

ENVIRONMENTAL IMPACT ASSESSMENT TO SUPPORT MARINE INNOVATION

The ‘Rochdale Envelope’ and ‘Deploy & Monitor’ in the UK’s Ocean Energy Industry

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A new industrial revolution is taking place in the oceans, as humankind increasingly looks offshore to meet its needs for energy, resources and food.¹ This growing demand for marine space and resources is placing further pressure on an ocean whose health is already declining. This evolving situation is encapsulated by the emerging ‘Blue Economy’ discourse, which advocates sustainable development of the oceans to meet economic and social needs.² The European Union (EU), in its Blue Growth Agenda, highlights the potential to ‘harness the untapped potential of Europe’s oceans, seas and coasts for jobs and growth ... whilst safeguarding biodiversity and protecting the marine environment’.³ Developing a blue economy is a major challenge that necessitates the evolution of existing regulatory frameworks.

Marine renewable energy (MRE) resources, such as offshore wind, wave, and tidal, have been identified by the EU as one of the five key ‘value chains’ that can contribute to a blue economy.⁴ Offshore wind is growing rapidly,⁵ with projects moving into deeper waters, and new technologies being developed.⁶

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¹ *Smith, H.D.*, The Industrialisation of the World Ocean, *Ocean & Coastal Management*, 2000 (43), p. 11; *Stojanovic, T. & Farmer, C.J.Q.*, The Development of World Oceans & Coasts and Concepts of Sustainability Marine Policy, 2013 (42), p. 157.

² *Dom, A.*, Limits to Blue Growth, *EP Intergroup CCBSD* (Seas at Risk, 2014); *Kathijotes, N.*, Keynote: Blue Economy – Environmental and Behavioural Aspects Towards Sustainable Coastal Development, *Procedia – Social and Behavioral Sciences*, 2013 (101), p. 7; *Surís-Regueiro, J.C., Dolores Garza-Gil, M. & Varela-Lafuente, M.M.*, Marine Economy: A Proposal for Its Definition in the European Union, *Marine Policy*, 2013 (42), p. 111.

³ *European Commission Maritime Affairs*, *Blue Growth: Opportunities for Marine and Maritime Sustainable Growth*, 2012.

⁴ *Ibid.*

⁵ *Global Wind Energy Council*, *Global Wind Report: Annual Market Update 2013*, pp. 53–57.

⁶ E.g. floating turbines.

In the United Kingdom (UK) offshore wind currently meets around 3% of total electricity demand, but this figure is likely to rise substantially in pursuit of the UK's legally binding target⁷ to source 20% of its total energy consumption from renewables by 2020.⁸

Ocean energy technologies,⁹ which utilise waves and tides to generate electricity, are now attracting considerable interest and investment,¹⁰ and bringing their own unique challenges to existing marine governance and project approval frameworks.¹¹ Indeed, ocean energy is not simply a technically challenging extension of onshore renewable energy technologies: 'the policy environment, governance, patterns of resource use, conservation values, and distribution of ownership rights are all substantively different'.¹² Interest in ocean energy is particularly high in Europe, where the European Commission has developed an action plan to support the sector.¹³ The UK, and Scotland in particular, has emerged as the frontrunner in this new industry, with ocean energy enjoying political support, resources and technical expertise.¹⁴

1. ENVIRONMENTAL IMPACT ASSESSMENT FOR OCEAN ENERGY

Ensuring that the deployment of innovative new technologies does not negatively impact the marine environment is a defining challenge of the push towards a blue economy. This is particularly acute in relation to new renewable energy technologies, where there is concern that damage will be caused to local and

⁷ Under the EU Renewable Energy Directive (2009). See Department of Energy and Climate Change, *The UK Renewable Energy Strategy (2009)* www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/res/res.aspx.

⁸ Scarff, G., Fitzsimmons, C. & Gray, T., *The New Mode of Marine Planning in the UK: Aspirations and Challenges*, *Marine Policy*, 2015 (51), p. 96.

⁹ The term 'ocean energy' is used to denote wave and tidal technologies, whereas the broader term MRE includes offshore wind. Ocean energy also encompasses ocean thermal energy technology (OTEC) and salinity gradient technology. These technologies have followed a different development pathway to wave and tidal. In this chapter, 'ocean energy' refers to the wave and tidal technologies currently approaching commercialisation in the UK.

¹⁰ For up-to-date investment figures, see the latest edition of the REN1 Global Status of Renewables report, available at www.ren21.net/.

¹¹ Wright, G., *Marine Governance in an Industrialised Ocean: A Case Study of the Emerging Marine Renewable Energy Industry*, *Marine Policy*, 2015 (52), p. 77; Kerr, S. *et al.*, *Establishing an Agenda for Social Studies Research in Marine Renewable Energy*, *Energy Policy*, 2014 (67), p. 694.

¹² Kerr, S. *et al.*, *ibid.*

¹³ The EC has convened an Ocean Energy Forum with the potential to develop into a European Industrial Initiative between 2017–2020. See http://ec.europa.eu/maritimeaffairs/policy/ocean_energy/forum/index_en.htm.

¹⁴ Johnson, K., Kerr, S. & Side, J., *Marine Renewables and Coastal communities – Experiences from the Offshore Oil Industry in the 1970s and Their Relevance to Marine Renewables in the 2010s*, *Marine Policy*, 2013 (38), p. 491; Kerr *et al.*, *supra* note 11.

regional ecosystems in pursuit of broader climate mitigation goals ('paradoxical harm').¹⁵ In this vein, a recent report of the United Nations (UN) Open-ended Informal Consultative Process on Oceans and the Law of the Sea notes that ocean energy

could foster increased energy security, generate employment and play a role in mitigating the impacts of climate change. At the same time, the importance of assessing and studying the impacts of [ocean energy], including on the marine environment, was stressed ...¹⁶

In most jurisdictions, existing EIA regulation is applied unaltered to ocean energy projects. This is partly because EIA is intended to be a generally applicable regulatory tool, however, new technologies generally develop within existing legal frameworks, but inevitably elicit new legal responses as commercialisation approaches.¹⁷ It is in this context that some specific modifications of the EIA process for new offshore technologies are considered in this chapter, with particular reference to ocean energy.

The overall EIA process for ocean energy context is essentially the same as any other EIA process, though the European Marine Energy Centre (EMEC)¹⁸ has helpfully developed a set of guidelines that provides an outline of the EIA process for ocean energy projects and highlights the scientific knowledge that will have to be generated.¹⁹ As part of the screening and scoping stages, developers will have to identify available information regarding the proposed deployment site, followed by baseline studies to describe the nature of the site.²⁰ This data is then used to identify all possible impacts and assess worst-case scenarios and potential mitigation options before compiling the relevant documents for submission to the relevant regulatory authorities.

The EIA process in the ocean energy context is complicated by two factors: knowledge gaps and poorly developed regulatory processes. Ocean energy technologies suffer from a paucity of knowledge on two levels. Firstly, other

¹⁵ White, R., Climate Change and Paradoxical Harm, in Farrell, S., Ahmed, T. & French, D. (eds), *Legal and Criminological Consequences of Climate Change*, 2012.

