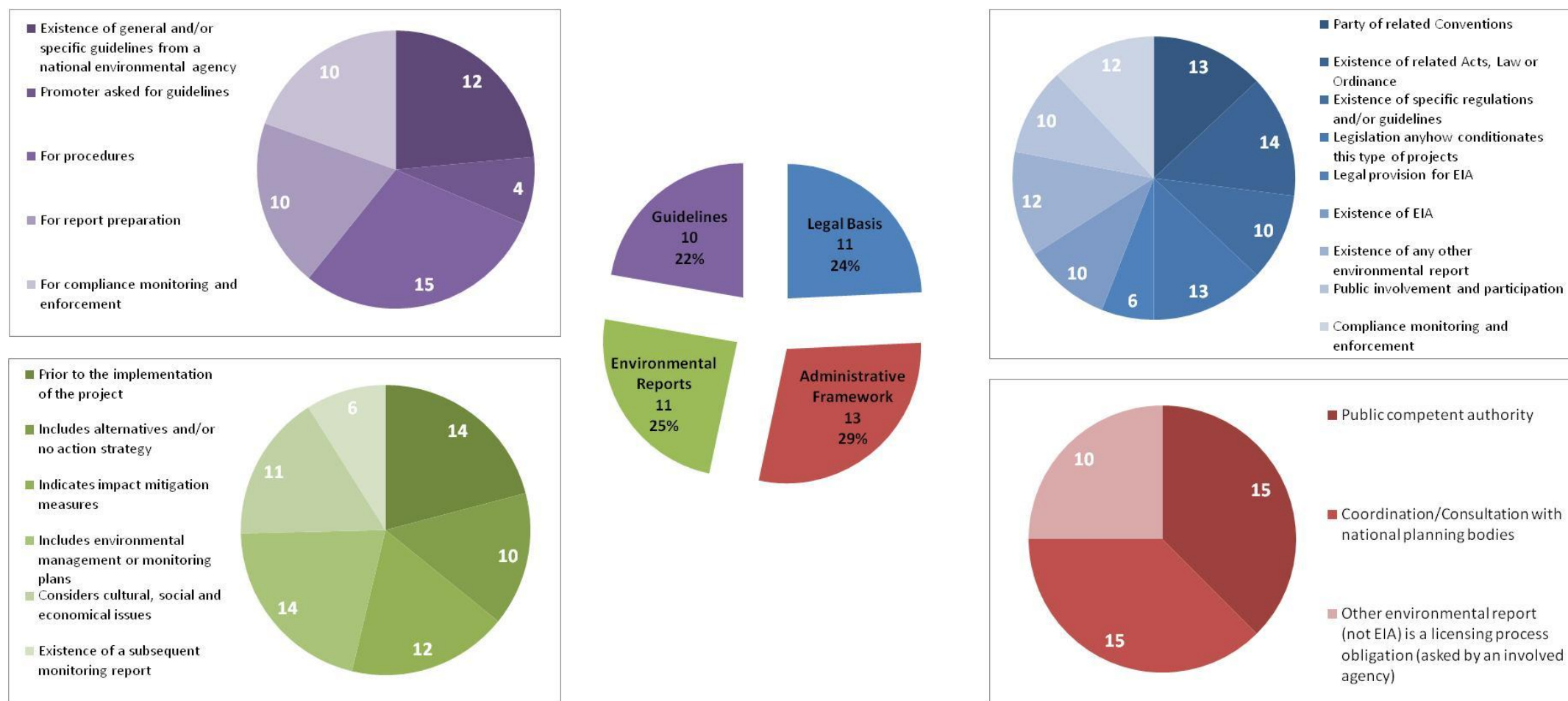


Figure 2 Pie charts resulting from the Countries' Comparison on legal requirements and environmental reporting of the three different projects

There was a total of 16 independent variables (Sunken ships projects from Portugal, the UK, Malta, the USA, Brazil and Australia; Hydrocarbons prospecting in Portugal, the UK, Ireland, Denmark, the USA and Brazil; wave energy projects in the United Kingdom, Ireland and the United States of America) and the average of occurrence of all criteria was ca. 11 out of 16.

The “Administrative Framework” section gathered the most significant compliance, whilst the existence of a “Public competent authority” and the “Coordination with national planning bodies” were the criteria with higher occurrence overall. Both sections on “Legal basis” and “Environmental Reports” comprehended high occurrence components, such as “Party of related Conventions”, “Existence of related Acts, Laws or Ordinance”, “Legislation anyhow conditions this type of projects”, the fact that the report was “Prior to the implementation of the project” and the existence of “Environmental management or monitoring plans”. Lastly, the “Guidelines” section had the lowest occurrence, though the “Existence of general and/or specific guidelines from a national environmental agency”, particularly “For procedures”, occurred at 15 out of the 16 total projects.

Also, and by summing up the fulfilled criteria for each independent variable, it was possible to identify countries and project types that most complied with the distinct requirements of this evaluation. In general, ca. 16 out of the 23 criteria were met, with wave energy projects having, on average, higher compliance (19 criteria met), followed by the sinking of ships (ca. 17 criteria met) and hydrocarbons prospecting (14 criteria met).

The Portuguese cases were, in all three types of projects, in the set of countries that meet fewer criteria. Concerning the sunken ships, both Portugal and Brazil had the lowest results, with 13 and 12 hits, respectively; Malta (22) and the UK (19) occupied the top positions. While the exploratory drilling for hydrocarbons had the most discordant results, with Portugal (6), Denmark (12), the USA (13) and Ireland (14) having very dissimilar compliance when comparing to the UK (18) and Brazil (20); wave energy projects presented equivalent values, except Portugal (17), which could still be considered a high average. These results were demonstrated by the dendrogram in Figure 3.

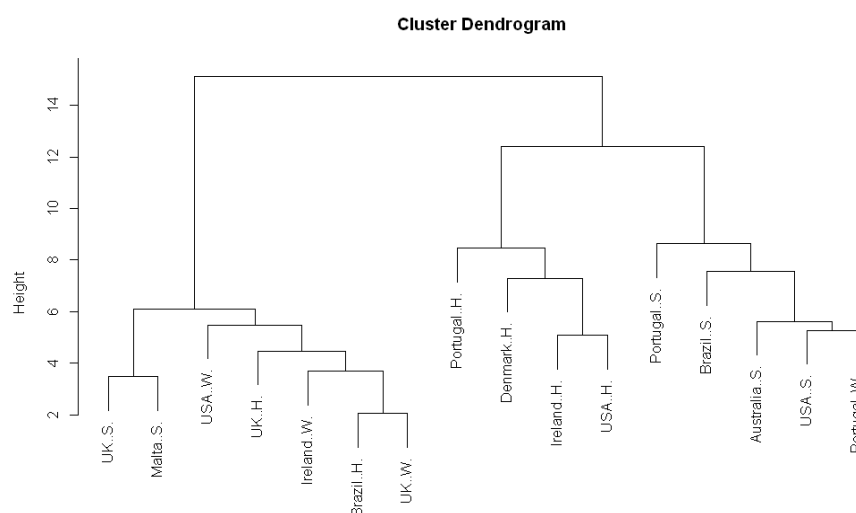


Figure 3 Dendrogram of the Countries' Comparison of three types of projects (S = sunken ships; H = hydrocarbons prospecting; W = wave energy), representing 16 cases from 7 different countries/states

Table 4

EIAs Comparison concerning case-specific EIA procedure, contents and outcomes

	Scylla (UK)	P31 (MT)	P29 (MT)	Adelaide (AU)	Desire (UK)	Rockhopper (UK)	Fylla (DN)	Alaska (USA)	BES (BR)	EMEC (UK)	AMETS (IR)	Reedspot (USA)
(i) EIA Procedure												
Screening process	1	1	1	1	1	1	1	1	1	1	1	1
Scoping process/Terms of reference	1	1	1	1	1	1	1	1	1	1	1	1
Environmental Impact Statement	1	0	0	0	1	1	0	0	1	1	1	0
Environmental Planning Statement	0	1	1	0	0	0	0	0	0	0	0	0
Review process	1	1	1	0	1	1	0	1	0	1	1	1
Public participation	0	1	1	1	1	1	0	1	1	1	1	1
Provisions for follow-up and implementation	1	1	1	1	1	1	0	1	1	1	1	1
Temporal and spatial frameworks for the phases of the procedure	1	1	1	1	1	1	1	1	1	1	1	1
(ii) Report content												
a. Description of the environment												
Site selection, description and background of the proposed project	1	1	1	1	1	1	1	1	1	1	1	1
Description of ecological, social and economic and physical conditions	1	1	1	1	1	1	1	1	1	1	1	1
Definition of baseline conditions	1	1	1	0	1	1	1	1	1	1	1	1
Baseline conditions obtained in the field	0	1	1	0	0	0	0	0	1	1	1	0
Reference to existing or future similar projects in the area	1	1	0	1	1	1	0	1	1	1	0	0
Objectives of the project (reference to various operational phases and techniques)	1	1	0	1	1	1	1	1	1	1	1	1
Analysis of the life cycle of project's usefulness	0	1	0	1	1	1	1	1	1	1	1	1
b. Impact Prediction												
Ecological, social and economical and physical impacts and effects	1	1	1	1	1	1	1	1	1	1	1	1
Estimate positive and negative impacts	0	1	1	0	1	1	1	1	1	0	1	1
Assessment of significance of impacts	0	1	1	0	1	1	0	1	1	1	0	0
c. Mitigation												
Proposal of mitigation	1	1	1	1	1	1	1	1	1	1	1	1
Monitoring methods and proposals	1	1	1	1	1	1	0	1	1	1	1	1
d. Alternatives												
Reference to alternatives	0	1	0	1	1	1	1	1	1	1	1	1
Indication of procedures for selection among alternatives	0	1	0	0	1	1	0	1	0	1	1	1
Comparison to "no-action" option	0	1	0	0	1	1	0	1	1	0	1	1
(iii) Documentation												
Summary of policy legislative and regulatory framework	0	1	1	1	1	1	1	1	1	1	1	1
Reference to legislation-derived thresholds of concern	0	1	1	1	0	0	0	0	0	0	0	0
Bibliographic documentation	1	1	1	1	1	1	1	1	1	1	1	1

(UK = United Kingdom; MT = Malta; AU = Australia; DN = Denmark; USA = United States of America; BR = Brazil; IR = Ireland; 1 = presence; 0 = absence)

Being mandatory or not, only case studies that had EIA took part of this and the following comparisons. Some projects, despite having prepared environmental reports, were left out since whether the full report was not available online (Brazil's hydrocarbons prospecting at Santos Bay), the contents revealed insufficient for us to draw comparable conclusions (USA Kaneohe Bay's wave energy generation; Australia's Ex-HMAS Canberra sinking), or there was already a similar/representative project (The Falkland Islands Desire prospective drilling from 2005).

The evaluation criteria presented in Table 4 served the purpose of comparing 12 different EIA processes (independent variables: 4 sunken ships, 5 hydrocarbons exploratory drillings and 3 projects of wave energy generation). Similarly to what was done previously for the Countries' Comparison, the most representative criteria of the EIAs Comparison, along with the completeness of the EIA process for each case study were identified (Figure 4).

The overall average of occurrence of the 26 evaluation criteria (dependent variables in Table 4) was ca. 9. The generally most complied section was "Report content", it presented and described the project, its objectives, site selection and characteristics, considered the impacts, mitigation measures and alternatives; but this section also showed several important criteria with low occurrence such as: "Baseline conditions in the field", "Reference to existing or future similar projects", "Assessment of significance of impacts", "Reference to procedures for selection among alternatives" and "Comparison to no-action option". The "EIA procedure" section included the fully complied screening and scoping processes and "Temporal and spatial frameworks for the phases of the procedure". Only 50% of the projects prepared an "Environmental Impact Statement", but a considerable number had a "Review process". Overall, the projects' reports included a summary of legislation and bibliographic documentation but missed the "Reference to legislation-derived thresholds of concern".

