Viewpoint

Marine legislation – The ultimate 'horrendogram': International law, European directives & national implementation

Suzanne J. Boyes & Michael Elliott

Institute of Estuarine and Coastal Studies (IECS), University of Hull, Hull HU6 7RX, UK

Tel.: +44 1482 464120; fax: +44 1482 464130. E-mail address: s.j.boyes@hull.ac.uk

Keywords: EU marine legislation Sectoral Holistic Policy mapping Governance

Abstract

The EU is a pre-eminent player in sustainable development, adopting more than 200 pieces of legislation that have direct repercussions for marine environmental policy and management. Over five decades, measures have aimed to protect the marine environment by tackling the impact of human activities, but maritime affairs have been dealt with by separate sectoral policies without fully integrating all relevant sectors. Such compartmentalisation has resulted in a patchwork of EU legislation and resultant national legislation leading to a piecemeal approach to marine protection. These are superimposed on international obligations emanating from UN and other bodies and are presented here as complex 'horrendograms' showing the complexity across vertical governance. These horrendograms have surprised marine experts despite them acknowledging the many uses and users of the marine environment. Encouragingly since 2000, the evolution in EU policy has progressed to more holistic directives and here we give an overview of this change.

1. Introduction

All seas face a number of environmental problems and are subject to competing spatial claims and conflicts between the many uses and users and this is especially so in seas adjoining developed, industrialised and agricultural regions such as Europe (van Tatenhove, 2013). Efforts to resolve these problems have led to extensive current administrative, legislative and management measures which all come under the term Risk Assessment and Risk Management (Cormier et al., 2013). These are then driven by a governance framework, embracing policies, politics, administration and legislation which cascade in a vertical sequence (Elliott, 2014). That vertical sequence requires integration from the international level down to national policies but, as will be shown here, this has resulted in a patchwork of European policies, national policies, private initiatives and regulations on different levels that often conflict with each other.

In Europe, the European Union (EU) is a pre-eminent player in the field of sustainable regional development and in recent decades, it has adopted more than 200 directives, regulations and many other forms of legislation and amendments in the area of environmental policy that have direct repercussions for regional development (Beunen et al., 2009). This policy framework is aimed at the sustainable use of marine resources, but also the protection of the marine biodiversity – indeed the main idea of marine management is to protect and enhance the natural structure, processes and functioning while at the same time delivering the ecosystem services from which society can take benefits (Elliott, 2011, 2013).

There is now a complex management framework (Elliott, 2014) in which local, national, regional and international initiatives have to be harmonised. In the case of Europe, at both the EU and Member State levels, progress towards managing and protecting the marine environment has been hindered

and is very often insufficient (EC, 2006). In Europe, measures to protect the marine environment by tackling the impact of human activities are not new. In the 1970s, many of the regional seas became the subject of international conventions including the OSPAR Convention for the North Eastern Atlantic, the Helsinki Convention (HELCOM) for the Baltic Sea, the Barcelona Convention and associated Protocols for the Mediterranean Sea and the Bucharest Convention for the Black Sea. Although now having much wider environmental remits, these Regional Sea Conventions (RSCs) were primarily created to address pollution from land-based and vessel-based sources. Historically, other maritime activities were also dealt with by a number of separate sectoral policies (Commission of the European Communities, 2008; van Hoof et al., 2012), which only took into account the priorities of one policy area (i.e. transport, fisheries, pollution etc) without fully assessing the impact across the board and giving equal weight to all the relevant sectors. Such compartmentalisation has led to a piecemeal approach to protecting the marine environment.

To our knowledge, there has been no attempt to collate and produce a synthesis of European marine environmental policies and so this paper aims to demonstrate the volume and extent of current legislation to manage the marine environment. As such it provides an overview and discussion of the types of directives and policies currently regulating European marine waters, emphasising the role of sectoral directives and how these have evolved to more holistic directives and management. To reinforce the point, we produce a road-map of the complex nature of the different types of legislation from International law and European jurisdictions. Given that this then requires an enabling framework within each Member State, we present as a case-example the national implementation in England used to protect the marine environment. We take the view that although we focus on the European situation, the analysis is relevant to all maritime states and will give lessons for those states whose marine use and protection legislation is less well-developed than European and North American states.

The fundamental questions addressed here are:

- Is there sufficient marine legislation to adequately manage the marine environment, giving protection to the natural system whilst providing ecosystem services and societal benefits?
- Are all sectors adequately managed or do we require better management or better implementation of the current legislation?
- Is there an important piece of legislation missing?
- Are the levels integrated both vertically (from globally to nationally) and horizontally (in all aspects within one geographical area)?