¹⁶ United Nations General Assembly, Report on the Work of the United Nations Open-Ended Informal Consultative Process on Oceans and the Law of the Sea at Its Thirteenth Meeting (A/67/120, 2012) vol 40091.

¹⁷ In the marine context see, e.g., Nyhart, J.D., The Interplay of Law and Technology in Deep Seabed Mining Issues, *Virginia Journal of International Law*, 1974 (15), pp. 827, 830.

¹⁸ An ocean energy testing and research centre based in Orkney in Scotland.

¹⁹ European Marine Energy Center, *Environmental Impact Assessment (EIA) Guidance for Developers at the European Marine Energy Centre*, 2005. The precise regulatory requirements vary by jurisdiction, and will change as legislation is developed and implemented. The guidelines nonetheless provide a useful starting point.

²⁰ These baseline studies could relate to a range of issues, such as determining local fish and mammal populations. At EMEC, baseline data is already available for use in EIA.

renewable energy technologies are well established,²¹ but practical experience with the deployment of ocean energy technologies is limited. While a spectrum of potential environmental interactions has now been mapped out,²² research to date has generally studied small-scale deployments. A commercial-scale industry will likely have different interactions with the marine environment that will need to be explored and managed over time. Secondly, the marine environment is notoriously difficult to study, and scientific research is limited by high costs, inaccessibility, and relative lack of development compared to onshore. These difficulties make EIA in the marine environment unusually challenging.²³

The scientific uncertainty caused by these information gaps is compounded by under-developed regulatory frameworks and EIA processes that are not yet adapted to better meet the needs of emerging technologies in the marine environment. While some aspects of the relevant regulatory frameworks are being improved to better fit the ocean energy context,²⁴ recent commentary confirms that ocean energy continues to bear a considerable regulatory burden, particularly in relation to EIA:

marine energy attracts a depth of scrutiny from environmental regulators and statutory nature conservation bodies that more established marine industries such as fishing and shipping have managed to escape.²⁵

The resulting time and cost is a considerable barrier to the development of ocean energy projects, and encourages developers to be guarded about sharing their results, meaning that privately collected data is less likely to be publicly available

²¹ For example, regulators can draw on over a century of experience with conventional hydropower technologies.

²² *Boehlert, G. & Gill, A.*, Environmental and Ecological Effects of Ocean Renewable Energy: A Current Synthesis, *Oceanography*, 2008 (23); *Inger, R. et al.*, Marine Renewable Energy: Potential Benefits to Biodiversity? An Urgent Call for Research, *Journal of Applied Ecology*, 2009, p. 1; *Simmonds, M.P. et al.*, Marine Renewable Energy Developments: Benefits versus Concerns (Paper SC/62/E8 presented to the IWC Scientific Committee, 2010 (unpublished)); *Frid, C. et al.*, The Environmental Interactions of Tidal and Wave Energy Generation Devices, *Environmental Impact Assessment Review*, 2012 (32), p. 133; *Linley, A.*, Environmental Interactions with Marine Renewable Energy, *Marine Scientist*, 2012, p. 22.

²³ *Smith, A.K.*, Impact Assessment in the Marine Environment – the Most Challenging of All, in *Impact assessment in the marine environment* (International Association of Impact Assessment annual conference), 2008.

²⁴ *O'Hagan, A.-M.*, A Review of International Consenting Regimes for Marine Renewables: Are We Moving towards Better Practice?, in 4th International Conference on Ocean Energy, 2012; *Wright, G.*, Regulating Marine Renewable Energy Development: A Preliminary Assessment of UK Permitting Processes, *Underwater Technology: The International Journal of the Society for Underwater*, 2014 (32), p. 1.

²⁵ *Merry, S.*, Marine Renewable Energy: Could Environmental Concerns Kill off an Environmentally Friendly Industry?, *Underwater Technology*, 2014 (32), p. 1.

to benefit the industry as a whole.²⁶ This has a significant impact on the development and sustainability of the technology.²⁷

1.1. CASE STUDY: MARINE CURRENT TURBINES, NORTHERN IRELAND

Marine Current Turbines' (MCT), a private company now wholly-owned by Siemens, deployed its SeaGen device in Strangford Lough, Northern Ireland in April 2008. This was the first deployment of a commercial-scale tidal energy device and it has since generated over 3GWh of electricity to the grid. The experience of MCT has already been illuminating in a number of respects, and the final report of the environmental monitoring program notes that it has informed policy development in the UK (though it not specify how exactly it has influenced policy).²⁸

MCT proceeded through each stage of the EIA process over the course of several years producing, amongst other documents: a Scoping Report; an Environmental Impact Statement (EIS); an EIA report; an Environmental Action and Safety Management Plan; and an Environmental Monitoring Programme (EMP). MCT established a scientific working group to advise on the scientific and operational details of the EMP and mitigation measures, while a broader liaison group was established to engage stakeholders and place the scientific research in context.

The EMP is remarkable in its extent and depth, particularly the compliance and monitoring regime that was agreed with the regulator in order to obtain consent at a cost of £3 million to the developer over a period of 3 years.²⁹ This regime involves a range of pre- and post-deployment monitoring activities, including: surveillance and post-mortem evaluation of animal carcasses; a sonar marine mammal detection system enabling automatic precautionary shutdown; manual shutdown when a mammal is within 50m of the device; land-based visual surveys; and telemetry studies and acoustic data logging for harbour porpoise activity.³⁰ The implementation of MCT's EMP began in June 2005 and ended in 2011 with a final report concluding that no major impacts on marine mammals were detected in 3 years of post-installation monitoring.

²⁶ *Sterne, J.K. et al.*, The Seven Principles of Ocean Renewable Energy: A Shared Vision and Call for Action, *Roger Williams University Law Review*, 2009 (4), pp. 600, 611. Nonetheless, some efforts to collaborate on data sharing are taking place. See, e.g. Tethys (<http://tethys.pnnl.gov/>).

²⁷ *Jeffrey, H. & Sedgwick, J.*, ORECCA European Offshore Renewable Energy Roadmap, September 2011, p. 14.

²⁸ *Keenan, G. et al.*, SeaGen Environmental Monitoring Programme, 2011, p. 10.

²⁹ *Riddoch, L.*, Seal of Approval, *The Nature of Scotland*, 2009, p. 21.

³⁰ *Keenan, G. et al.*, *supra* note 28, pp. 13–18.