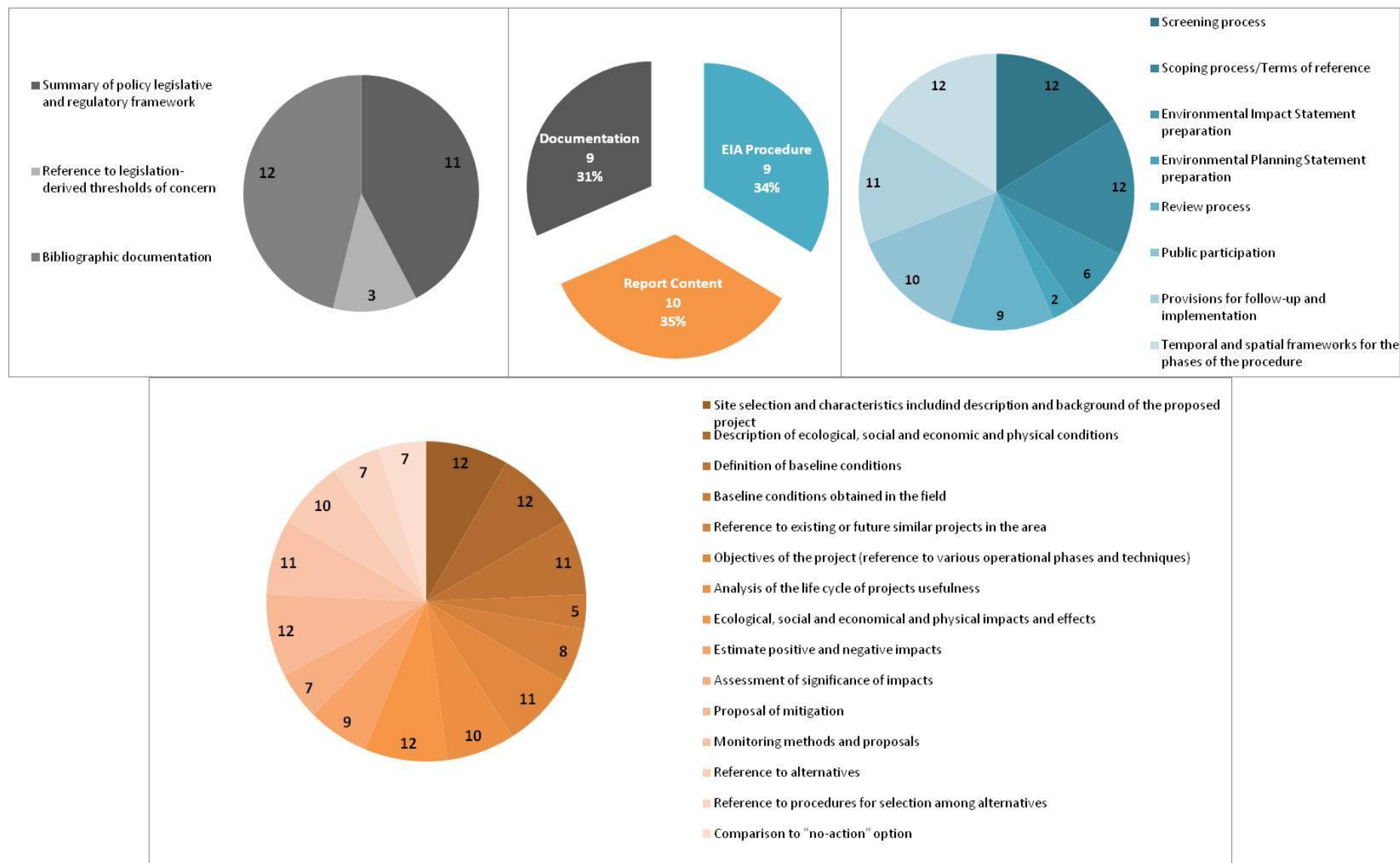


Figure 4 Pie charts resulting from the EIAs Comparison concerning case-specific EIA procedure, contents and outcomes

Regarding each case studies' EIA specificities and reports' completeness, it was shown that, although the sinking of ships presents the lower means of compliance (ca. 19 criteria satisfied), it has the most complete process of all types of projects considered (Malta's 2009 Ex-P31 sinking, fulfilling 25 of the 26 criteria). The hydrocarbons prospecting would have been the type of projects with the highest means of criteria obedience (ca. 23) but the Greenland case (only ca. 14) made it drop down to ca. 21, which matched the wave energy projects' average compliance. These results were demonstrated by the dendrogram presented in Figure 5.

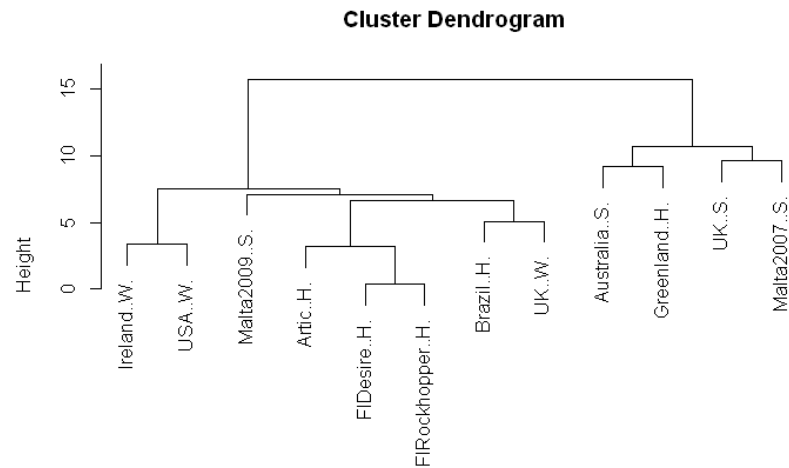


Figure 5 Dendrogram of the EIAs Comparison of three types of projects (S = sunken ships; H = hydrocarbons prospecting; W = wave energy), representing 12 different EIA processes

Table 5 presents the categories of descriptors found on the projects' EIAs, which allowed one to identify which were most frequently taken into account on the various reports.

Table 5
Overview of the projects' main descriptors included in EIS

		Scylla (UK)	P31/P29 (MT)	Adelaide (AU)	Desire/ Rockhopper (UK)	Fylla (DN)	Alaska (USA)	BES (BR)	EMEC (UK)	AMETS (IR)	Reedspot (USA)
Ecological environment	Lower trophic level	0	0	1	1	1	1	1	1	0	0
	Marine mammals	1	1	1	1	1	1	1	1	1	1
	Birds	0	1	0	1	1	1	0	1	1	1
	Fish	0	0	1	1	1	1	0	1	0	1
	Marine flora	0	0	0	1	0	0	1	0	1	1
	Coastal or terrestrial habitats	0	0	0	1	1	1	1	1	1	1
	Protected species and habitats or other fauna	0	0	0	1	0	0	1	1	0	1
Social and economical environment	Socioeconomics, population and cultural resources	0	0	0	1	1	1	1	0	1	1
	Land and sea uses	0	1	0	0	0	1	0	0	1	1
	Landscape and visual assessment	1	0	0	0	0	1	0	0	1	1
	Archaeological and cultural heritage	0	1	1	1	0	0	0	0	1	1
	Navigation, maritime transport or communication	1	0	0	1	1	1	0	0	1	0
	Recreation and tourism	0	0	1	1	1	1	0	0	1	1
	Fisheries	0	0	0	1	1	0	0	0	1	0
Physical environment	Public health	0	0	0	0	0	1	0	0	0	0
	Bathymetry and oceanography	0	1	1	1	1	1	1	0	1	0
	Physical environment	0	0	1	1	0	0	0	0	1	0
	Geology	0	0	1	1	0	1	1	0	1	1
	Meteorology	0	0	0	1	1	1	1	0	0	0
	Water quality	0	0	1	0	0	1	1	0	1	1
	Air quality	0	0	0	0	0	1	1	0	1	0
Physical environment	Acoustics and noise	0	0	0	0	0	1	0	0	1	0

(UK = United Kingdom; MT = Malta; AU = Australia; DN = Denmark; USA = United States of America; BR = Brazil; IR = Ireland; 1 = presence; 0 = absence)

The average on the descriptors' overall occurrence was ca. 5, the "Ecological environment" is the category with highest average (ca. 6 out of 10) and the "Marine mammals" the descriptor that has more occurrences (10). Both other sections, Social and Economical and Physical environment present lower means (around 4) but have more general descriptors that stand out: "Socioeconomics, population and cultural resources", "Recreation and tourism", "Bathymetry and oceanography" and "Geology".

The most complete description section belongs to the hydrocarbons prospecting projects (considering ca. 14 out of 22 descriptors), especially the Alaska and the Falkland Islands, followed by the wave energy developments with the most complete report from Ireland (17 descriptors) and the weaker being from the UK (only 6). The sunken ships' reports are far less descriptive (with a means of ca. 6 descriptors). These results are demonstrated by the dendrogram presented in Figure 6.

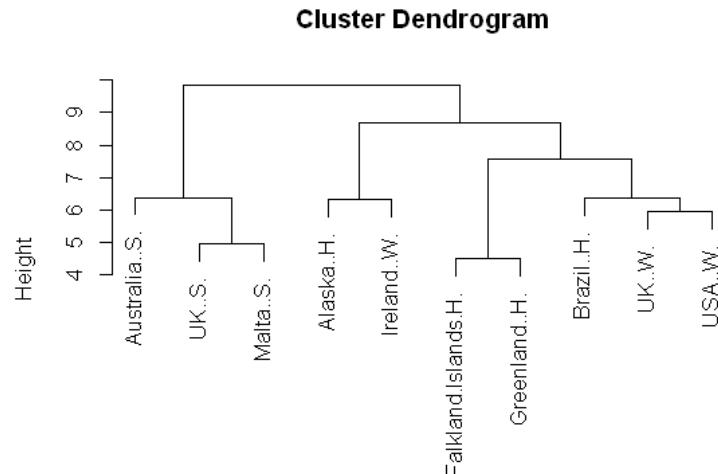


Figure 6 Dendrogram of the main descriptors included in 12 different EISs of three types of projects (S = sunken ships; H = hydrocarbons prospecting; W = wave energy)

Relatively to the impacts of the different projects (Table 6), the most affected of the 13 criteria was the “Existing marine biota” (with 11 out of 12 cases admitting their negative impact), followed by “Water quality”, “Fisheries”, “Geology” and “Noise and vibration”. “Tourism and recreation” gathered some significant positive impacts, mainly by the sunken ships projects. With most neutral impacts, there was the “Land use” criterion, along with “Landscape and visual assessment” (except two wave energy projects) and “Population and human health” (except two hydrocarbons prospecting projects).

