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Establishing a legal research agenda for ocean energy

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ABSTRACT

The literature on ocean energy has, to date, largely focussed on technical, environmental, and, increasingly, social and political aspects. Legal and regulatory factors have received far less attention, despite their importance in supporting this new technology and ensuring its sustainable development. Building on the social sciences research agenda developed by the International network for Social Studies of Marine Energy (ISSMER) and published in *Energy Policy*, a complementary agenda for legal research linked to ocean energy was set out. Key directions for future research structured around the core themes of marine governance: (i) international law; (ii) environmental impacts; (iii) rights and ownership; (iv) consenting processes; and (v) management of marine space and resources were identified.

1. Introduction

A new industrial revolution is taking place in the oceans [79,83], challenging existing legal and regulatory frameworks and changing the way we think about marine governance [10,64,71,79]. Growing demand for marine space and resources, coupled with declining ocean health, necessitate the evolution of marine governance frameworks that can facilitate innovation and economic development, while also preserving the marine environment.

The need to balance economic, social and environmental concerns within marine governance frameworks is encapsulated by the emerging "Blue Economy" discourse. The term "Blue Economy" refers to the sustainable development the oceans as a new engine for economic growth [15,44,84]. The European Union's (EU) Blue Growth Agenda, for example, 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" [25].

At the same time, the environmental imperative to decarbonise the energy system, has driven unprecedented interest in marine renewable energy (MRE) resources. MRE technologies, including wave and tidal energy,[1] have been identified by the EU as one of the five key activities that can advance the Blue Economy, delivering sustainable growth and creating new jobs [25].

Offshore wind is growing rapidly [31], with projects moving into deeper waters and new technologies being developed, such as floating turbines. In the United Kingdom (UK), for example, offshore wind meets about 3% of the country's electricity demands, but this is likely to rise to 20% to fulfil the EU 2020 renewable energy target [73].

Ocean energy technologies, utilising waves and tides to generate electricity[2] are now attracting considerable interest and

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[1] The term 'Ocean Energy' is used to denote wave and tidal technologies, whereas the broader term 'Marine Renewable Energy' (MRE) is used to denote offshore wind and ocean energy technologies.

[2] 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 paper, 'ocean energy' is used to refer primarily to the wave and tidal technologies currently approaching commercialisation.

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investment [68]. As with other novel offshore activities, ocean energy is bringing its own unique challenges to marine governance frameworks [98]. Kerr et al. [47] note that ocean energy is:

> *More than a technically challenging extension of onshore renewable energy development. The policy environment, governance, patterns of resource use, conservation values, and distribution of ownership rights are all substantively different from the situation onshore.*

Political will and interest in developing ocean energy is high, and has attracted the attention of various key international energy governance institutions, including the International Energy Agency (IEA), which established the Ocean Energy Systems Implementing Agreement (IEA-OES) to "advance research, development and demonstration",[3] and the International Renewable Energy Agency (IRENA),[4] which has started to develop activities on ocean energy as part of its portfolio [38].

Interest in ocean energy is especially high in Europe. The European Commission has recently developed an action plan to support the ocean energy sector, convening an Ocean Energy Forum to bring together stakeholders and develop solutions. This will feed into a strategic roadmap, providing an agreed blueprint for action. There is potential for a European Industrial Initiative to be developed during a second phase (2017–2020).[5] Ocean Energy Europe, an industry association, has concurrently convened a Technology and Innovation Platform for Ocean Energy, the primary focus of which is to foster a broad consensus on priorities for technological innovation.[6] The UK, and Scotland in particular, finds itself at the vanguard of this new industry, as ocean energy enjoys a combination of political support, significant resources and technical expertise [43,48].

Academic interest is also developing, with a growing literature on various aspects of ocean energy development, including increased discussion of legal and policy issues. It is within this context that this legal research agenda has been developed to act as both a guide for ongoing reform and policy processes, and as a framework for further legal research in this developing field. This research agenda complements the social sciences research agenda previously developed by Kerr et al. [47].