This onerous process was partly due to the fact that the receiving environment was designated as both a Special Protection Area and a Special Area of Conservation,³¹ and partly because it was the first deployment of its kind, necessitating extensive EIA to convince regulators that the project should be permitted. The final SeaGen EMP report echoes this sentiment, stating ‘the SeaGen EMP provides an ambitious plan beyond what might be expected of future projects now that more knowledge is available’.³²

Overall, MCT agrees that the process has proven the sustainability of their device, improving scientific knowledge and allowing the regulator to take an adaptive management approach and reducing the mitigation burden in subsequent variations of the licence.³³ However, such an intensive EIA process is burdensome and ‘could prove too much for future projects’.³⁴

2. ISSUES WITH EIA FOR OCEAN ENERGY PROJECTS

Given the foregoing, the main issues can be summarised briefly as follows:

- *Lack of scientific certainty regarding impacts.* This causes the EIA process to be particularly costly and time consuming as compared to EIA processes for well-established technologies in well-understood environments.
- *Lack of available data on the receiving environment.* Low availability of suitable scientific data regarding the marine environment at a means that developers must invest substantial time, cost, and effort in establishing of baseline data.
- *Utilisation of scientific knowledge.* The EIA process and regulators must ensure that existing data is identified and utilised in order to minimise the knowledge gaps and reduce the regulatory burden.
- *Data-sharing.* Developers that invest substantially in the generation of new scientific knowledge are unlikely to be willing for this to be used to assist the consenting of other projects,³⁵ potentially resulting in the inefficient duplication of data. The EIA process would ideally facilitate the diffusion and utilisation of new scientific knowledge generated in the course of permitting.
- *Regulator capacity.* Regulators need to be equipped with tools to acquire scientific data relevant to policy and consenting decisions, rather than require

³¹ Under the EC Wild Birds Directive (79/409/EEC) and the EC Habitats Directive (92/043/EEC) respectively.

³² Keenan, G. et al., *supra* note 28, p. 10.

³³ *Ibid*, p. i.

³⁴ Riddoch, L., *supra* note 29.

³⁵ In at least one case, that of Crest Energy in New Zealand, the developer specifically argued that the data generated in the EIA process should not be available for utilisation by other developers. See Wright, G., A Tidal Power Project, *New Zealand Law Journal*, 2011, p. 260.

it solely from the proponent. Regulators need relevant data in order to set standards, monitor the receiving environment, and enforce compliance with permits and licences. Without the appropriate resources and capabilities, this task falls to developers.

- *Innovation*. Placing too great a burden on the proponent of an innovative project will slow the development of new industries. An equitable balance needs to be found that allows for innovation without imperilling the marine environment.

3. INTRODUCING RISK INTO THE REGULATORY FRAMEWORK

The precautionary principle, which is essentially the legal implementation of the adage ‘better safe than sorry’, is a well-entrenched tenet of environmental law.³⁶ The principle can be stated as a call to action for environmental measures, as in the Principle 15 of the Rio Declaration:³⁷

Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

The principle can also be framed as a failsafe, ensuring that potentially harmful activities do not go ahead until there is full scientific certainty as to its impacts. In this context, the UN’s *World Charter for Nature* states that when ‘potential adverse effects are not fully understood, the activities should not proceed.’³⁸

Within the EU, the precautionary principle is enshrined in Article 191 of the Lisbon Treaty (Treaty on the Functioning of the European Union), which states: ‘Union policy on the environment shall aim at a high level of protection [...]. It shall be based on the precautionary principle and on the principles that preventive action should be taken.’³⁹

Where an action risks causing harm to the environment, in the absence of scientific consensus or certainty that the action is not harmful, the precautionary

³⁶ See, e.g. *Cameron, J. & Abouchar, J.*, The Precautionary Principle: A Fundamental Principle of Law and Policy for the Protection of the Global Environment, *BC Int’l & Comp. L. Rev.*, 1991 (14), p. 1; *Freestone, D. & Hey, E.*, The precautionary principle and international law: the challenge of implementation, 1996.

³⁷ Rio Declaration on Environment and Development Report of the United Nations Conference on the Human Environment, Stockholm, 5–16 June 1972, UN Doc. E.73.II.A.14 and corrigendum, chapter I.

³⁸ World Charter for Nature, G.A. Res. 37/7, U.N. GAOR, 37th Sess., Supp. No. 51, at section (II) (11)(b), UN Doc. A/Res/37/7 (1992).

³⁹ Consolidated versions of the Treaty on European Union and the Treaty on the Functioning of the European Union, OJ 2012, C 326/1.

principle places the burden on the proponent of the action to provide this certainty.⁴⁰ Regulators have traditionally taken a cautious approach to novel applications, including towards renewable energy projects, strictly following the precautionary principle even where the risk of environmental impact is comparatively low and placing the burden of attaining scientific certainty on project proponents.⁴¹ The nature of the marine environment, coupled with the emerging consensus the ocean energy is relatively benign, leaves developers with the very difficult task of detecting small changes in an environment that is naturally highly variable.

By not allowing for the introduction of some risk into decision-making, the regulatory framework can lead decision makers to perceive a potential environmental harm as being more likely than it truly is. Sunstein argues that such a cautious approach ‘threatens to be paralyzing’.⁴² There is therefore a need, in certain circumstances, for an element of risk to be introduced into regulatory frameworks, yet this proposition directly contradicts one of the most fundamental principles of environmental law.

The extent to which uncertainty can be accommodated within existing legal frameworks and how adaptive and risk-based management strategies interact with the precautionary principle is an overarching problem for policymakers. The extent to which the introduction of risk is legally permissible remains largely unknown in many legal systems, while in others, such as the EU, such strategies appear to directly contravene environmental directives. This context must be borne in mind when considering how risk-based management might be introduced into regulatory frameworks. Indeed, a project funded by the EU’s Horizon 2020 research and innovation programme aims to explore this issue.⁴³

The choice between a strictly precautionary approach and a risk-based approach has the potential to shape regulation and facilitate or hinder industry development, and as such it is a heated issue. For example, a ‘fiercely contested’ debate took place in the UK over which approach was more appropriate in the consenting of offshore wind farms.⁴⁴

A risk-based approach aims to shift the focus of decision-making toward the assessment and management of risk. Risk-based regulation provides a systematic framework that prioritises regulatory activities, and the scientific studies required to meet regulatory requirements, according to an evidence-based assessment of

⁴⁰ Cross, F.B., *Paradoxical Perils of the Precautionary Principle*, Washington and Lee Law Review, 1996 (53).

⁴¹ *RenewableUK*, *Consenting Lessons Learned: An Offshore Wind Industry Review of Past Concerns, Lessons Learned and Future Challenges*, 2011, p. 18.

⁴² Sunstein, C.R., *Beyond the Precautionary Principle*, Chicago Public Law and Legal Theory Working Paper, 2003 (38), p. 1.

⁴³ See RiCORE, <http://ricore-project.eu/>.

⁴⁴ *RenewableUK*, *supra* note 41, p. 18.

risk.⁴⁵ This enables existing research to be more fully integrated into consenting processes by not requiring the developer to prove complete certainty as to all the details of its specific case. In being more permissive, a risk-based approach can also drive additional scientific study into impacts.