Table 6
Overview of the projects’ main potential impacts reported in EIS

		Scylla (UK)	P31 (MT)	P29 (MT)	Adelaide (AU)	Desire (UK)	Rockhopper (UK)	Fylla (DN)	Alaska (USA)	BES (BR)	EMEC (UK)	AMETS (IR)	Reedspot (USA)
Biological impacts	Existing marine biota	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Coastal and onshore habitats	0	0	0	0	-1	-1	-1	-1	-1	0	-1	0
Social and economical impacts	Tourism and recreation	0	+1	+1	+1	0	0	+1	-1	-1	0	+1	0
	Land use (marine archaeology and cultural heritage)	0	0	+1	0	-1	-1	0	0	0	-1	0	0
	Landscape and visual assessment	0	0	0	0	0	0	0	0	0	0	-1	-1
	Navigation and maritime transport	0	-1	0	-1	0	0	+1	-1	-1	-1	-1	-1
	Fisheries	0	-1	-1	0	-1	0	0	-1	-1	-1	-1	-1
	Population and human health	0	0	0	0	-1	-1	0	0	0	0	0	0
Physical impacts	Geology (soil/sediment quality)	0	-1	-1	0	-1	-1	-1	0	-1	0	-1	-1
	Waves, currents and coastal processes	0	-1	-1	0	0	0	0	0	0	-1	-1	-1
	Water quality (possible sources of contamination)	-1	-1	0	0	-1	-1	-1	0	-1	-1	-1	-1
	Air quality and climate	0	0	0	-1	-1	-1	-1	-1	-1	0	0	0
	Noise and vibration	0	0	0	-1	0	0	-1	-1	-1	-1	-1	-1

(UK = United Kingdom; MT = Malta; AU = Australia; DN = Denmark; USA = United States of America; BR = Brazil; IR = Ireland; -1 = negative, 0 = neutral, +1 = positive)

According to typology, it was established that the most harmful are the wave energy projects (with an average of -8 impact degree), followed by the exploratory drillings, whose estimated impact is -7 (the overall most damaging project is Brazil's hydrocarbons prospecting with -9). The sinking of ships revealed to be the marine intervention provoking least negative effects overall (average: ca. -3; UK's Ex-HMS Scylla's scuttling was the harmless project) and in the several impacts' category. These results are demonstrated by the dendrogram presented in Figure 7.

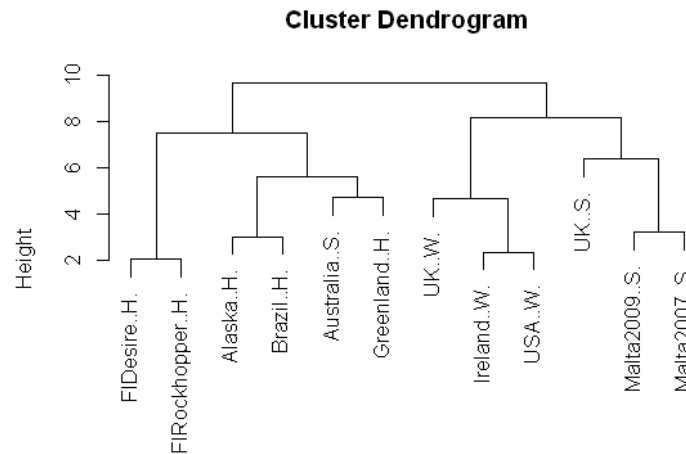


Figure 7 Dendrogram of the main potential impacts reported in 12 different EISs of three types of projects (S = sunken ships; H = hydrocarbons prospecting; W = wave energy)

4. Discussion and conclusions

The sunken ships and wave energy projects are pioneering projects in their category in Portugal, both representing economy-driven activities (this also applies to the hydrocarbons prospecting) – which, nowadays, constitutes a very reasonable motive for promoters to want to speed up the decision-making process. Both are nearshore projects and have similar environmental impacts. They both affect coastal communities, including humans, through visual impacts (wave energy) and recreational opportunities (sunken ships).

Wave energy generation projects, for example, are expected to have effect on the coastal wave climate, and also coastal habitats; removing energy from the waves at an offshore or nearshore site will reduce the height and power of the waves as they propagate further towards the coast (Palha *et al.*, 2010). This type of project is relatively recent but already much work has been done, since renewable energies, and their economic feasibility, easily generate consensus amongst different countries and stakeholders.

The countries' comparison, concerning the degree of legal dispositions and, consequently, the extent of the procedures underlying the development of the distinct types of projects, reveals that, generally speaking, wave energy generation projects meet more legal demands than the hydrocarbons prospecting and the sinking of ships. This means that wave energy has a more regulated process (all wave energy international projects have mandatory EIA). Additionally, the sunken ships projects from Malta and the UK, and the hydrocarbons prospecting from Brazil and the UK, also show high degree of regulation. The latter-project – hydrocarbons exploration in the UK – is under the Falkland Islands' law for petroleum exploration and exploitation, while the former three are the only projects of their typologies for which EIA is mandatory (both from the EU, with common Conventions and Directives).

In terms of EIA process completeness, both wave energy and hydrocarbons prospecting projects satisfy a greater number of evaluation criteria (and so does the Malta's P31), and

present similarities, including on descriptors' categories. The exploratory drilling EIA compliance is probably associated with the fact that when there is an EIA for this phase, it is often already envisioning the production phase and so the promoter saves some work and time, by including all phases of the project's life cycle.

Recent perspectives of the future of the offshore oil and gas industry have attempted to stress the importance of ensuring that offshore economic activities are accompanied by an appropriate level of commitment to improved environmental performance (Barker and Jones, 2013; OSPAR Quality status report, 2010).

It should be expected that the hydrocarbons exploratory drillings in Portugal would be the type of project with most negative impacts. It has been gaining more visibility in the media; a petition was even initiated, given its potential impacts. It seems that after 75 years since the first oil exploration permit was granted, this type of projects is getting the appropriate attention. The oil prospecting activities in Portugal do not require any environmental study to be conducted. If hydrocarbons are detected, the promoter should provide an EIA accompanying the requirement for a production license. However, it often goes unnoticed that the exploration phase also involves drilling.

In the international arena, Salter and Ford (2000) concluded that considerable research, concerning oil and gas operations, has been dedicated to: protecting the marine environment, achieving compliance with legislative controls, assessing the technical and economic feasibility of platform disposal options and ecological surveying. By comparison, considerably less research has been carried out in other important areas such as: assessing the impacts of wastes returned to shore for disposal, identifying sustainable strategies for operations, and assessing and mitigating against adverse impacts from atmospheric emissions.

The hydrocarbons prospecting and the sinking of ships tend to show more similarities, amongst different countries, in the way they are approached by legislation and the type of environmental reporting. It might also be the case that impacts classified as non-significant (neutral or, in fact, NA), for both types of projects, are attributed to insufficient data; we must take into account that few were the international projects of these typologies that had EIA, fewer where it was mandatory. In this manner, bearing in mind that the wave energy projects' EIAs suggest that this is the typology with more negative impacts, it is hypothesized that the significance of impacts may be disguised due to less regulation and, consequently, inadequate provision of information.

The artificial reefs have, as corroborated by our research, positive impacts on local economies, mostly touristic activities, where they are deployed. Also, they are considered a fisheries management tool for the Algarve coast, especially for the gill net fisheries, which play a very important role in the region (Santos and Monteiro, 1997). Our results show that the sinking of ships has the lower EIA compliance, and that their EIAs consider fewer descriptors (specially, "Marine mammals"), which are generally distinct from the other two types of projects. Both hydrocarbons prospecting and wave energy projects give particular emphasis to "Coastal and terrestrial habitats". The hydrocarbons cases highlight descriptors such as "Lower trophic level", "Birds", "Fish", "Navigation, maritime transport and communication" and the "Physical environment", while the wave energy generation pays special attention to "Birds". The Alaska's hydrocarbons prospecting has the most descriptors' compliance, probably since the main goal of the report is to study the baseline conditions of the area, and serve as reference for further licensing permits and environmental studies.

The main goal of the *Ocean Revival*, specifically, was to increase the offer for (amateur) recreational diving in Algarve. However, the depth at which the ships are sunk (20-30 meters), has reduced visibility¹, since it is under influence of Rio Arade's Estuary; its currents and lost fishing gear, combined with the type of reef structure, limit the experience and the touristic potential of the project (more indicated for professional divers). Even though the impacts might prove minor, it might have been more practical (and enlightening) to conduct one Environmental Impact Assessment than depending on 14 licensing authorities and their opinions. One of *Ocean Revival*'s promoters believes that if EIA was mandatory for this type of projects, the bureaucracy process would have been far less demanding, even facilitating the development of the project². This comes to support the idea that EIA should be integral to project development and design processes, hence reducing the emphasis on compliance-oriented EIA. This would allow impact assessors to work more constructively with proponents and stakeholders to develop processes that meet the needs of all parties, and in so doing, result in projects that are consistent with the environmental and social aspirations of local communities (Morgan, 2012).

This article set out to infer about the need for the sinking of ships, the hydrocarbons prospecting and wave energy projects to be contemplated in Annex I or II of the DL 69/2000. It is hypothesized that subjecting national projects of these types to Environmental Impact Assessment, might help overcome some technical or methodological insufficiencies, which can be seen as gaps in their licensing process. These are summarized on the next few paragraphs.

Relatively to the *Ocean Revival*'s sunken ships, it was established that: i) there are no legal provisions for any type of environmental study, including EIA; ii) both the Administration of the Hydrographic Region of Algarve, competent licensing authority, and the Institute for Nature Conservation and Forests, the competent authority of AEInc, felt compelled to request an "Analysis of Environmental Incidences" as part of the licensing process, even though the legislation is silent; (iii) the sunken warships were donated at zero cost to the Municipality of Portimão (transparency issues); (iv) no answer was obtained when trying to contact SUBNAUTA by e-mail, aiming to gather the remaining conducted studies; (v) the sinking sites are close to the Site of Community Importance of Ria de Alvor, the ICNF's evaluation of impacts and project's approval is based on (insufficient) technical knowledge of submerged equivalent structures (possibly concrete pilot models, as described in Santos and Monteiro, 1997); (vi) monitoring reports required by ICNF for all phases of the project have not been publicly released; (vii) ICNF informed that a monitoring committee was formed to follow the pilot project, engaging entities with competence in the field; (viii) the licensing process of this project was subjected to 14 *ad hoc* favorable opinions from separate authorities, which reflects the lack of regulation of the project; (ix) there is public controversy concerning *Ocean Revival* because of the absence of public consultation, which was highlighted by the environmental NGO *Liga para a Protecção da Natureza* (LPN), based on their understanding

¹<http://visao.sapo.pt/aventura-creoula-6-mergulho-aos-navios-afundados-no-mar-de-portimao=f739040>; <http://www.sulinformacao.pt/2012/02/descontaminacao-dos-navios-para-afundar-em-portimao-custa-24-milhoes/> (In Portuguese), September 25th 2013.

² This was a personal comment from Luis Sá Couto, owner of SUBNAUTA, made during a debate over the "Artificial reefs: Pros and Cons" in Lisbon, organized by the Portuguese Centre of Sub-aquatic Activities (CPAS) on May 21st 2012.

that the project contradicts DL No. 59/97, DL No. 73/2011 and Dispatch No. 6484/2011³. This ENGO also opposes the international sinking of ships because it considers it as “dumping”.

For the Algarve’s hydrocarbons prospecting, it was established the following: (i) a first drilling will be done in 2014⁴, at 40 km from the Algarve’s coast, as declarations of the Minister of Environment in 2012 state that the prospecting and exploration would be conducted “beyond the 12 nautical miles between 400 to 600 meters deep, in an area not covered by Natura 2000 Network or the National Ecological Reserve (REN)”⁵; (ii) it is often ignored that exploratory activities – not only production – also involve drilling, though no EIA was conducted, nor any assessment of impacts (e.g. wildlife, fishing industry, tourism industry, recreational sports, regional assets, climate, coastal habitats) or potential associated risks (e.g. accidental spills); (iii) there are no binding legal dispositions in Portugal for offshore activities of oil/natural gas prospecting related to work safety, health issues or environmental responsibility; (iv) the first oil rig was allegedly bought as “scrap” in Indonesia⁶; (v) there is also public controversy (mainly related with environmental and economic risks for people, land and sea), and a petition⁷ has been launched by a regional association to force the Parliament to discuss this project (it is not the first one for this type of project in Portugal); and finally (vi) a local Member of the Parliament⁷ has been criticizing the project since it started for fear that the environmental impacts of an oil spill might seriously affect this tourism-dependent region, also that regional inhabitants are not obtaining any benefits from this environmental and economic risk they are subjected to, while also criticizing the lack of any open disclosures by the authorities or the companies involved and of any public consultation (lack of information and transparency).