This paper first discusses the development of the ocean energy literature to date, noting the emergence of a range of technical, environmental and social studies, but the relative lack of focus on important legal and regulatory issues. A legal research agenda is then developed, structured around the key themes of modern marine governance, namely: international law; environmental impacts; rights and ownership; consenting processes; and the management of marine space and resources. For each theme, an overview of key issues is provided, followed by the major research questions identified. The paper concludes with an outline of the main directions for future research.

2. Towards a legal research agenda for ocean energy

Academic engagement with the legal aspects of ocean energy deployment first took place in the 1970s as the oil crisis catalysed rapid development of a range of technologies, particularly in the United States (US) [72]. This period saw a drastic rise in research and development funding and investment, and the concomitant development of a distinct literature surrounding the technology.

Legal research conducted at that time focussed on the then-frontrunner, Ocean Thermal Energy Conversion (OTEC), and its international law ramifications. Much of this literature simply identified the relevant legal frameworks, however some also dealt with improving these frameworks and removing barriers to development [3,51,52,61]. Many of the issues raised by this early scholarship remain pertinent some 40 years later. For example, Knight [50] noted the "adverse effects of the late blooming jurisdictional and environmental impediments to implementation of new technologies". Such adverse effects remain a risk for modern ocean energy technologies as rapid technological advancement outpaces development of legal frameworks.

Ocean energy lay dormant for decades following the easing of the oil crisis, but a new era of climate change, renewable energy and the Blue Economy is driving renewed interest and development.[7] In this context, a range of scholarship has emerged, focusing initially on resource assessment, device design, and environmental impacts. This focus is beginning to broaden as a commercial-scale industry develops.

In 2012 the International Network for Social Studies in Marine Energy (ISSMER) was convened, bringing together those interested in the social science aspects of MRE development.[8] The first ISSMER workshop resulted in the development of a research agenda for social studies focussed on offshore renewables [48], highlighting the need for research into: economic impacts; wealth distribution and community benefits; communication and knowledge flow; consultation processes; dealing with uncertainty; public attitudes; and planning processes (the 'ISSMER Agenda'). The ISSMER Agenda consolidates and advances the growing interest in social sciences research into MRE over the last few years. Research has already focussed on issues such as community acceptance [5,58,74], attitudes of fishermen toward MRE development [2], co-existence with fisheries[13], and the economic impacts of industry development [33,82].

Far less attention has been paid to legal and regulatory aspects, despite the role marine governance regimes play in industry development and the strong linkages between these regimes and the elements of the ISSMER Agenda. Legal and regulatory issues are continually cited as a major non-technical barrier to the development of ocean energy. The ISSMER Agenda refers to broad marine governance issues, including "policy environment, governance, patterns of resource use, conservation values, and distribution of ownership rights", though legal issues in the Agenda are ultimately confined to "dealing with uncertainty" and "planning processes". While undoubtedly important, these two aspects form only part of a much broader and more complex legal situation.

A number of commentators provide a broad overview and context for legal research [42,48,64,98], though there remains no coherent agenda or framework for conducting and organising such research. It is the aim of this paper to provide such a framework. The evolving discourse on modern marine governance is used to structure this agenda around a number of key themes [64,71,85,98],

[3] This is an intergovernmental collaboration between countries, under a framework established by the IEA, rather than a regulatory body. See http://www.ocean-energy-systems.org/about-oes/.

[4] IRENA is a relatively new entrant to the international energy governance landscape. For background, see Wright [95].

[5] "European industrial initiatives are public–private partnerships that bring together industry, researchers, Member States and the Commission to set out and implement clear and shared objectives over a specific timeframe. They enhance the impact of innovative research and development and provide a platform for sharing investment risk." See http://ec.europa.eu/maritimeaffairs/policy/ocean_energy/forum/index_en.htm.

[6] See http://www.oceanenergy-europe.eu/index.php/en/tpocean/tpocean.

[7] The WAVENET project (2000–2003) was perhaps the first to reengage with ocean energy, considering the environmental and social impacts of wave energy, especially public acceptability with reference to the relevant legal frameworks [92].

[8] See http://www.issmer-network.org/.