There are a number of ways that this approach can be operationalised and both approaches discussed below take a step towards risk-based management. Regardless of the mechanism, the flexibility and risk introduced by such approaches must be carefully managed to protect regulators, but also to be useful for developers. Too much flexibility could threaten the permanence of a license and create an unstable investment environment, while too little could hamper development. Balancing certainty and flexibility is therefore crucial, though few, if any, jurisdictions currently take a structured and holistic approach to this. At the very least, the legal framework needs to be predictable in the way it adapts regulatory processes to new information.

4. CASE STUDY: THE UK

Two modifications of the EIA process have emerged in the UK as a response to the issues discussed above: the 'Rochdale Envelope', which allows a project description to be broadly defined in a consent application to allow for technological change over the life of a project;⁴⁶ and the 'Deploy and Monitor' approach (D&M), which permits deployment before complete certainty as to impacts.⁴⁷

Despite being widely discussed and increasingly utilised within the industry, neither approach has received much attention in the academic literature. The following sections therefore aim to introduce these concepts to the literature, provide an overview for further discussion, and offer some critical commentary on the use of these approaches, potential stumbling blocks, and the future of such reforms to traditional EIA processes.

⁴⁵ Peterson, D. & Fensling, S., Risk-Based Regulation: Good Practice and Lessons for the Victorian Context, in Victorian Competition and Efficiency Commission Regulatory Conference, 2011, p. 1.

⁴⁶ Freeman, S., Pushing the 'Envelope', Offshore Wind Engineering, 2013 (Summer), p. 6; Walker, B., Managing Uncertainty; Wright, G., Strengthening the Role of Science in Marine Governance through Environmental Impact Assessment: A Case Study of the Marine Renewable Energy Industry; *The Crown Estate*.

⁴⁷ *Marine Scotland*, Survey, Deploy and Monitor Licensing Policy Guidance; Wright, G., *supra* note 46.

4.1. ROCHDALE ENVELOPE

The ‘Rochdale Envelope’ approach to EIA derives from a UK planning law case⁴⁸ and has been reinvigorated by the MRE industry. In this new context, the approach has ‘very quickly become popular’.⁴⁹ The Rochdale Envelope allows a developer to describe its project within a number of agreed parameters for the purposes of an EIA (this forms the ‘envelope’) and provide its EIS based on the maximum extents of the parameters, i.e. a ‘worst-case scenario’. For example, where a developer is considering a range of rotor diameters, they could elaborate the EIS on the basis of the maximum diameter under consideration, rather than deciding on a smaller diameter at the time of consent. This provides the developer with a level of flexibility and allows for the evolution of the technology and the project in the years between consenting and deployment.

The eponymous cases concerned a planning application for a business park in Rochdale, which was initially approved by the local authority. The planning application was an ‘outline application’; i.e. it provided basic information regarding the size and scale of the development and formed the first step towards the construction of the business park, with detailed matters (such as siting, design, external appearance, means of access and landscaping) reserved for further consideration at a later time. The consent allowed a period of 10 years within which the reserved matters had to be detailed and a full application made. The consent was subject to numerous conditions, including that further detail be provided in relation to mitigating environmental impacts. In particular, one condition required the preparation of a framework document that would show the design and layout of the proposed development and set out the phases of construction.

The complainants sought to challenge the approval on a number of grounds, primarily that there was: (i) a failure to adequately describe the project as required by the relevant planning laws; and (ii) a failure to give the relevant information required environmental effects regulations (which themselves implement an EU Directive).⁵⁰

The court held that the nature of an outline application meant that many of the particulars of a development would not be available at the early stages of an application, and that this lack of detail was therefore not necessarily problematic in itself. However, it was held that the submission of a merely illustrative master plan and indicative schedule of uses was tacit acknowledgement that the description of the development was inadequate for the purposes of supplying relevant

⁴⁸ *R. v Rochdale MBC ex parte Milne (No. 1)* and *R. v Rochdale MBC ex parte Tew* [1999] and *R. v Rochdale MBC ex parte Milne (No. 2)* [2000].

⁴⁹ *Dolman, S.J. & Simmonds, M.P.*, Ensuring Adequate Consideration of Cetaceans in Scotland’s Ambitious Marine Renewable Energy Plans, 2012.

⁵⁰ EC Directive No. 85/377 on the assessment of the effects of certain public and private projects on the environment.

information for environmental effects regulations. That is, as the application did not contain any information as to the design, size, or scale of the development, it was not possible to evaluate the environmental impacts, thereby precluding the ability to grant planning permission within the law.

Despite the failure of this particular application, the Rochdale Envelope principle was elucidated by Justice Sullivan, who colourfully observed that projects had been confined ‘in a legal straitjacket by the assessment regulations ... drawn so tightly as to suffocate such projects’. He states:

If a particular kind of project ... is, by its very nature, not fixed at the outset, but is expected to evolve over a number of years depending on market demand, there is no reason why [planning regulations] should not recognise that reality. What is important is that the environmental assessment process should then take full account at the outset of the implications for the environment of this need for an element of flexibility ... the difficulty of assessing projects which do require a degree of flexibility is not a reason for frustrating their implementation.

Justice Sullivan noted the clear wording of the relevant EU Directive, that planning applications must be approved in ‘full knowledge of the project’s likely significant impact on the environment.’ However, he stated that this

should not be regarded as imposing some abstract state or threshold of knowledge which must be attained in respect of all projects, but should be applied to the particular project in question. For some projects it will be possible to obtain a much fuller knowledge than for others. The directive seeks to ensure that as much knowledge as can reasonably be obtained, given the nature of the project, about its likely significant effect on the environment is available to the decision taker.

The Rochdale cases thereby establish the basic idea that a project description can be broadly defined, within a number of agreed parameters, for the purposes of an environmental assessment and planning application.

4.1.1. Selected Examples of Use of the Rochdale Envelope for Ocean Energy Projects

Project	Report	Size (MW)
Wave		
Brough Head ⁵¹	Scoping	200
Costa Head	Scoping	200
Tidal		
Inner Sound ⁵⁴	Scoping	400
Westray South ⁵⁶	Scoping	200
Test site		
Falmouth Bay Short Term Test Site (FabTest)	Description of proposed facility	-

⁵¹ Brough Head Wave Farm Limited, Brough Head Wave Farm Scoping Report, 2011.

⁵² Marine Scotland, Brough Head Wave Farm, West Orkney Scoping Opinion, 2011.

⁵³ Marine Scotland, Costa Head Wave Farm Orkney Scoping Opinion, 2012.

⁵⁴ MeyGen Phase 1 EIA Scoping Document, 2011.