In the case of wave energy projects such as the *Waveroller*, it was established that: (i) such projects are not subjected to EIA (Annexes I or II of DL 69/2000), but there is specific legislation determining the completion of an “Analysis of Environmental Incidences” (AEInc), a type of impact assessment only applicable to projects in sites of Natura 2000 Network. Additionally, the AEInc is considered a pre-evaluation instrument, which applies both to plans (SEA of plans and programs may superimpose) and to actions and projects (as EIA). In practice, AEInc does not have independent existence and its utility is subjective, since it follows the EIA procedures when, by ministerial decision, any project that may significantly affect the environment can be subjected to EIA (even if it is not contemplated in the EIA Directive’s annexes). The *Waveroller* project, which was recognized as a Project of Public Interest, obtained a “Conditionally-Favorable Decision on Environmental Issues”, meaning that its approval required the promoter to present a monitoring plan for marine mammals and fulfill the mitigation measures proposed by ICNF). There were no public objections to *Waveroller*;

³ http://www.lpn.pt/Backoffice/UserFiles/menu_lpn/CI/2012/CI_Naviosafundados_17_Fevereiro_2012.pdf (In Portuguese), September 13th 2013.

⁴ http://www.ccdr-alg.pt/ccdr/parameters/ccdr-alg/files/File/upload//Publicacoes/Clipping/20130627_JornalAlgarve_Gasnaturaloupetroleo.pdf (In Portuguese), September 13th 2013.

⁵ <http://www.mynetpress.com/mailemail/noticia.asp?ref4=2n&ID=%7b792AD3A4-15CB-443C-9123-6C9560826D59%7d> (In Portuguese), September 12th 2013.

⁶ <http://www.change.org/petitions/say-no-to-oil-rigs-in-the-algarve-diz-n%C3%A3o-%C3%A0s-plataformas-de-petr%C3%B3leo-no-algarve>, September 12th 2013.

⁷ <http://sicnoticias.sapo.pt/economia/article1366038.ece> (In Portuguese), September 13th 2013.

yet, according to the Portuguese Government⁸, this type of projects has solely two impediments: “the Portuguese bureaucracy and aspects of licensing (which) are obstacles to economic development”.

The results on the Countries’ and EIAs Comparisons, including main affected descriptors and potential impacts, allowed some considerations to be made on: 1) how Portugal could learn from other countries approach to similar projects, and settle on the benefits from subjecting these projects to EIA; and 2) how to promote harmonization between these projects’ legal frameworks and other regulations.

Although all the typologies of projects were analyzed together, the conclusions are given separately.

Regarding the sunken ships, although the predicted impacts are minor, it was determined that the more regulation projects have, the more impacts are identified. Also the impacts categories are similar between wave energy and sunken ships projects. The sunken ships projects which are conditioned by legislation (Malta and the UK have legal provision for EIA) present many resemblances with the wave energy legal dispositions and type of environmental study, in the international arena. These results suggest that this type of project should be subjected to Environmental Impact Assessment, under Annex I of the DL 69/2000. Particularly, the *Ocean Revival* project would benefit from EIA as suggested by LPN, and supported by the project’s promoter. From a perspective of administrative frameworks, this project would vastly benefit from a public competent authority, and consequent coordination between national planning bodies (offsetting the need of 14 *ad hoc* licensing opinions). In addition, evaluating cultural, social and economical issues, and having a mandatory public consultation would possibly prevent the public controversy and contribute to public clarification of the environmental impacts of such projects. Further advantages could come from compliance monitoring, and EIA subsequent monitoring reports, contributing for a better understanding of the seabed and the impacts of these structures, which are still subject to considerable debate.

Portugal is legally bound by the same Conventions on dumping of wastes (London Convention) and pollution from ships (MARPOL Convention) as Malta and the UK. However, both of these countries present specific legislation conditioning this type of projects, on the category of construction of artificial reefs and sinking of vessels (both from 2007). The Portuguese legal gap concerning this type of project should then equally imply the establishment of specific regulation, giving its innovative character (not even minimally addressed in Portuguese legislation) and the imminence of similar projects (OSPAR Commission, 2009).

Concerning the hydrocarbons prospecting, this research demonstrated that the international approach to this type of project resembles the one to the sinking of ships, in terms of legal basis and environmental reporting. However, this type of project is generally (in more countries) conditioned by legislation, even though it is only obliged to undergo EIA in Brazil (the project presenting more negative impacts). As shown on the EIAs Comparison, the prospecting phase is often considered along with the production phase, which needs a licensing permit and requires EIA. So, the EIS compliance can easily be attributed to the analysis of the full life cycle of the project, foreseeing hydrocarbons discovery and,

⁸http://www.tsf.pt/PaginalInicial/Vida/Interior.aspx?content_id=2837310&utm_medium=referral&utm_source=pulsenews&page=-1 (In Portuguese), September 13th 2013.

consequently, the production.

It is considered that, even if this type of project was to be included in the Annex I of the EIA Directive (and, consequently, in Annex I of DL 69/2000), independently from the hydrocarbons production licensing process, very few benefits would come out of it, as it is currently approached. At least, by contrast with the results from the EIAs Comparison; there is inexistence of monitoring plans and reports, public involvement and participation, and knowledge of baseline conditions.

It is widely agreed that if EIA is to make an effective contribution to this agenda, then a number of quality improvements will need to be made: scientific application, scoping and dissemination of best practice (Barker and Jones, 2013; Wood *et al.*, 2006). The oil and gas industry is already increasingly being held accountable for its operations through soft law concepts such as the precautionary principle, polluter pays and producer responsibility (Salter and Ford, 2000). It is clear that the regulatory regime offshore will get tougher and have an increasing influence on offshore oil and gas field environment planning and management. Further EU regulations should hereafter include work safety and health issues, environmental responsibility, and be extended to all the Member States' Exclusive Economic Zones.

As for wave energy projects, our results clearly demonstrate that this type of project is a regulated activity (Countries' Comparison); whether it is under EIA Directive 85/337/EEC (UK), the European Communities Foreshore Regulations, 2009 (Ireland) or specific legislation (USA and Portugal). Given the fact that the AEInc has some shortcomings, usually compensated by adopting the procedure of EIA, further legislative reform is probably not necessarily required to ensure EIA effectiveness, but rather a focus on changing the behavior of impact assessors (Morrison-Saunders and Retief, 2012). In practice, the fact that DL 69/2000 does not include wave energy projects is probably relating to the discretion of the EIA Directive, which will probably be rectified when the new Directive proposal entries into force (mainly because of the screening process). However, including this project in Annex II of DL 69/2000 (even though it produces <1MW, which is a requirement of ES by the UK) would not fundamentally change the type and quality of environmental reporting. Moreover, recalling the Portuguese bureaucracy question, concerning projects of wave energy generation, including them in Annex II of DL 69/2000 would probably just increase it.

The findings of this thesis are not final, and though they purport to be comprehensive, they are not exhaustive. The given conclusions and considerations apply to these projects specifically, even if it can be extrapolated in some cases. There are always gaps in knowledge that could not be filled during the research. For example, only one national project of each typology was taken into account, which restricts the conclusions to a small scale. This approach could be further pursued by analyzing the practical implications of each type of projects on local communities. By identifying the main stakeholders and conducting direct interviews (following the same approach as Ramos *et al.*, 2011), it would be possible to gather opinions about each Portuguese case study, which would serve to strengthen the given conclusions, or counter them.

Also, other innovative projects in the marine environment not subjected to EIA are imminent, and there should be consistent guidelines on how to conduct the screening process in order to ensure that projects with significant environmental effects are subjected to an impact assessment. This might be clogged by turning scoping an obligatory phase of EIA, but it should also be important to expand the scoping.

III. FINAL REMARKS AND FUTURE PERSPECTIVES

This thesis addressed specific projects affecting the marine environment in Portugal and their lack of EIA obligation in Portugal. The Portuguese EIA legal framework does not contemplate neither the sinking of ships, hydrocarbons prospecting or wave energy projects. The recognized gaps in the licensing processes of these projects represented the main motivation for the Research Paper. After conducting international comparisons (with and between legal frameworks and EIAs from similar projects, our findings suggest that some of the licensing processes' technical and/or methodological insufficiencies might be remedied by Environmental Impact Assessment.

There are benefits of realizing EIA for the three types of projects. However, we do not recommend that all of the projects should be included in Annexes I or II of DL 69/2000. The sinking of ships needs to have legislation requiring EIA for the licensing process to be complete. It is suggested that, similarly to the international case studies, this legislation should be specific and oriented to artificial reefs and sinking of vessels. This is justifiable by its public controversy (artificial reefs vs. dumping), extensively debated impacts and implications, and increasing investment in similar projects.

Increasing environmental awareness support the idea that the hydrocarbons prospecting should be regulated in the same way as the hydrocarbons production, and included in Annex I of DL 69/2000. Yet, the assessment of impacts must be independent from the licensing process of the production phase. Additionally, a number of quality improvements need to be made to improve the quality of these EIAs: scientific application, scoping and dissemination of best practice.

The wave energy projects are already subjected to Analysis of Environmental Incidences, which can be considered a pre-Environmental Impact Assessment. So, in practice, including this type of project in the Annex II of DL 69/2000 would not make a considerable difference on the reporting contents and outcomes. It could even increase some inconsistencies due to, for example, overlapping procedures or competent authorities' duties.

This thesis adopted, in this manner, a novel approach to the licensing process of these types of projects, focused on the possible benefits of them undergoing EIA, which not only elucidates decision-makers, but also, if necessary, provides mechanisms for development proposals to be amended and likely adverse impacts ameliorated. Although it can lead to abandonment of certain projects' proposals, its focus is on mitigation of any harmful environmental impacts expected to arise (Jay *et al.* 2007; Peterson, 2010).

The findings of this thesis have policy implications related to the three types of project hereby contemplated. These policy implications, developed in the Conclusions section of the Research paper, and previously synthesized, are quite important since the EIA, as a concept, has been accepted by governments, the international legal community, funding agencies and other key players. The profile of EIA is expected to increase as concerns over environmental issues grow and communities and governments recognize the importance of anticipatory and participatory mechanisms in their decision-making processes. The impact assessment community has the opportunity to build on these foundations, and shift EIA thinking away from the licensing obligation and closer to the critical decisions within organizations and sustainability. That is, EIA should be integral to project development and design processes, not left to the final legal step before project implementation (Morgan, 2012).

The conflicts between economic development and fragile natural resources can be solved by simple methods to incorporate EIA into development planning and review, as suggested by Gamman and McCreary (1988): empowering the project officer to broaden participation in the EIA process, organizing the information-gathering phase of EIA as a joint fact-finding and collaborative analysis effort, conducting post-project monitoring of mitigation measures, and carrying out a Master Environmental Assessment on a regional basis.

Before considering future research approaches, it is essential to admit some of the recognized limitations of this thesis.

First of all, and concerning the research approach, in particular, the online search, the availability of Environmental Impact Statements, and/or the dependency of international sources to answer questions by email, restricted the sampling spectrum. Also, the fact that there are not many English versions of international EIA reports from countries where English is not the first language, did not allow an accurate expression of the international outlook of these types of projects. However, some attempts were made to overcome this, throughout the thesis, by introducing other authors' scientific considerations for comparison purposes.

Secondly, concerning the EIA effectiveness, the obvious distinction between marine and land projects creates issues that have not been truly recognized within land-use planning and management to date. The EA regulations tend to fail to realize the differences in marine developments and activities, not just in their location but also with regard to the difficulties in carrying out an EA in the marine environment and the plethora of components that need to be assessed. Perhaps the major difference is in the manner of planning for each sector with land-based projects being governed by one encompassing system of legislation and marine projects being regulated by a variety of sectorial arrangements (Budd, 1999). This was taken into account when suggesting legal harmonization with other regulations, regarding each type of projects.