2. Principles for environmental management

As marine governance relates to policies, politics, laws and administrations, these are for the wide adoption of eight internationally recognised principles. These are ecologically sustainable development; intergenerational equity; the precautionary principle; Conservation of Biological Diversity and ecological integrity; economic valuation of environmental factors; the polluter pays principle; waste minimisation, and public participation (e.g. EDOWA, 2011).

In turn, the prevailing marine management has to reconcile several wide-ranging topics: the vertical integration of governance across geopolitical levels, the horizontal integration across the many types of stakeholders, the chain of activities leading to pressures and impacts, the risk assessment and response (as risk management) to those impacts, the creation of ecosystem services with a potential to deliver societal benefits, and the Ecosystem Approach (Elliott, 2014). The latter may be regarded simply as the ability to maintain, protect and enhance the natural system, its structure, functioning,

health and productivity while at the same time deliver the services, goods and benefits required by society; hence this is the central aim of managing those seas (Atkins et al., 2011; Tett et al., 2013).

Where management measures are introduced (or proposed) to address the adverse impacts of development, it has been postulated that for environmental management measures to be seen as being likely to be both successful and sustainable, they should meet the so-called 10-tenets (that actions should be socially desirable, environmentally and/or ecologically sustainable, economically viable, technologically feasible, legally permissible, administratively achievable, politically expedient, culturally inclusive, ethically defensible and effectively communicable) (Elliott, 2013).

Therefore to deliver sustainability relies on the coordinated and harmonised approach to marine governance, taking into account the Ecosystem Approach and the 10-tenets. The integrated and sustainable management of the seas thus requires those many aspects to be coordinated (Elliott, 2011; Barnes, 2012). Hence, sustainable and holistic marine management requires horizontal integration across the various stakeholders and players as well as vertical integration of governance at several geopolitical scales.

3. Types of EU legislation/policy

3.1. Sectoral policy

Until relatively recently, the EU approach to the protection of the marine environment has been piecemeal. Since the 1970s, marine based activities have been regulated through a number of sectoral policies, where the sector include fishing, aquaculture, navigation, infrastructure development, agriculture, etc. Each piece of legislation then addressing a particular problem usually in isolation from other issues (Mee et al., 2008), some of which still exist today such as the Common Transport Policy and the Common Fisheries Policy. Long (2011) considered that these policies were, and in some instances still remain 'stand-alone policies' with few common features giving holistic protection of the marine environment.

In 1972, the year of the first United Nations Conference on the Environment, the European Community adopted its first five-year Environment Action Programme (EAP) (1973–1977) setting out the principles and priorities that would guide its policies in the future. This first EAP set out detailed lists of actions to be taken to control a broad range of pollution problems, based on the fundamental ideas that 'prevention is better than cure', the 'polluter pays' principle and environmental impacts should be taken into account. EU marine policy (including coasts, estuaries and wetlands) began with directives being adopted which were sectoral in nature (Apitz et al., 2006). This is demonstrated, for example, by the control of bathing water quality, shellfish growing areas, shellfish hygiene and the framework for dangerous substances; the latter in turn gave rise to more specialised 'daughter' directives on individual or groups of compounds such as Mercury, Chlorinated hydrocarbons etc. Some directives tackled particular pressures in restricted areas such as the Urban Waste-water Treatment Directive (91/271/EEC) which dictated the level of sewage treatment based on the ability of the receiving waters to assimilate it, or the Nitrates Directive (91/676/EEC) aimed at controlling diffuse pollution especially from agriculture and its adverse effects of eutrophication. Other directives aimed at Risk Assessment and Risk Management for specific plans or projects (the Integrated Pollution Prevention and Control Directive (2008/1/EC), and the Environmental Impact Assessment Directive (EIA) (85/337/EEC)). More recently this has continued with the passing of the Flood Risk Management Directive (2007/60/EC) which aims to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity by ensuring that flood risk from all sources is assessed and managed in a consistent way.

3.2. Holistic policy

Only recently has EU law changed to a whole system view (Apitz et al., 2006; Holt et al., 2011) with the development of a more holistic approach in terms of estuarine, coastal and marine management brought about by the evolution of EU directives. With framework directives now the principal means of regulatory intervention under the EU environmental policy, this large body of environmental legislation and policy has been developed in order to monitor, conserve and protect the marine environment. Where most sectoral directives are prescriptive in nature setting targets and giving detailed descriptions, in contrast, framework directive leave the details to the discretion of the Member States. This follows the European principle of subsidiarity and allows Member States a degree of control and considerable discretion as to how the policy is transposed into national legislation (van Leeuwen et al., in press). In practice, this can lead to the implementation of the EU legislation in the national legal system of individual Member States which may differ from each other. Prior to the adoption of the Single European Act in 1986 (which entered into force on 1 July 1987), Member States required enabling legislation to enact the EU directives whereas since then, only national regulations have been required.