Use/parameters of Rochdale Envelope	Comments/regulator response
Wave	
<ul style="list-style-type: none"> • BHWF plans to use the Rochdale Envelope approach • Sets out parameters in scoping report • Following site selection BHWF will adjust the extents and magnitudes defined in its scoping document accordingly 	<p>Marine Scotland (MS) notes:⁵²</p> <ul style="list-style-type: none"> • Purpose of scoping report is to broadly identify/assess the most important issues; • Rochdale envelope 'is not a substitute for accurate project details and in this instance appears to undermine the purpose of the scoping phase since so little is actually known about the project'; • 'downgrading of the scoping phase could result in information overload when the EIA is finally submitted which is time consuming for the developer and the regulatory process'; and • Rochdale Envelope is 'usually applied to unknowns such as exact device dimensions and numbers'.
<p>SSE states that it plans to use the Rochdale Envelope approach during the EIA process.</p>	<p>MS notes that the eventual EIS must:⁵³</p> <ul style="list-style-type: none"> • Contain a rationale for requiring such flexibility; • Define ranges (size, shape, tonnages etc.) or alternatives (e.g. for cable routes); • Contain justification of what constitutes the 'worst-case'; and • Discuss how the worst-case impacts different receptors.
Tidal	
<ul style="list-style-type: none"> • Project still in the early stages of design • Rochdale Envelope will be used • Two turbine models to be used – both will undergo planned testing and assessment which will feed into EIA • Various options available for all other elements of project 	<p>MS, in its response:⁵⁵</p> <ul style="list-style-type: none"> • Notes interaction of Rochdale Envelope with EU Habitats Directive (proposal can only be consented 'if it can be ascertained beyond reasonable scientific doubt that it will not adversely affect the integrity of a Natura site'); • States that the Rochdale Envelope must apply to both offshore and onshore elements together: 'i.e. what is the maximum extent of onshore/associated development that is required to support the maximum number of tidal turbines'; and • Explicitly recommends use of the Rochdale Envelope for turbine siting,
<ul style="list-style-type: none"> • The project developer has not yet chosen a technology, meaning that substantial uncertainty exists as to final environmental interactions • The scoping document narrows the choice to non-surface piercing horizontal axis turbines with rotor diameter of up to 20m and a generating capacity of at least 1MW. • Up to 200 devices may be deployed, with a limit of 45 in the first phase of deployment. 	<p>MS notes the technology-neutral nature of the project, but nonetheless requires that the proponent must justify the need for flexibility and take responsibility for determining whether changes made later are material to the EIA process: 'The EIA will reduce the degree of design flexibility required and that [the EIS] provided for consent will be further refined as a condition of consent'.⁵⁷</p>
Test site	
<ul style="list-style-type: none"> • Description of the range and extent of potential devices and mooring systems to be tested. 	<p>FabTest is a preconsented testing site intended to be used by a range of devices.</p>

⁵⁵ Marine Scotland, Meygen, Phase 1, Tidal Turbine Array, Inner Sound, Pentland Firth: Scoping Opinion, 2011.

⁵⁶ SSE Renewables, Environmental Scoping Report: Westray South Tidal Array, 2011.

⁵⁷ Marine Scotland, SSER Westray South Tidal Array, Westray Firth Orkney: Scoping Opinion, 2012.

The UK's *Overarching National Policy Statement for Energy* subsequently alluded to the Rochdale Envelope approach,⁵⁸ and the Infrastructure Planning Commission (IPC) has published a guidance note on using the Rochdale Envelope.⁵⁹ The Scottish Government has committed to developing a guidance document on application of the approach⁶⁰ and has endorsed use of the Rochdale Envelope in a letter to heads of planning,⁶¹ while the Crown Estate led a dedicated workshop to discuss issues relating to the use of the approach for ocean energy projects.⁶²

The Rochdale cases, and subsequent IPC Guidance Note, set out a few principles applicable to use of this approach:

- An application seeking to make use of the Rochdale Envelope should acknowledge the need for details to evolve over a number of years. In practice this has meant that proponents have explicitly signposted the fact that they will use the Rochdale Envelope.
- As to the definition of impacts themselves, the level of detail of the proposal must be sufficiently clear and adequately described and tested in order for an EIA to be able to properly consider the range of likely environmental effects and necessary mitigation measures. While the assessment may conclude that a particular environmental impact could fall within a fairly wide range, it is consistent with EU regulations to adopt the worst-case scenario.⁶³
- Mitigation measures should be developed that could deal with this worst-case so as to ensure that the development is environmentally benign, even if the worst case eventuates.
- The EIS must specify the upper and lower limits of a range of parameters, such as height, width and length of each building in the context of a business park development. Without such details, it is very difficult to assess likely environmental impacts, and any permission granted without such detail will be highly vulnerable to legal challenge.
- The flexibility provided by the Rochdale Envelope is not to be abused and does not excuse developers from their obligation to provide adequate descriptions of their projects.

⁵⁸ *Department of Energy and Climate Change, Overarching National Policy Statement for Energy (EN-1)*, p. 47.

⁵⁹ *Infrastructure Planning Commission, Using the 'Rochdale Envelope'*, pp. 2–3.

⁶⁰ *Marine Scotland, Marine Scotland Policy Development for Marine Renewables and Offshore Wind Covering Marine Planning and Licensing; Scottish Government, Simplified Marine Licensing*, 2012 www.scotland.gov.uk/Topics/marine/marineenergy/background/licensing. 'Work is underway, in consultation with the marine offshore renewables industry and other stakeholders, to produce Scottish Government licensing policy guidance on the application of the "Rochdale Envelope" approach.' This had not yet been completed at the time of writing.

⁶¹ *Davidson, C., Environmental Impact Assessment Directive: Questions and Answers*. Letter from Planning Directorate to Heads of Planning.

⁶² The Crown Estate.

⁶³ Specifically the objectives of European Council Directive 85/337/EEC.

- The planning authority determines what degree of flexibility can be permitted in each case, having regard to the particularities of an application. Any consent awarded by an authority based on the Rochdale Envelope approach must create ‘clearly defined parameters’ for the developer to work with.
- The authority can impose conditions to ensure that the project evolves within these parameters. It will clearly be prudent for developers and authorities to ensure they have assessed the range of possible effects implicit in the flexibility provided by the permission.

4.2. DEPLOY & MONITOR

The Deploy and Monitor (D&M) approach, allows for a consent to be granted for a project before there is complete certainty as to the potential environmental impacts, enabling the developer to conduct monitoring, data collection, and scientific research. Generally the approach is advocated as a means to facilitate the development of small-scale projects or test deployments.

The D&M approach again introduces an element of risk, allowing the regulator to assess the likely risk of a project and consent it appropriately. The approach therefore directly violates the precautionary principle, but does allow for existing scientific knowledge to be better accounted for: where good baseline exists data for an area and a technology poses little risk, a deployment could be made with little regulatory oversight. As will be discussed below, a survey component can be incorporated to preliminarily rule out particularly sensitive sites before proceeding with deployment.⁶⁴

At its most permissive, D&M would relieve developers of much of the onerous requirements of the usual EIA process, on the basis that the weight of evidence suggests that ocean energy technologies are environmentally benign. This approach would allow for deployment of an ocean energy device with relatively few initial restrictions, but with subsequently monitor the deployment to confirm that this is the case in practice. If the monitoring showed the device not to be benign, the consent could be terminated.