Further on EIA application, and according to Pope *et al.* (2013) and Bond *et al.* (2010), although EIA under the *National Environmental Policy Act* was originally intended to apply to strategic as well as project-level decision-making, the term remains almost exclusively reserved for project level assessment. The ability to make valid decisions on the environmental impact of a project depends to a large extent on the quality of the EIA process and the information used in the EIA report. Currently, the EIA Directive sets essentially procedural requirements, quality criteria and standards for information provision, whereas the EIA process as such is exclusively left to the national authorities. This often results in a lack of or poor quality of EIA data and analysis, which make their way into the EIA reports and lead to ill-informed decisions.

The proposal for a new EIA Directive (expected to come into force in 2014) aims to improve and clarify some of these procedures. For instance, a streamlined screening procedure will ensure that only projects with significant environmental effects are subjected to an impact assessment (e.g. projects using or affecting valuable resources, projects proposed for environmentally sensitive locations, or projects with potentially hazardous or irreversible effects). The proposal also strengthens the rules for the EIA procedure to ensure better decisions, for example, the scoping stage will become mandatory, hoping to bring more certainty and improve the quality of the assessment. The impacts of projects relating to new environmental challenges (e.g. impacts on climate change and biodiversity, measures to address risks from natural and man-made disasters, etc.) will be assessed, contributing to a

better protection of the human and natural environment. Assessing reasonable alternatives for projects will become obligatory and monitoring will be required for projects that appear to have significant negative effects on the environment. Also, competent authorities will be asked to better justify their final decisions. Finally, the various stages of the EIA process will also be streamlined and further harmonised to ensure more legal certainty and avoid inconsistencies with the EIA process itself and to other legislation (e.g. Industrial Emissions Directive (IED), Habitats Directive, Strategic Environmental Assessment Directive). In particular, timeframes will be introduced for key steps of the EIA process, as well as a mechanism to facilitate the assessment process when several assessments and permits are required.

Regarding public participation, and according to EIA legislation, the public has the right to be consulted and express its views on the project. “Public consultation” involves the public dissemination of impact studies and their results, during which interested parties (stakeholders) are given the opportunity to take part and influence the decisions. Lack of communication, transparency and understanding between the decision-makers, the scientific community and the general population can then lead to public controversy. According to Gonçalves (2002), as no institutionalized structures or processes exist for the debate and negotiation of the conflicting positions, underlying the Portuguese projects in the marine environment not subjected to EIA, the decisive space for discussion ended up being the mass media. Gonçalves (2002) also highlights a specific case where social movements and media campaigns converged to create conditions for the recognition of the role that science can play in both informing and legitimating political decision-making within EIA. In this manner, some input from contesting stakeholders (collected from the media) was given in the Discussion section, hoping to complement our conclusions, support the importance of public participation, and pave the way for future research. Unlocking the potential of EA, in large part, requires finding new ways to include input from informal processes surrounding EA (Mulvihill, 2003).

Some issues identified during the elaboration of this thesis were also not completely clarified, for instance, the remainder structural and functional information about the international EIS (Appendix I). The analysis of these data would constitute interesting lines of inquiry for future research, for example, to deepen some case-specific EIS incongruities, such as: lack of information necessary for decision-making and/or excessive unnecessary data, gaps on specific knowledge about some categories of impacts considered, failure to identify locational and technological alternatives to the proposed projects, mitigation and compensatory programs not included or not developed, lack of transparency in the process, or mismatch between the EIA and government plans, policies and programs.

However, the effectiveness and contribution of EIA provisions during construction, operation and maintenance (sunken ships and wave energy) and exploration, production and decommissioning (oil and gas operations) should also represent an interesting approach. This would allow an assessment of the real achievement stemming from the integration of EIA into sustainable decision-making. But, this would only provide convincing results if further knowledge was acquired concerning the effectiveness of the considered international EIAs as instruments of planning. It should also give us a broader perspective if an evaluation of the level of complementarity of EIA with other parallel assessments was performed (e.g. Risk Assessment, Cost Benefit assessment) or, at a more strategic and political level, Strategic Environmental Assessment.

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LEGISLATION

International

- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention) of 1992
- Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel Convention) of 1989
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APPENDIXES

APPENDIX I Results from the preliminary review of EIA documents

Table 1

Sunken ships projects

	Ex-HMS Scylla, Whitsand Bay, Cornwall (2004) - UK	Ex-P31 Patrol Boat, Comino (2009) - Malta	Ex-P29 Patrol Boat, Cirkewwa (2007) - Malta	Ex-HMAS Adelaide, NSW (2009) - Australia
EIA report format: nr of pages, chapters, etc	No information.	Terms of Reference (ToR) have 16 pages. PDS 26 pages - Chpts: Introduction, Background of the project, Objectives of the scheme, Characteristics of the site, Surrounding land and sea uses, Description of the scheme, Diving in Malta and Gozo, The diving product, The diving product on Gozo and Comino, Scuttling of diving wrecks (The issues), Feedback from stakeholders, Comino, Strategic approach to wreck development, Preliminary potential environmental impacts (1/2pg), Mitigation proposals. EPS-NTS 10 pgs: Introduction, Background to the scheme, Terms of reference, Method statements, EIA approach, Significance of impacts, Significant environmental impacts (1pg), Mitigation.	Environmental Planning Statement (EPS) has 6 pages - Chpts: Intro, EIA consultation, The proposed development, The site and surroundings, Planning, policies and legislation, Assessment of impacts and mitigation measures (1pg), Monitoring plans, Residual impacts, Comments made by the public and consultees, Conclusions.	Review of Environmental Factors (REF) has 107 pages - main chapters: Introduction, Environmental assessment framework, Consultation, Description of the activity, Description of the existing environment, Assessment of the likely environmental impacts (25pgs), List of approvals, concurrences, licenses, permits, Proposed environmental safeguards, Summary, References and bibliography.
Publicity of EIA decisions and results	EIA is not available online for consultation, only notes were given for this analysis regarding the requested criteria and methods.	According to EIA Regulations: publish a notice in at least one daily newspaper in English and one in Maltese according to the template specified in the Regulations; and attach a notice in Maltese and English.	This project is prior to the P31, it was important to corroborate some data that was lacking the P31 project. The results are available in EPS report and monitoring reports. ToR is less exhaustive/descriptive than the one from P31 and so is the EPS.	REF is available online (consultation included posting project progress and information on the LPMA website and later the official Ex-HMAS Adelaide website).

	Ex-HMS Scylla, Whitsand Bay, Cornwall (2004) - UK	Ex-P31 Patrol Boat, Comino (2009) - Malta	Ex-P29 Patrol Boat, Cirkewwa (2007) - Malta	Ex-HMAS Adelaide, NSW (2009) - Australia
Active public participation in the development of EIA	Not on the EIA process. But in posterior reports (Rame Head), Centre of Environment, Fisheries and Aquaculture Science's (CEFAS) staff engaged with stakeholders when requested and fulfilled their duties as government advisors, although they have not always fully communicated their results or explained the licensing process, or the constraints of detecting effects. The reports were brief and may not have enabled the public to fully understand the research outcomes.	Yes. EIA ensures that the significance of the impacts, and the scope for reducing them, is clearly understood by both the public and MEPA before a decision is made on whether or not the project should proceed.	The public was invited to submit comments on the EPS after certification (EPS was available for consultation at the Mellie, a Local Council and MEPA): No comments were received from stakeholders; Submission by Din I-Art Helwa requesting details of the depth, a statement of how scuttling would be carried out, a description of the cleaning process, a description of alternatives and a benthic survey were addressed in the EIA; appropriate signage and monitoring has also been addressed.	LPMA has undertaken considerable consultation to gain input on the project from other government agencies, diving interests and the general community (Interagency Steering Committee, Stakeholder Meetings, Consultation). Preparation of the REF, Plan of Management and Long Term Monitoring and Management Plan was undertaken by under a single consultancy engagement.

	Ex-HMS Scylla, Whitsand Bay, Cornwall (2004) - UK	Ex-P31 Patrol Boat, Comino (2009) - Malta	Ex-P29 Patrol Boat, Cirkewwa (2007) - Malta	Ex-HMAS Adelaide, NSW (2009) - Australia
Expected impacts confirmed in the field/Validity of concerns (taken from monitoring reports)	No evidence of increased turbidity or significant sediments' accumulation in the long term; Metal concentrations overestimated; No detectable ecological impacts of the litter; No specific records of harm to marine life; Vessel was colonized by a mature invertebrate and algal community: reduced species diversity, abundance of organisms (sulphur-reducing bacteria <i>Beggiatoa</i> , <i>Eunicella verrucosa</i> , various mobile crustaceans and fish); Characteristic species of degraded seabed, pollution and disturbance tolerant are not present; Insufficient evidence to link any decline in the populations of commercial fisheries to the disposal activity; No serious public health issues; Potential for loss of income if current dredging and disposal continue.	The outer surfaces of the P31 (and P29) wreck supported a biocoenosis of infralittoral algae; The species richness and abundance of the associated benthic macrofauna were impoverished compared to same biocoenosis on natural hard substrata; Megafauna were conspicuously rare; Paint is peeling off the wreck's hull and above-deck structures in places (this is expected to hinder biological colonization and succession processes, while introducing potential pollutants into the marine environment); Rich fish fauna in the vicinity of the P31 wreck (significantly surpassed that recorded from the bare soft sediment reference site); Small differences between the benthic map from 2011 work and data collected in 2008 - Decrease in cover of beds of the seagrass <i>Cymodocea nodosa</i> present in the immediate vicinity of the wreck; Appears to be structurally sound but the presence of deep scouring (3m deep) below the vessel's fore-section is concerning (stress on the ship's hull, potentially leading to breakage); few metal sheets and other metal items had become detached from the vessel and were found lying on the seabed on the wreck's port side; the sediment around the wreck didn't show any evidence of pollution from the wreck (visual inspection); no strips/flakes of paint were evident on the seabed in the vicinity of the wreck; no archaeological items were detected on the seabed within the area surveyed.		At the early stage of colonization, spatial differences in community assemblages were evident, particularly apparent among transects sampled from the deck and hull surfaces - which were significantly different from each other; The majority of the ship's surface had changed from being virtually bare to completely covered in encrusting organisms; Fish abundance and diversity have also increased substantially (three species; from three families were initially observed in the baseline survey: blackspot goatfish (<i>Parupeneus spilurus</i>), bannerfish (<i>Hemiochus</i> sp.) and sabretooth blenny (<i>Petroscirtes lupus</i>)); A total of 19 species from 16 families were observed during the present survey (dominated by eastern fortesque (<i>Centropogon australis</i>) and yellowtail scad (<i>Trachurus novaezelandiae</i>) and included a mixture of resident reef-associated species and transient visitors which are typical of temperate natural reef habitats); No introduced marine pests or species that are protected under conservation legislation were observed during the survey.

	Ex-HMS Scylla, Whitsand Bay, Cornwall (2004) - UK	Ex-P31 Patrol Boat, Comino (2009) - Malta	Ex-P29 Patrol Boat, Cirkewwa (2007) - Malta	Ex-HMAS Adelaide, NSW (2009) - Australia
Impacts confirmed by adequate methodology (monitoring)	Extensive monitoring at a high cost, justified using priorities based on the need for environmental protection and public concern; +-20% of the CEFAS total budget available for monitoring the impacts of dredge disposal has been assigned to the Rame Head site; Overall, the science has been adequate and proportionate to the issues being addressed; detailed studies have been carried out by CEFAS and other institutions - focused on sediment transport modeling, turbidity monitoring, contaminants monitoring and studies on the impacts of pollutants (accepted procedures and protocols).	Environmental Monitoring Plan (Adi Associates): Monitoring of the growth on the wreck itself and of fauna associated with it (simple visual assessment supported by video and/or photographs taken along the two transects, semi-quantitative assessment of the fish populations); Monitoring of changes to the physical environment around the wreck as a result of the reef's presence (visual inspection of the seabed supported by time-lapse photography at yearly intervals, side-scan sonar survey, samples of sediments and/or biota); Monitoring of the structure of the wreck itself for signs of deterioration/risks to divers (visual inspection).		Field surveys (11 and 13 October 2011): divers took photoquadrats and underwater video on different parts of the ship; Photoquadrats statistically analyzed - % cover of encrusting biota; Photoquadrats from the baseline survey (April/May 2011) compared with the current survey; Underwater video footage was reviewed and used to describe the encrusting reef community colonizing the hull, deck and superstructure; Monitoring structural integrity, vessel stability and position of the scuttled ship, sediment movement, colonization of the artificial reef over time by marine biota, sediment quality and bioaccumulation studies; Reef Community Baseline Survey: establishment of horizontal and vertical transects on the hull and superstructure of the vessel immediately post scuttling; Transects were recorded using a combination of underwater video and still photography methods providing a record of the baseline condition of marine growth on the vessel.