As with the US Federal system, a Member State can go further than is indicated by the Directive but will be reported to the European Court under legal action (called Infraction Proceedings) if it does not adhere to the letter or spirit of the Directive. These newer instruments share a common objective of attaining sustainable development and through the implementation of the Ecosystem Approach, existing and new policy making and delivering institutions must be able to accommodate and adapt to a new multi-sectoral approach (Mee et al., 2008; Bainbridge et al., 2011; van Leeuwen et al., in press). This in turn follows from the European Member States being signatories of the UN Convention on Biological Diversity which is based on the 12 principles of the Ecosystem Approach (e.g. Elliott, 2011).

The sectoral directives have gradually been superseded or subsumed into holistic or framework directives or those with a wider geographical remit. The new wave of directives formulate objectives which are not geographically bound to national jurisdiction, but apply to all uses and users of a marine area (Qui and Jones, 2013), ensuring regional sea management and protection. For example, the Strategic Environmental Assessment Directive (2001/42/EC) focuses on larger areas and is an attempt to consider cumulative and in-combination effects thus expanding the control of EIA. Similarly, the so-called Natura 2000 directives relating to Habitats and Species (92/43/EEC as amended) and Wild Birds (2009/147/EC – the codified version of Directive 79/409/EEC as amended) cover many features within designated areas (Special Areas of Conservation and Special Protected Areas respectively). Hence within those areas (and within adjacent areas), all activities, plans and projects have to be considered.

Despite the above, it was the Water Framework Directive (WFD) (2000/60/EC) which marked a change in emphasis in EU legislation, being part of the so called 'third wave' of EU legislation which adopts a holistic approach to water environmental protection and regulation (Moran and Dann, 2008). The WFD provides an integrated policy tool aimed at achieving Good Chemical and Good Ecological Status (GEcS) or in the case of Heavily Modified Water bodies (HMWB) Good Chemical Status and Good Ecological Potential of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater and also to prevent deterioration in the status of those water bodies by 2015 (Hering et al., 2010). However, although it covers the catchments and transitional waters, the WFD only covers the narrow band of coastal waters extending either one or 3 nautical miles (depending on country) from high water.

The EU vision for future management of its seas is set out in the 'Blue Book', the Integrated Maritime Policy for the EU (Commission of the European Communities, 2007). The EU Integrated Maritime Policy (IMP) calls for the 'integration of maritime governance' to ensure stakeholder engagement, coherent agendas, removal of sectoral policy thinking and creation of cross sectoral management structures (EC, 2009). Implementation of an Ecosystem-Based Approach (EBA) through the Marine Strategy Framework Directive (MSFD) (2008/56/EC) thus forms the environmental pillar of the IMP. The MSFD seeks to establish an integrated framework for the management of marine spaces, and requires large ecoregions to achieve or maintain Good Environmental Status (GEnS) by 2020 (Borja et al., 2010, 2013; Hering et al., 2010). (NB Following Mee et al., 2006, and Borja et al., 2010, here we use GEnS for Good Environmental Status rather than GES to differentiate it from GEcS in the WFD.) Whereas the WFD considers the ecological status according to a set of biological quality elements, the MSFD potentially focuses on the functioning and responses according to a set of 11 Descriptors. It enshrines in a legislative framework the EBA for the management of human activities having an impact on the marine environment, integrating the concepts of environmental protection and sustainable use (Ounanian et al., 2012). Hence, the MSFD is a unique directive and is the first piece of legislation applied across European regional seas that requires assessing the range of issues that should encompass overall marine environmental sustainability (EC, 2008; Long, 2011; van Leeuwen et al., in press).