Such an unbridled implementation of D&M is not strongly advocated in the literature, or by developers. This is likely because the environmental impacts of such a lax approach could be much greater and developers are likely to support whichever framework can best prove the sustainability of their devices. A framework that allows deployment under few conditions may prove less burdensome to developers in the short-term, but one impactful deployment could be a setback to the entire industry.

⁶⁴ *Leary, D. & Esteban, M.*, Renewable Energy from the Ocean and Tides: A Viable Renewable Energy Resource in Search of a Suitable Regulatory Framework, *Carbon & Climate Law Review*, 2009, p. 417; *House of Commons Energy and Climate Change Committee*, *The Future of Marine Renewables in the UK*, 2012.

Nonetheless some stakeholders are clearly concerned that such an approach could eventuate. For example, the Head of Climate Change at the Royal Society for the Protection of Birds (RSPB) states:⁶⁵

in a perfect world where we already had a thorough understanding of marine biodiversity in our waters, then we would be feeling a lot more relaxed about deploy and monitor because you would be able to filter out all the most sensitive sites; but, given that we have an imperfect and partial understanding of where wildlife is in the seas, I do not think deploy and monitor is appropriate for now [...]

There are instances where deploy and monitor might be appropriate [i.e.] there is good baseline data for that area and we know that that area does not have areas of significant biodiversity interest. For now, because we have imperfect knowledge of biodiversity, deploy and monitor is not appropriate as a general rule, but it might be in certain instances.

The addition of a ‘survey’ component, alluded to in the above passage, would enable particularly sensitive sites to be excluded completely.⁶⁶ Thus this is at the stronger end of the D&M spectrum. With the addition of the extra component, this approach has come to be called ‘Survey, Deploy and Monitor’ (SDM). Leary and Esteban eluded to such an approach early on in the development of the legal literature relating to ocean energy, stating:

Available evidence suggests that the environmental burdens of offshore energy schemes are likely to be low, provided developers show sensitivity with appropriate site selection and *planning authorities controlling development in sensitive locations*.⁶⁷

This approach therefore exercises a certain level of precaution by utilising existing scientific knowledge to exclude certain sites, while also allowing deployment in other areas, thereby enabling additional studies to be undertaken. This will then provide both scientific data in relation to the technology and the receiving environment.

Scotland is apparently the only jurisdiction actively applying D&M,⁶⁸ which it has started to formalise through the development of a *Survey, Deploy and Monitor Licensing Policy Guidance* (SDM Guidance).⁶⁹ The Guidance is an attempt to turn the broad proposition of D&M into something concrete that can be used by

⁶⁵ *House of Commons Energy and Climate Change Committee, supra* note 64, Ev 26.

⁶⁶ This could be achieved by zoning, declaration of a strict marine protected area, or simply through regulatory practice.

⁶⁷ *Leary, D. & Esteban, M., supra* note 64 (emphasis added).

⁶⁸ *O'Hagan, A.-M., supra* note 24.

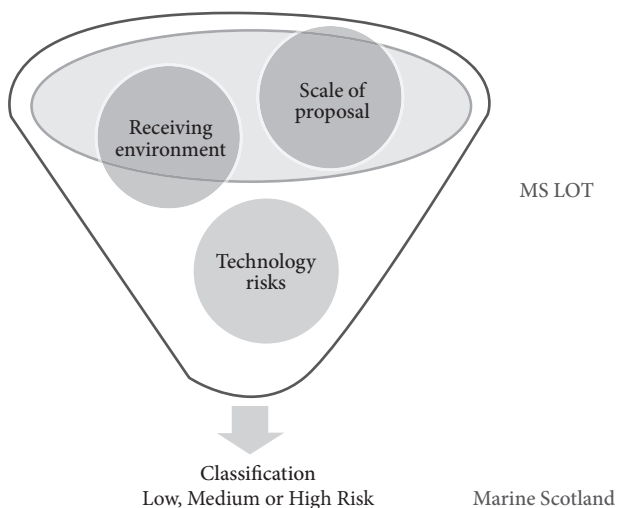
⁶⁹ *Marine Scotland, Survey, Deploy and Monitor Licensing Policy Guidance*, 2012.

regulators to ensure sustainable deployment of devices and the generation of new scientific knowledge.

Under the SDM Guidance, a proposal undergoes a formal risk-assessment. Where there is already sufficient scientific knowledge to provide a suitable EIA, the decision-maker can fast-track the approval. The proposal will be assessed as low, medium or high risk based on the level of certainty regarding impacts, and this will be used to guide the requirements for site characterisation and EIA. A fast-tracked development is one for which there are sufficient grounds to request consent based on a minimum of 1 year of survey effort and analysis to understand the characteristics of the receiving environment prior to the application, based on the overall picture given by assessment of the three factors described below.

The classification of a MRE proposal for the purposes of the SDM Guidance depends on three factors: (i) the sensitivity of the receiving environment; (ii) the scale of the proposed deployment; and (iii) the risk posed by the particular technology.⁷⁰ Each is graded low, medium, or high based on the available scientific evidence provided by the proponent. The three individual assessments are combined into an overall risk assessment by Marine Scotland Licensing Operations Team (MS-LOT); the final overall assessment is assigned by Marine Scotland based on MS-LOT's recommendations.

Figure 1. Relevant factors for determining risk classification under Scotland's SDM Guidance



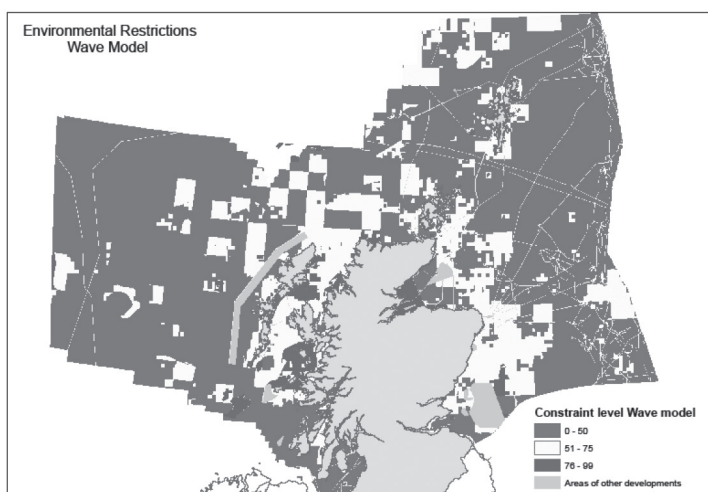
The scale of a development is based on the proposed total installed generating capacity. A small-scale proposal, assessed as low risk can be up to 10MW, medium

⁷⁰ Ibid.

between 10–50MW, and large-scale, and therefore high-risk developments are those over 50MW.

Regarding the sensitivity of the receiving environment, the regulator undertakes an assessment of the environmental sensitivity of the proposed deployment location based on maps, one each for wave and tidal, which combine data from 19 different datasets. This enables areas of differing sensitivity to be distinguished. These maps are indicative only, are not considered ‘complete’,⁷¹ and are subject to revision as more data becomes available.