	Ex-HMS Scylla, Whitsand Bay, Cornwall (2004) - UK	Ex-P31 Patrol Boat, Comino (2009) - Malta	Ex-P29 Patrol Boat, Cirkewwa (2007) - Malta	Ex-HMAS Adelaide, NSW (2009) - Australia
Mitigating measures carried out satisfactorily	Yes, very few. Not aware of any changes to the project. The main point highlighted by the EIA was the potential for contamination from the antifouling paint if it was not removed. Subsequent correspondence with the Department for Environment, Food and Rural Affairs suggests that it is unlikely that there would be contamination of the environment from any residual TBT – the vessel was last painted in 1992 and most of the TBT would have already leached into the sea.	Yes? Detailed survey of the proposed scuttling location to identify an area that is devoid of <i>Cymodocea nodosa</i> beds or has as little of this sea grass as possible where to accommodate the vessel; Thorough cleaning of the vessel prior to scuttling; Removal of all structures from the vessel in order to render it safe for divers; Malta Maritime Foundation must certify that it is safe for divers; Scuttling is carried out according to guidelines to ensure it is a controlled and coordinated manner of scuttling; Plotting of the exact position on nautical charts and its presence signaled by means of a Notice to Mariners to be issued by MMA; Inclusion by the MMA of this dive site in the Notice to Mariners designating conservation areas around wrecks; Establish a post-deployment monitoring program of the marine environment, avifauna, archaeology and structural integrity of the vessel.	Monitoring scouring on a regular basis has been recommended; it is imperative that a "no fishing zone" be established around the wreck.	Environmental Safeguards: Scuttling Management Plan, Towing Stability Condition Report, Crown Reserve Plan of Management, Assessment Management Plan.
Decision-making significantly affected by EIA results	MIS had no hesitation in declaring it environmentally sound as long as the vessel is properly cleansed before placement and a sediment transport model shows no areas for concern.	Good practice advises that EIA should be treated as an iterative process, rather than a one-off, post-design environmental appraisal. In this way, the findings from the EIA can be fed into the design process, leading to the production of a more environmentally sensitive project.		REF was prepared. If the assessment had identified any significant impact on the environment, the legislation requires an EIS.

	Ex-HMS Scylla, Whitsand Bay, Cornwall (2004) - UK	Ex-P31 Patrol Boat, Comino (2009) - Malta	Ex-P29 Patrol Boat, Cirkewwa (2007) - Malta	Ex-HMAS Adelaide, NSW (2009) - Australia
Project modified as a result of EIA findings (or as result of a review process suggested by EIA)	There may be the case for a minor adjustment to the disposal site by moving it slightly further offshore over a rocky reef into slightly deeper water - adjustment to the boundary of the licensed area, enabling disposal in a rocky area with greater potential for offshore dispersal; Screening for litter prior to disposal shall continue as rigorously as possible and that quayside practices are monitored to reduce waste; The source of the PAH contamination should be investigated and studies to determine the fate of sediments and contaminants transported out of Plymouth Sound would be beneficial.	There is a EPS Addendum. The original scuttling location has been shifted towards the coast and in shallower waters (the original location earmarked for the scuttling had a depth of approximately 28m). The shift was made following the findings of the benthic survey, which showed that the original area identified for scuttling contained meadows of the sea grass <i>Posidonia oceanica</i> in the deeper parts and mixed beds of the sea grasses <i>Cumodocea nodosa/Halopila stipulacea</i> in the shallower parts. These mixed beds are a very rare phenomenon locally and are considered to be of scientific importance - once the Malta Maritime Authority gave the green light, additional studies were undertaken on the infauna, sediments, avifauna and archaeology.	It must be noted that the original proposal was for scuttling of the Trawler Hannibal (PA 00597/03: To scuttle trawler 'Hannibal' (to be renamed 'Wenzu' in the location shown). This proposal has been withdrawn and replaced by the present proposal; This scuttling location represents a shift by 30m to the North West from the previously proposed location. This is since the EIA identified impacts on rare benthic habitats present.	After a decade of positive community involvement, this situation changed in February 2010 when some members of the Avoca community formed the No Ship Action Group (NSAG). Just a few weeks before the original scheduled scuttling date of 27 March 2010, their vigorous opposition to the project culminated in legal action in the Administrative Appeals Tribunal. The first time a permit issued under the Environment Protection (Sea Dumping) Act 1981 had been reviewed by the Tribunal. The Administrative Appeals Tribunal handed down its decision on 15Sept2010, allowing the scuttling to proceed with some extra conditions - preparation of the ship and environmental monitoring. The Tribunal concluded 'all the information available to us points to a conclusion that there is no risk of harm to human health or the environment' and 'The level of pollutants now aboard the ship is low, and those that remain are either in very low quantities of inert and unlikely to cause any environmental problem'.

	Ex-HMS Scylla, Whitsand Bay, Cornwall (2004) - UK	Ex-P31 Patrol Boat, Comino (2009) - Malta	Ex-P29 Patrol Boat, Cirkewwa (2007) - Malta	Ex-HMAS Adelaide, NSW (2009) - Australia
EIA used as an effective instrument of planning (standard or specific approach?)	Communication between the various institutions was inadequate; the use of a standard approach can be criticized for not being sufficiently site-specific in formulating and addressing testable hypotheses for the area, so it suggests that the EIA didn't work as an effective instrument of planning, maybe because that wasn't its purpose to begin with.	Yes. EIA ensures that the likely significant environmental impacts of the proposals are assessed in a systematic way. These reports are very similar, same text, impacts, mitigation measures, very few information is site/project-specific. Regardless, it follows guidelines from the given Terms of Reference, and if one should consider the report <i>per se</i> , it is very informative about all phases of the project and its positive outcomes, not denying the negative impacts as well, and taking into account all the feedback from stakeholders and comments from consultees.		Yes. EIA includes a list of approvals, concurrences, licenses and permits (US Government, DEHWA, Sydney Ports Corporation, NSW Maritime, Gosford City Council, Civil Aviation Safety Authority, Dept of Environment and Climate Change, Dept of Primary Industries, Dept of Planning, WorkCover, Tourism NSW). It seems like a case-specific approach; also the impacts given are separated along with the phases of the project (scuttling and artificial reef).

Table 2

Hydrocarbons prospecting projects

	The Falkland Islands, North Falkland Basin (Desire) (2009) - UK	The Falkland Islands, North Falkland Basin (Rockhopper) (2009) - UK	Fylla, Greenland (2000) - Denmark	Beaufort Sea and Chukchi Sea, Alaska (2011) - USA	Espírito Santo Bay (2009) - Brazil
EIA report format: nr of pages, chapters, relevant info, etc	EIS has 397 pages with NTS and index: Introduction, Legislative framework, Stakeholder engagement, Alternatives to proposed drilling program, Project description, Operational aspects, Existing environment, Impact assessment and mitigation (23pgs), Management framework, Conclusions, Acknowledgements, References.	EIS has 410 pages with NTS and index, same chapt has the EIA from Desire project. Impact Assessment and mitigation (18 pgs).	Preliminary Environmental Impact Assessment has 48 pages and an index, main chapt: Summary, Introduction, Project description, Physical and ecological setting, Socioeconomic background, Preliminary impact assessments (11pgs), Mitigation measures, Identified gaps in knowledge and a preliminary EIA program, References.	Effects of Oil and Gas Activities in the Arctic Ocean: Draft Environmental Impact Statement has 1600 pages, Executive Summary (40pgs) - Index: Introduction, Alternatives, Affected environment and environmental consequences (13pgs), Oil spill analysis, Implementation, monitoring and reporting, and adaptive management. Supplemental Draft Environmental Impact Statement (2013) with 1408 pages.	EIA is divided in pdfs according to chapters; I. General Dispositions; II. Environmental Impact Study: Identification of the activity and the promoter, Characterization of the activity, Description of the activity, Area of influence, Environmental diagnose, Identification and evaluation of impacts (105 pgs), Analysis of alternatives, Risk analysis, Individual Emergency Plan, Mitigation measures, Conclusion, References, Glossary, Annexes, Technical staff.
Publicity of EIA decisions and results	Yes, EIS available online.		Yes, preliminary EIAs available online.	Yes, Draft and Supplemental Draft available online.	Full EIA and RIMA available online on the IBAMA site.

	The Falkland Islands, North Falkland Basin (Desire) (2009) - UK	The Falkland Islands, North Falkland Basin (Rockhopper) (2009) - UK	Fylla, Greenland (2000) - Denmark	Beaufort Sea and Chukchi Sea, Alaska (2011) - USA	Espírito Santo Bay (2009) - Brazil
Active public participation in the development of EIA	EIS prepared by, or on behalf of, the applicant and EIA commissioned by the Governor - no public review period, whereas an EIS will generally be required to go through public consultation period. Where public review is required, the statement is published in the Falkland Islands Gazette for 42 days following government submission; Opportunities for public discussion, dissemination of information and feedback from stakeholders will be available. The document is also presented to the Executive Council (ExCo).		Regulated by Mineral Act, other acts and regulations in GL don't apply for oil and gas exploration and production (e.g. environmental legislation and legislation on land use). It also means that procedures like public hearings and integration of local authorities do not apply to the petroleum industry.	During scoping: Concerns regarding the NEPA process; Impacts to marine mammals and habitats; Risks of oil spills; Climate change; Protection of subsistence resources and the Iñupiat culture and way of life; Availability of research and monitoring data for decision-making; Monitoring requirements; Suggestions for, or implementation of, mitigation measures.	Yes.
Expected impacts confirmed in the field/Validity of concerns	No monitoring reports available.				

	The Falkland Islands, North Falkland Basin (Desire) (2009) - UK	The Falkland Islands, North Falkland Basin (Rockhopper) (2009) - UK	Fylla, Greenland (2000) - Denmark	Beaufort Sea and Chukchi Sea, Alaska (2011) - USA	Espírito Santo Bay (2009) - Brazil
Impacts confirmed by adequate methodology (monitoring)	Careful monitoring and control of the fluid system and installation of casing in each section of the well and also a blow-out preventer stack; Waste transfers from the rig will be fully documented in line with rig procedures and relevant international regulatory monitoring and reporting procedures; Analyzing the water temperature at different depths over a seven month monitoring period; Seabird monitoring and survey programs conducted by FC/JNCC; UK standard Environmental Emissions Monitoring System (EEMS) - monitoring the consumption of resources and emissions to air and water. Shipping manifests will be completed for all shipments to and from the drill rig; Monitoring, calculating and reporting of greenhouse gas emissions requires various assumptions to be made and relies on a multiple tier approach based on degrees of uncertainty; Marine observers or acoustic monitoring for standard drilling and vessel operations are not required; Monitoring and reporting figures for resource consumption in accordance with established protocols.		No monitoring methodology.	The MMPA requires that monitoring plans be independently peer reviewed “where the proposed activity may affect the availability of a species or stock for taking for subsistence uses.” During these reviews, NMFS charged the panel members with determining whether or not the monitoring plans, as put forth by the applicants, would accomplish the goals described earlier in this Executive Summary. After the meetings, the panel members provided a final report to NMFS with their recommendations. NMFS then works with the applicants regarding the practicability of including these measures and protocols, and then includes the selected measures as requirements in the issued authorizations. Recommendations from improvements to monitoring plans have been made to NMFS at the Arctic Open-Water Meetings, through public comments on NEPA and MMPA documents, and at Plan of Cooperation (POC) meetings. The new peer review format that has been developed includes: focused prioritization of needs and guidance to applicants before they develop their initial applications.	Impacts’ evaluation: mathematical models of dispersion for gravel and drilling fluids and oil. The impacts were identified in the different phases of the project, considering the performance of support vessels. Environmental monitoring plan: identify the marine local fauna (specially, cetaceans, turtles and birds) and their behaviour when in presence of the platform (systematic observation from offshore platforms or fixed points on land); Identify and classify the vessels near the platform, their fishing gear and target species (Marine Traffic Registration forms); Evaluate (by VRO) the existence of sensitive communities around the areas of the exploratory wells in order to avoid this type of activities in those areas.

	The Falkland Islands, North Falkland Basin (Desire) (2009) - UK	The Falkland Islands, North Falkland Basin (Rockhopper) (2009) - UK	Fylla, Greenland (2000) - Denmark	Beaufort Sea and Chukchi Sea, Alaska (2011) - USA	Espírito Santo Bay (2009) - Brazil
Mitigating measures carried out satisfactorily	No monitoring reports available.		No report.	I've no knowledge of any monitoring report or even if there should be one. This Draft extensively considers all the alternatives and gives mitigation measures to all possible scenarios admitted. Standard Mitigation Measures: required in all 4 of the action alternatives, NMFS and BOEM have agreed that these are appropriate to require in G&G permits, ancillary activity notices, and MMPA authorizations. Typically, these measures (e.g. shutdown zones, time/area closures to protect known subsistence uses) have been used consistently in past permits and authorizations; Additional Mitigation Measures: evaluated but not required in all 4 action alternatives, may or may not be implemented in current and future activities depending on the outcome of the MMPA authorization processes (or other environmental compliance processes) associated with current and future actions. These measures are intended to include other reasonable potential mitigation measures, such as those that have been required or considered in the past or recommended by the public.	No known report. Some of the identified impacts are already expected to be mitigated by environmental control procedures predicted by PERENCO. Additionally, some environmental projects were proposed, such as: Environmental monitoring projects, Pollution control, Social communication, Environmental education to workers, etc.

	The Falkland Islands, North Falkland Basin (Desire) (2009) - UK	The Falkland Islands, North Falkland Basin (Rockhopper) (2009) - UK	Fylla, Greenland (2000) - Denmark	Beaufort Sea and Chukchi Sea, Alaska (2011) - USA	Espírito Santo Bay (2009) - Brazil
Decision-making significantly affected by EIA results	Despite the high sensitivity and international importance of the Falkland Islands' waters, there is obvious dedication to carrying out these operations to a high environmental standard. Given the current operational commitments and proposed mitigation measures, it is considered that the proposed operations can be undertaken without significant impacts to the Falkland Islands' environment.		Yes. The main political issue on Greenland is the right of land-ownership. The ownership of the petroleum-resources has been debated since the beginning of the 1970's (historical rights); Economy and income: where some see the possibilities others see negative impacts both environmentally and socially; Greenland-Denmark relations - A Fylla development and production project could mean less economic dependence on Denmark.	Yes. The Final EIS will identify the Preferred Alternative given the findings of this report (no-action conditions and impacts of the project). The Record of Decision (ROD) will provide a listing of activities addressed by the Preferred Alternative and will identify any conditions of approval that are relevant to industry authorization requests. The EIS and ROD together constitute a decision document to be used for ongoing and future permitting activities addressed by this EIS. NMFS and BOEM will use the EIS when issuing ITAs and G&G permits and ancillary activity notices for oil and gas exploration that may occur within the five-year period of 2012 through 2017.	The preparation of this EIS aims to support the licensing body on the decision-making process regarding the granting of the license (Preliminary permit and Operating license) for execution of exploratory activity in these blocks. IBAMA issued the ToR No. 02/09 of March 2009 for the EIS.

	The Falkland Islands, North Falkland Basin (Desire) (2009) - UK	The Falkland Islands, North Falkland Basin (Rockhopper) (2009) - UK	Fylla, Greenland (2000) - Denmark	Beaufort Sea and Chukchi Sea, Alaska (2011) - USA	Espírito Santo Bay (2009) - Brazil
Project modified as a result of EIA findings (or as result of a review process suggested by EIA)	No. As no strong environmental gradients were recorded within the sediments, generally weak correlations occurred within the macrofaunal community and other environmental variables; Overall, no environmentally sensitive species or habitats considered to be of conservational value were recorded during the regional survey operations; Neither macrofaunal nor physico-chemical analysis revealed any background contamination within the sediments analyzed for this study		Further work: CO ₂ -emissions need to be calculated (different technical solutions); NO _x emission (different alternative concepts); potential impact on air quality, nitrogen deposition and onshore impacts; VOC-emissions, the potential of elevated ozone concentrations close to the ground and possible impacts on vegetation; SO ₂ emissions; Potential impact of noise from helicopter transport on sea birds and marine mammals; Noise levels from onshore facilities; volumes and composition of discharges to the sea, their potential impacts on marine life; discharges related to pre commissioning and commissioning activities; Environmental risk analysis for production phase on a year round basis(oil spills from accidents involving the storage tanks onboard the production vessel, shuttle tankers; impacts of both flora and fauna,	The alternatives are based upon the agencies' analysis of additional information, including the comments and information submitted by stakeholders during the Draft EIS public comment period. For this reason, the agencies determined it appropriate to prepare a Supplemental DEIS and allow for an additional public comment period before releasing the Final EIS and Record of Decision. Substantive changes - Alternatives: Added a new alternative that contemplates a higher level of exploratory drilling activity; Based on updated data, modified some of the time/area closures (areas in which activities could be limited in order to protect marine mammals during times when key life functions are being performed) and subsistence hunting areas from the effects of exploration activities. Mitigation Measures: Updated the structure and analysis of the mitigation measures contemplated for inclusion under the alternatives; For each measure, outlined activities to which it applies its purpose, the science, support for reduction of impacts to marine mammals or subsistence availability of marine mammals, the likelihood of	No. The activity seems to be environmental viable, the majority of the impacts were considered of low importance. Besides that, it was demonstrated the feasibility to avoid or mitigate these impacts through the proposed measures and environmental projects to be developed throughout the life cycle of the project (already mentioned).

	The Falkland Islands, North Falkland Basin (Desire) (2009) - UK	The Falkland Islands, North Falkland Basin (Rockhopper) (2009) - UK	Fylla, Greenland (2000) - Denmark	Beaufort Sea and Chukchi Sea, Alaska (2011) - USA	Espírito Santo Bay (2009) - Brazil
			landscape and cultural heritage interest at the alternative locations; data on fishery activity in the field development area and along possible pipeline routings (safety and/or restriction zones and interactions between subsea installations/pipelines and fishery activities); Potential social and cultural impacts (concepts, cost evaluations and production - direct economic impacts through personal taxation, production royalties, company taxes, and secondary impacts through purchase of local products and services as well as consume generated effects); local labor market and education, population developments and community structure.	effectiveness, the history of implementation, practicability for applicant implementation, and recommendation for how, and if, to apply the measure in future MMPA ITAs; Baseline Information: Using data and literature noted by commenters during the previous public comment period, updated information in the affected environment sections to incorporate newer information (mostly for marine mammals and subsistence activities). Impact Analyses: Revised the impact criteria and analyses of potential impacts to marine mammals and subsistence resources to include additional factors that more closely align with analyses conducted under the MMPA; Included information regarding potential changes to the acoustic criteria currently used by NOAA to determine the level at which injury of marine mammals and behavioral effects from seismic airguns occurs.	

	The Falkland Islands, North Falkland Basin (Desire) (2009) - UK	The Falkland Islands, North Falkland Basin (Rockhopper) (2009) - UK	Fylla, Greenland (2000) - Denmark	Beaufort Sea and Chukchi Sea, Alaska (2011) - USA	Espírito Santo Bay (2009) - Brazil
EIA used as an effective instrument of planning (standard or specific approach?)	Probably not. All of the studies from the Falkland Islands have the same structure and text, impacts and figures to demonstrate them, mitigation measures, alternatives, etc, and very few information is specific.		Yes. "The content of an EIA will have to be adjusted to fit the actual project and location, but overriding issues as given in the guidelines, are the cumulative effects and the indigenous people of the Arctic".	Yes or it should rather be considered as guidelines. Because the EIS addresses general effects and is not specific to the request for an ITA for a particular activity, additional NEPA review may be required for each application for authorization. The form of the additional review will depend on the nature and scope of the proposed activity (Categorical Exclusion and/or a Memorandum to the File; Environmental Assessment (EA); a Supplemental EIS; or a new EIS.	Yes. Although having the same approach/context, structure and mitigation measures (plans for monitoring, etc), as other reports on different projects of this type, the reports are informative and the descriptions and environmental diagnoses are area-specific, as is the history of past explorations at the given site. "It is imperative that the politico-administrative jurisdictions (federal, state and municipal) have established criteria and standards to contribute to the development of the coastal areas, the use of resources and rationalization of socioeconomic or cultural activities developed within their limits. It is in this context that the environmental diagnosis in this EIA is performed".

Table 3

Wave energy projects

	Oyster 2 Array Wave Energy Project, EMEC, Orkney, Scotland (2011) - UK	Atlantic Marine Energy Test Site, Belmullet, County Mayo (2011) - Ireland	Reedspot, Oregon (2012) - USA
EIA report format: nr of pages, chapters, relevant info, etc	ES has 135 pages, index and main chapters: NTS, Introduction, Legislative framework, Project alternatives, Project description, Stakeholder engagement, Environmental overview, Environmental impact assessment methodology & envind, Marine wildlife impact assessment, Seabed interactions impact assessment, Navigational safety risk assessment, Accidental discharges (37pgs overall impacts), Environmental management and monitoring, References.	EIS has 212 pages, index and main chapters: NTS, Introduction, Rationale and alternatives, Alternative solutions examined, Project description, Impact on human activity, Flora and fauna, Water, Soils, geology and groundwater, Air quality, Noise, Traffic and transport, Navigation risk assessment, Cultural heritage, Visual impact assessment, Material assets, Coastal processes, Indirect and cumulative impacts and interaction between them, Summary of impacts and mitigations (142 pgs overall impacts), Management, monitoring and communications, Conclusion.	EA has 288 pages, index and main chapters: Executive Summary, Introduction, Proposed action and alternatives, Environmental analysis (171 pgs, impacts are mixed along several chapters; this one and the following three), Developmental analysis, Conclusions and recommendations, Finding of no significant impact, Literature cited, List of preparers.
Publicity of EIA decisions and results	Yes, ES available online.	Yes, all chapters of AMETS-EIS available online.	Yes, EA available online together with the Notice of Availability of EA.

	Oyster 2 Array Wave Energy Project, EMEC, Orkney, Scotland (2011) - UK	Atlantic Marine Energy Test Site, Belmullet, County Mayo (2011) - Ireland	Reedspot, Oregon (2012) - USA
Active public participation in the development of EIA	Yes. Aquamarine Power has undertaken to engage regularly and thoroughly with stakeholders, where necessary against a backdrop of a number of established relationships between EMEC and consultees. Consultation throughout EIA: Ensure that statutory and other bodies with a particular interest in the environment are informed of the proposal and provided with an opportunity to comment; Obtain baseline information regarding existing environmental site conditions; Establish key environmental issues and identify potential effects to be considered; Identify those issues which are likely to require more detailed study and those that may be justifiably excluded from further assessment; and Provide a means of identifying the most appropriate methods of impact assessment. Community consultation: The majority of comments related to the onshore elements of the project.	Yes. An Environmental Scoping Report for the project was prepared separately and issued to statutory bodies nationally and to key stakeholders in the Belmullet area. Prior to its issuance, consultation took place with the National Parks and Wildlife Service, Heritage and Local Government. A public meeting was also held in Belmullet in April 2010. The comments are present in the EIS report. Throughout the project development stage meetings were held with key stakeholders at local and national level and with representatives in the Belmullet area.	Yes. The intent of the Commission's pre-filing process is to initiate public involvement early in the project planning process and to encourage citizens, governmental entities, tribes, and other interested parties to identify and resolve issues prior to an application being formally filed with the Commission. To this end, OPT conducted consultation under the traditional licensing process, which included 45 meetings or conference calls with a wide range of stakeholders, including numerous resource agencies, tribes, and non-governmental organizations representing fishermen, surfers, and conservation groups.