Figure 2. Environmental risk map for wave energy projects in Scotland, showing areas of low, medium and high environmental risk



Source: Marine Scotland (2012)⁷²

The classification of device risk is based on the potential environmental impacts identified. It is ‘an expression of how the device or technology (including moorings or support) is installed, moves, behaves and interacts with the surrounding environment’, providing a ‘broad assessment of the potential effects of the device on marine life.’⁷³ The SDM Guidance provides a table of impacts that will be considered,⁷⁴ but building an exhaustive list would likely prove impossible.

At the low end of the risk scale will be small developments of well-understood technology, in an area of low environmental sensitivity. In this case, the regulator *might* consider fast tracking the application, if the available information is

⁷¹ In that they do not provide an overall assessment of a site’s environmental richness, biodiversity, or sensitivity to other forms of development.

⁷² *Marine Scotland*, Survey, Deploy and Monitor Licensing Policy Guidance, 2012, p. 8.

⁷³ *Ibid*, p. 2.

⁷⁴ See *Marine Scotland*, A Review of the Potential Impacts of Wave and Tidal Renewable Energy Developments on Scotland’s Marine Environment.

‘considered robust or underpinned by strategic survey information’.⁷⁵ This will require 1 year of site characterisation data to inform an EIA and licence application.

At the high end of the scale are large developments utilising a high-risk device, to be deployed in an environmentally sensitive area. Such a proposal would not be suited to a fast-tracking approach. Instead the regulator would require a minimum of 2 years of site characterisation data in support of the application. The developer would also usually be expected to undertake testing and monitoring of a test device or demonstration array in a different location elsewhere in order to reduce the uncertainty surrounding the interactions of the device with wildlife.⁷⁶

In between the two is a medium-risk deployment, for which it is initially presumed that 2 years of site characterisation data would be required. However, if the regulator considers that the environmental risk is lower than anticipated, or that the data gathered is adequate to inform the EIA process after one year, it would be ‘prepared to discuss relaxation of the requirements for further site characterisation, on receptor-specific or hazard-specific bases’.⁷⁷ Marine Scotland call this the ‘2–1 approach’: it envisages that the 2nd year’s studies will not be automatically suspended, but continued as the project develops during the second year. The application for a medium risk deployment will normally be supported by data from a relevant demonstration device or devices.

In the event that environmental data generated in the monitoring phase alerts the regulator to the need for further information regarding a particular aspect of the receiving environment or project, the SDM Guidance allows the EIA process to continue in parallel with the additional research, rather than halting the entire consenting process. While the outcome of the consent application will not be determined until all additional data requirements have been met, this flexibility ensures that a lack of data will not significantly slow the approval process for a relatively low risk project where there are only some discrete uncertainties remaining.

This risk assessment should allow more rapid deployment and therefore provide developers with the opportunity to generate new scientific information regarding impacts, without having to study every potential impact in advance to a high level of certainty.

⁷⁵ *Marine Scotland*, Survey, Deploy and Monitor Licensing Policy Guidance, 2012, p. 6.

⁷⁶ This is based on size: a proposal for a large (>50MW) array should be informed by studies of a smaller ‘demonstration array’, while in turn a proposal for a demonstration array should be informed by studies of a single demonstration device (and/or relatively smaller demonstration array).

⁷⁷ *Marine Scotland*, Survey, Deploy and Monitor Licensing Policy Guidance, 2012, pp. 5–6.

5. CHALLENGES

As new innovative industries emerge, project developers are likely to press for a risk-based approach to planning and increasing flexibility. At the same time, regulators may become more reluctant to take risks, stifling development of important innovations. In this context, the Rochdale Envelope and D&M approaches will likely face a number of challenges as their use becomes more widespread and ocean industrialisation advances.

Flexibility will be a key issue. Despite encouraging developments, the level of flexibility provided in the EIA process is often limited. The ‘worst-case scenario’ developed under the Rochdale Envelope places the perceived potential risks at the extreme end of the scale, while the level of flexibility is assumed to be low and there may be limited opportunity to alter the project outside the envelope.⁷⁸ Similarly, the D&M process remain cautious, with only the lowest level of risk allowing for a fast-tracked consent; obtaining this classification will still require considerable investment in research and monitoring on the part of the developer.⁷⁹ It also remains to be seen whether the SDM guidance is capable of reliably integrating accumulated scientific knowledge into the process in order to adapt the regulatory approach accordingly.

This reflects a broader tension between precaution and risk. These regulatory tools are most useful to developers when they provide the greatest amount of flexibility, while regulators will generally be most satisfied where the flexibility is constrained and the project, and resultant environmental interactions, can be precisely defined. If a developer is required to submit a rigid project description or to conduct extensive baseline environmental studies, this could result sub-optimal projects being developed, slower development of the technology, and delays in construction.

With this tension in mind, there are a number of potential pitfalls that developers may fall into. An EIS based on a Rochdale Envelope approach may fail to cover all material effects, or an application may be assessed under the SDM Guidance to be high risk where only a relatively small amount of additional scientific knowledge would reduce this classification. Evidently it is easier to ensure that regulations are adhered to if more information is provided, but this translates to greater time and cost, and potentially less flexibility, at the expense of faster development of a renewable energy technology.

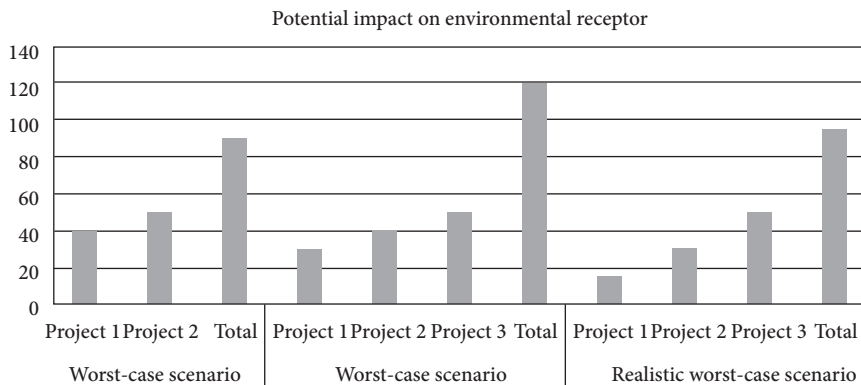
A major issue, not immediately apparent from the analysis above, is the relationship between the Rochdale Envelope and cumulative impact assessment. Where a number of project developers each submit an EIS based on the worst-case scenario, the theoretical cumulative impacts of those projects may exceed

⁷⁸ Walker notes that regulators tend to assume that only minor variations will occur between consenting and construction of the final project. *Walker, B., supra* note 46.