	Oyster 2 Array Wave Energy Project, EMEC, Orkney, Scotland (2011) - UK	Atlantic Marine Energy Test Site, Belmullet, County Mayo (2011) - Ireland	Reedspot, Oregon (2012) - USA
Expected impacts confirmed in the field/Validity of concerns	No monitoring report but the ENVID (Environmental Impact Identification) process has been applied throughout the project. An initial ENVID was undertaken during the scoping stage of EIA and the results incorporated into the EIA Scoping Report. This was carried forward and updated during the full EIA following receipt of the Scoping Opinion. Findings: Potential interactions with marine wildlife; Potential interactions with the seabed; Potential navigational safety issues; and Potential accidental discharges.	No monitoring report, but the problems raised by the stakeholders groups are in concordance with the most discussed impacts in the EIS: Fishermen - loss of fishing ground, noise and electromagnetic effects on target species; Water-based activities - impacts of SAC near the cable landing beach, effects on birds, surfing waves and employment; Local area councilors - concern that local people have to be properly consulted about plans for the project; Public information - effect of trenching of cables on the beach, visual impact of shore facilities and devices at sea, impacts on flora and fauna, royalties on the commercial exploitation of wave energy and the assertion that even the wave and weather buoys deployed for the proposed project were taking up valuable fishing area.	Consultation indicated that the primary issues associated with licensing the project are potential effects of the proposed project on marine mammals, birds, salmon, navigation, commercial fishing and crabbing, and recreation. I didn't have access to any monitoring report. But the EA report is very focused on these issues and since there was no significance evaluation of the impacts, it was highlighted the need for monitoring studies to confirm the estimated impacts.

	Oyster 2 Array Wave Energy Project, EMEC, Orkney, Scotland (2011) - UK	Atlantic Marine Energy Test Site, Belmullet, County Mayo (2011) - Ireland	Reedspot, Oregon (2012) - USA
Impacts confirmed by adequate methodology (monitoring)	<p>The environmental monitoring strategy is an important aspect of Aquamarine Power's wider development strategy, monitoring undertaken for Oyster2 Array will be designed to be fit for purpose and appropriate to the scale of development and the projects' location within the EMEC wave test site. However, monitoring will also be undertaken to help define the likely extent of any potential impacts or identify performance improvements in the context of the intended commercial development of the Oyster technology, e.g: Assessment of the potential for impact on marine wildlife (marine wildlife data collected for the EMEC wave test site by both EMEC (wider test site, April 2009 – March 2011) and Aquamarine Power (inner bay area, April 2010 – March 2011)); Assessment of the potential for impact on the seabed environment (field work conducted at the installation site, desk-based research and Aquamarine Power's experience of deployment of Oyster 1); Measurement of underwater noise and fouling; Navigational Safety Risk Assess. and addendum have been undertaken in accordance with Marine General Guidance Notice - Offshore Renewable Energy Installations: Guidance on UK Navigational Safety and Emergency Response Issues; EMEC's Integrated Management System manual, Standard Operating Procedures and Permit to Work system.</p>	<p>The Strategic Environmental Assessment of the Offshore Renewable Energy Development Program envisages that one of the roles of AMETS Management Organization will be to design and implement an Environmental Management System, including audit of sub contractors and developers to make their assessments. The AMETS Environmental Management System will ensure that the environmental conditions, as characterized by the baseline studies, will be monitored on an on-going basis, so that any negative or positive impacts, caused by AMETS project, can be addressed at the earliest possible stage. General ecological monitoring (monthly sampling for marine mammals, birds and benthos until March 2012), including wave and weather data for the site, ecological surveys, underwater noise monitoring using acoustic hydrophones to characterize the background noise of the site and the noise emitted from the WEC devices in situ, specialist studies, brown crab survey, artificial reef effects from rock armouring, effects of nursery area created by the test site, water quality surveys, the output of the monitoring program will be used to inform and guide the management of the test site and provide data to enable a robust assessment of the impact of wave energy converter types and the test site itself on the ecology of the area.</p>	<p>The Settlement Agreement sets forth a detailed and collaborative Adaptive Management Process (AMP) through which the parties will evaluate monitoring results and consider the need for changes in design, operations or structures; changes in maintenance or other management practices; new or modified monitoring efforts; temporary suspension of construction or operations; or removal of one or more structures. The parties further agreed to use the AMP to identify and implement additional monitoring that may be required to evaluate a potential future license amendment to expand the project to up to 50 MW. We conclude that the AMP defined in OPT's proposal provides an appropriate framework to guide implementation of monitoring efforts, modify these efforts as needed, and identify appropriate potential measures to address any unanticipated adverse effects. The feedback loop that the AMP provides is especially important given the very limited amount of information that is available from constructed wave energy conversion projects.</p>

	Oyster 2 Array Wave Energy Project, EMEC, Orkney, Scotland (2011) - UK	Atlantic Marine Energy Test Site, Belmullet, County Mayo (2011) - Ireland	Reedspot, Oregon (2012) - USA
Mitigating measures carried out satisfactorily	As a new technology still in the test phase of development, operational environmental monitoring data for Oyster is limited. However, Aquamarine Power has developed an Environmental Monitoring Plan (EMP) and is committed to increasing the understanding of potential environmental impacts that result from the installation, operational and maintenance and decommissioning of the Oyster technology. This is an important part of the company's technology development process and also an important contribution to the advancement of this emerging renewable energy industry.	The data from the monitoring program described above will then be provided to WEC developers to enable them modify designs to mitigate against identified environmental impacts specifically associated with their device.	Staff's alternative was the preferred alternative because, under it, the project would: (1) provide a dependable source of electrical energy for the region (4,140 MW annually); (2) provide 1.5 MW of electric energy generated from a renewable resource that may offset the use of fossil-fueled, steam-electric generating plants, thereby conserving non-renewable resources and reducing atmospheric pollution; (3) include the recommended environmental measures to protect, mitigate, and enhance environmental resources affected by the project; (4) provide, through proposed monitoring, an improved understanding of the environmental effects of wave energy projects, which would be instrumental in assessing the potential effects of future projects of this type and identifying measures to minimize adverse environmental effects. The overall benefits of the staff alternative would be worth the additional costs of the recommended environmental measures.

	Oyster 2 Array Wave Energy Project, EMEC, Orkney, Scotland (2011) - UK	Atlantic Marine Energy Test Site, Belmullet, County Mayo (2011) - Ireland	Reedspot, Oregon (2012) - USA
Decision-making significantly affected by EIA results	The decision process related to defining whether or not a project is likely to significantly impact on the environment is the core principal of the EIA process. As there were modifications made to the project and choices made according to the findings of the studies mentioned in the EIA, evidently the EIA results influenced, or better, determined the course of the project.	The core activity of the AMETS will be on-going research and development program including monitoring of the environmental effects of small numbers of a variety of different types of wave energy converters, so that the results can be extrapolated to the likely impacts of future full scale wave farms and can inform licensing and policy decisions as to the appropriate location and scale of future farms.	Based on our independent review of agency and public comments filed on this project and our review of the environmental and economic effects of the proposed project and its alternatives, we selected the staff alternative, with some extra recommendations given on the EA. On the basis of our independent analysis, we conclude that approval of the proposed action, with our recommended measures, would not constitute a major federal action significantly affecting the quality of the human environment. Preparation of an environmental impact statement is not required.
Project modified as a result of EIA findings (or as result of a review process suggested by EIA)	Site selection: Use the EMEC wave test site to develop a test array adjacent to Oyster 1 or Subject to a successful application for a lease option agreement to The Crown Estate, develop a test array within the Brough Head Wave Farm site; Micro-sitting: Establish the most suitable location for deployment of the devices within the test site area.	The location of the AMETS was identified following a rigorous assessment of 7 locations on the west coast of Ireland (available wave resource to generate electricity, seabed conditions, environmental constraints, possibility of a grid connection, available infrastructure to support the development and suitable water depths reasonably adjacent to shore - Belmullet. There was also an assessment of options for cable landing in the vicinity of Annagh Bay and 5 locations were identified (preliminary cultural heritage and ecological surveys were carried out to identify any constraints; technical feasibility, environmental and cultural heritage) - Belderra Strand.	

	Oyster 2 Array Wave Energy Project, EMEC, Orkney, Scotland (2011) - UK	Atlantic Marine Energy Test Site, Belmullet, County Mayo (2011) - Ireland	Reedspot, Oregon (2012) - USA
EIA used as an effective instrument of planning (standard or specific approach?)	Yes. There was a scoping opinion from the Scottish Ministers that gave guidelines for the issues that should be contemplated in this report, very case-specific. One can really watch the project being developed on paper; the choices are made according to descriptive and field studies, considering options and all the potential impacts. All phases, operations, activities, devices, structures and materials seem to be covered and analyzed.	Yes. The report is very well organized and to the point, the impacts, alternatives, mitigation measures are very well identified. It has a continuity purpose, mainly, for monitoring methodology that evokes the "learning with your mistakes and correct it", it doesn't evaluate the impacts' significance, that's a negative point but as "The main objective is to inform future environmental assessment processes for larger scale commercial ocean energy development internationally", I think that it can be considered an effective instrument of planning	Yes. Although the impacts' section is confusing and repetitive, the structure isn't very reader-friendly and the impacts aren't quite evidently identified neither does their significance. But still the context, the management program, the choice of the best alternative and further measures to be applied make this, in my belief, an effective planning report

APPENDIX II Original table of projects' main potential impacts reported in EIS

		UK (S)	Malta2009 (S)	Malta2007 (S)	Australia (S)	FIDesire (H)	FIRockhopper (H)	Greenland (H)	Alaska (H)	Brazil (H)	UK (W)	Ireland (W)	USA (W)
Biological impacts	Existing marine biota	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Coastal and onshore habitats	0	0	0	0	-1	-1	-1	-1	-1	0	-1	0
Social and Economical impacts	Tourism and recreation	0	+1	+1	+1	0	0	+1	-1	-1	NA	+1	0
	Land use (marine archaeology and cultural heritage)	0	0	1	0	-1	-1	NA	0	0	-1	NA	NA
	Landscape and visual assessment	0	0	0	0	0	0	0	0	0	0	-1	-1
	Navigation and maritime transport	0	-1	NA	-1	0	0	+1	-1	-1	-1	-1	-1
	Fisheries	0	-1	-1	0	-1	0	0	-1	-1	-1	-1	-1
	Population and human health	0	0	0	0	-1	-1	NA	0	NA	NA	0	0
Physical impacts	Geology (soil/sediment quality)	0	-1	-1	0	-1	-1	-1	0	-1	0	-1	-1
	Waves, currents and coastal processes	0	-1	-1	0	0	0	0	0	0	-1	-1	-1
	Water quality (possible sources of contamination)	-1	-1	0	0	-1	-1	-1	0	-1	-1	-1	-1
	Air quality and climate	NA	NA	NA	-1	-1	-1	-1	-1	-1	0	0	NA
	Noise and vibration	NA	NA	NA	-1	0	0	-1	-1	-1	-1	-1	-1

(S = sunken ships; H = hydrocarbons prospecting; W = wave energy; -1 = negative, 0 = neutral, +1 = positive, NA = Not available)