⁷⁹ *Marine Scotland, Survey, Deploy and Monitor Licensing Policy Guidance, 2012, p. 5.*

regulatory thresholds for certain environmental receptors. This could cause the regulator to refuse consent, thereby precluding any further consideration of other aspects of the project. This has already happened in the UK in the offshore wind context, where a proposed 540MW offshore wind farm in the North Sea failed to obtain consent.⁸⁰

Figure 3. Graphical representation of cumulative impacts under three hypothetical deployment scenarios



There may be an issue regarding public and stakeholder perception of risk-based approaches function. It is likely that perceptions of unfettered flexibility are likely to cause community opposition. The success of approaches to planning flexibility may therefore depend to some extent on how effectively it can be communicated to stakeholders that environmental effects of the eventual project are fully assessed during the consenting process.

Another stakeholder issue is that increased flexibility can make it more complicated for stakeholders, especially those with limited resources, to engage with the planning process. Where the EIA process is reasonably static, it is much easier to engage; increased flexibility means that stakeholders will likely have more changes, documentation and data to deal with. Stakeholders have already commented on this in relation to the Rochdale Envelope. The Whale and Dolphin Conservation Society stated that it understood the need for the Rochdale envelope approach, but ‘without understanding the detailed design of the wave farm it is very difficult ... to comment to a great level of detail’.⁸¹ Likewise, responding to a proposed extension to an offshore wind farm, the Maritime and Coastguard Agency (MCA) noted that ‘the vast number of variables suggest that an accurate

⁸⁰ Centrica’s Docking Shoal project. For background, see Shearer, K., *Assessment of Cumulative Impacts in Offshore Wind Developments*, 2013.

⁸¹ Marine Scotland, *Costa Head Wave Farm Orkney, Scoping Opinion*, 2012.

worst case scenario cannot be developed'.⁸² The MCA agreed in principal to the development, but required further consultation later.

Perhaps one of the most important and overarching issues is the relationship of such approaches to the legal framework within which they are operated. The Rochdale Envelope, for example, has a strong legal foundation in case law, establishing a legally-binding precedent. However D&M, as implemented by the SDM Guidance, is currently only a policy approach put forward by the regulator. As such, there are no legislated underpinnings: the approach is open to challenge by other levels of government and other actors and stakeholders, and even to change or disregard by the regulator itself. As such, the approach cannot be fully relied upon by a developer. The interaction between such policies and the formal legislative arrangements will become clearer over time, but for now it is sufficient to note that there is some concern that the nature of the legislative framework could limit the extent to which purely policy interventions can manage a transition to a more flexible and effective EIA framework.

Even more crucially, the lack of any legal mandate to introduce risk into environmental decision-making is likely to hamper efforts to more rapidly deploy innovative technologies. As a regulator is accountable for the decisions they make within the existing legal framework, they are understandably unlikely to be willing to implement policies that, while striking a sensible balance between ocean energy and concerns regarding potential environmental risks, are contrary to the precautionary principle and the regulatory frameworks based on the principle.

6. FUTURE DEVELOPMENT

It is clear that the Rochdale Envelope and D&M approaches to the EIA process will play a key role in authorising ocean energy projects in UK waters. Depending on how successfully these approaches balance the various competing concerns and interests, it is likely that they will become an important part of regulatory change in the context of the blue economy more generally.

However, it is equally clear that such approaches are not without significant challenges. They must be developed, implemented, and supported by a range of other complementary reforms in planning processes, such as Strategic Environmental Assessment⁸³ and Marine Spatial Planning.⁸⁴ This chapter aimed

⁸² Statement of Common Ground between DONG Energy Walney Extension (UK) Limited and Maritime and Coastguard Agency in Relation to the Proposed Walney Extension Offshore Wind Farm.

⁸³ See *Doelle, M.*, The Role of Strategic Environmental Assessments (SEAs) in Energy Governance: A Case Study of Tidal Energy in Nova Scotia, *Journal of Energy & Natural Resources Law*, 2009, p. 111; *Wright, G.*, *supra* note 46.

⁸⁴ See *Thoroughgood, C.A.*, Marine Spatial Planning: A Call for Action, *Oceanography*, 2010, (23), p. 9; *O'Hagan, A.-M.*, Marine Spatial Planning (MSP) in the European Union and Its

to provide an introduction to the Rochdale Envelope and D&M, as well as a starting point for further discussion and research. In this regard, a number of avenues for research could usefully be pursued.

Firstly, it would be interesting to better understand how developers have used these tools in practice, whether any widespread good practices have emerged, both for regulators and developers, and how their implementation can be improved. In particular it would be helpful to identify and analyse cases where a project was refused planning permission based on an erroneous or overly broad use of the Rochdale Envelope or where a project utilising the SDM Guidance was classified more or less strictly than envisaged. A comparative study with similar approaches in other jurisdictions would be of great interest, if such approaches exist elsewhere.

Secondly, there is an urgent need to better understand how to assess cumulative impacts based on realistic scenarios in the context of the Rochdale Envelope. A principled basis for introducing an element of risk to the existing precautionary approach is needed, though this will not be easy. Any such approach must ensure that projects are facilitated, without compromising the process, the environment, or even the perception of the effectiveness of the process.

Thirdly, there needs to be a much better understanding of how such 'soft' and bottom-up approaches to altering the EIA framework fit in with existing legal mandates and obligations. Without a solid legal foundation, it is unlikely that existing efforts will reach their full potential, or that substantial modifications will ever come to fruition.

Fourth, the relationship between the Rochdale Envelope and D&M and other aspects of planning policy should be explored with the aim of setting out a more comprehensive framework for the balancing of the various interests within EIA processes. The two approaches discussed, as relatively simple and narrowly applicable concepts, can serve only the limited purpose for which they were intended. This is not enough, alone, to ensure that regulators and policymakers are making principled, risk-based decisions in EIA processes that balance both local and global environmental considerations.

Finally, there may be an opportunity for these nuanced approaches to EIA, and similar regulatory developments, to develop into some framework for broader collaborative governance between developers and regulators. This is certainly occurring in Scotland, with Marine Scotland working closely with developers to offer assistance and discuss the developers approach to the consenting process.

Application to Marine Renewable Energy, International Energy Agency Ocean Energy Systems Implementing Agreement, 2012 www.ocean-energy-systems.org/ocean_energy/in_depth_articles/msp_in_the_european_union/.

7. CONCLUSION

The experience of the MRE industry with existing EIA frameworks suggest that substantial reform is required if the push towards a blue economy agenda is to advance. It is essential that innovative new marine technologies are supported by complementary regulatory frameworks and strong scientific evidence as to their environmental interactions. EIA can play a part in providing both.

A risk-based approach is clearly needed in order to make the best use of existing scientific knowledge and to permit deployment of devices that can generate new knowledge. The Rochdale Envelope and Deploy and Monitor approaches pioneered in the UK provide a starting point for factoring in a certain level of risk in project-level decision-making.

There will, no doubt, be further challenges to the legitimacy and parameters of such approaches as further industrialisation of the marine environment takes place. However, with further research and reform, EIA could become a significant part of efforts in all jurisdictions to better balance precaution with risk, ensure sustainability of innovative new marine activities, and ultimately help progress the blue economy.