With the competition for maritime space and the need to reduce conflict between competing developments (Douvere, 2008), the EU has recently adopted a new directive addressing Maritime Spatial Planning (MSP) (EC, 2014). This directive will manage and give greater coherence to all activities and uses and users, aimed at reducing the existing over-regulation and administrative complexity within the marine environment (EC, 2013a). Its aim is to ensure a coordinated approach to MSP throughout Europe, to enable the efficient and smooth application of MSP in cross-border marine areas, to favour the development of maritime activities and the protection of the marine environment based on a common framework, all under the umbrella of similar legislative implications (EC, 2011). Although the original recommendation on Maritime Spatial Planning and Integrated Coastal Management (EC 2013/0074) was passed by the Commission in April 2014, the integrated coastal management aspect of the directive has been removed. The directive must be transposed into national legislation by 2016 with national maritime spatial plans developed by 2021. However, it has been argued that this directive is essentially about promoting Blue Growth and neglects the framework nature and ultimate aims of achieving GEnS under the MSFD (Brennan et al., 2013), and favourable conservation status (FCS) under the Habitats Directives (Qui and Jones, 2013). MSP is already being promoted within many countries by both statutory and non-statutory bodies (e.g. De Santo, 2011; Foley and Halpern, 2010), with several EU countries already adopting national legislation and administrative measures to enable MSP to occur (Douvere and Ehler, 2009; Jay, 2010; Schaefer and Barale, 2011; Collie et al., 2013; Jay et al., 2013). England (with similar legislation being enacted within the devolved administrations) passed the Marine and Coastal Access Act in 2009 as a means of pre-empting the MSFD and then the MSP Directive. A total of ten marine plans covering all the seas around England are expected to be in place by 2021.

3.3. Proposed policy

Following the UN Conference on Environment and Development (UNCED), held in Rio de Janeiro in 1992, the International Maritime Organisation (IMO) initiated negotiations to consider the possibility of developing an internationally binding instrument to address the transfer of harmful aquatic organisms and pathogens in ship ballast water. The International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) aims to prevent, minimise and ultimately

eliminate the transfer of harmful aquatic organisms and pathogens through the control and management of ships' ballast water and sediments. Although the European Commission have 'strongly recommended' that Member States should ratify the BWM Convention, very few EU countries have done so. In an effort to address the problem, the EU has developed interim measures through the four Regional Seas Conventions (HELCOM, OSPAR Commission, UNEP-MAP/Barcelona Convention and the Black Sea Commission) and introduced several directives which address invasive alien species (IAS) (e.g. MSFD; Port Waste Reception Facilities Directive (2000/59/EC)). In 2013, the EC proposed new legislation which would require EU Member States to ascertain the routes of introduction and spread of IAS and set up surveillance systems and action plans (EC, 2013b). The Regulation on the prevention and management of IAS will draw on the EU Resource Efficiency Roadmap and the EU Biodiversity Strategy to 2020.

4. Mapping marine protection

4.1. Vertical integration

As discussed above, all European Member States have to respond to a large suite of international, regional and national policies, laws and agreements controlling many sectors such as fisheries, energy and conservation. Consequently there are many organisations and administrative bodies responsible for these such that in all countries no single authority is responsible for addressing marine affairs (see Elliott et al., 2006; Boyes and Elliott (in press)). This has resulted in a patchwork of EU directives and policies and national legislation, and a number of government bodies with overlapping duties to manage them. The International law, and European and national legislation currently in place (and proposed) to protect the marine environment has been mapped out in Fig. 1. At the centre are the international conventions, treaties and protocols (orange boxes for global law and agreements and blue boxes for International organisations) which many countries worldwide have signed and agreed to uphold. In a European context, for some Conventions such as the United Nations Framework Convention on Climate Change (UNFCCC), the signatory requirements have been given greater impetus through the implementation of a subsequent European Directive (Renewable Energy Directive). Shipping is also controlled on an international context, through IMO regulations and MARPOL.

Moving out from the centre, the red boxes in Fig. 1 show the EU directives and policies which govern activities in the European seas, with blue ovals showing the primary target/status to be met. There is a wide range of legislation relevant to the exploitation of marine resources and the management of human impacts on the marine environment. Although this set of directives was previously dominated by sectoral policies such as the Dangerous Substances, Bathing Waters and Urban Waste Water Treatment directives, the development of a more holistic approach in terms of coastal and marine management has been brought about by the recent creation of EU Framework directives giving protection to the whole aquatic environment. directives such as the Water Framework Directive, Marine Strategy Framework Directive, Birds and Habitats directives and the Strategic Environmental Assessment Directive formulate objectives which do not relate to administrative boundaries but to all uses and users and to large geographical areas. Several of these are Framework directives which while giving the main thrust of the policy, then leaves the detailed implementation to the Member State. As such they have a built-in difficulty of ensuring that policies are consistent and coherent across both the Members States and the directives even though there may be notable differences in implementation between Member States (e.g. Hering et al., 2010; Borja et al., 2013). A case in point was the original transposition of the Habitats Directive in England and Wales out to 12 nautical miles and the resulting legal action of Greenpeace. It is now settled in law that both the Habitats and Birds directives apply to areas under the jurisdiction of coastal Member States including the EEZ and

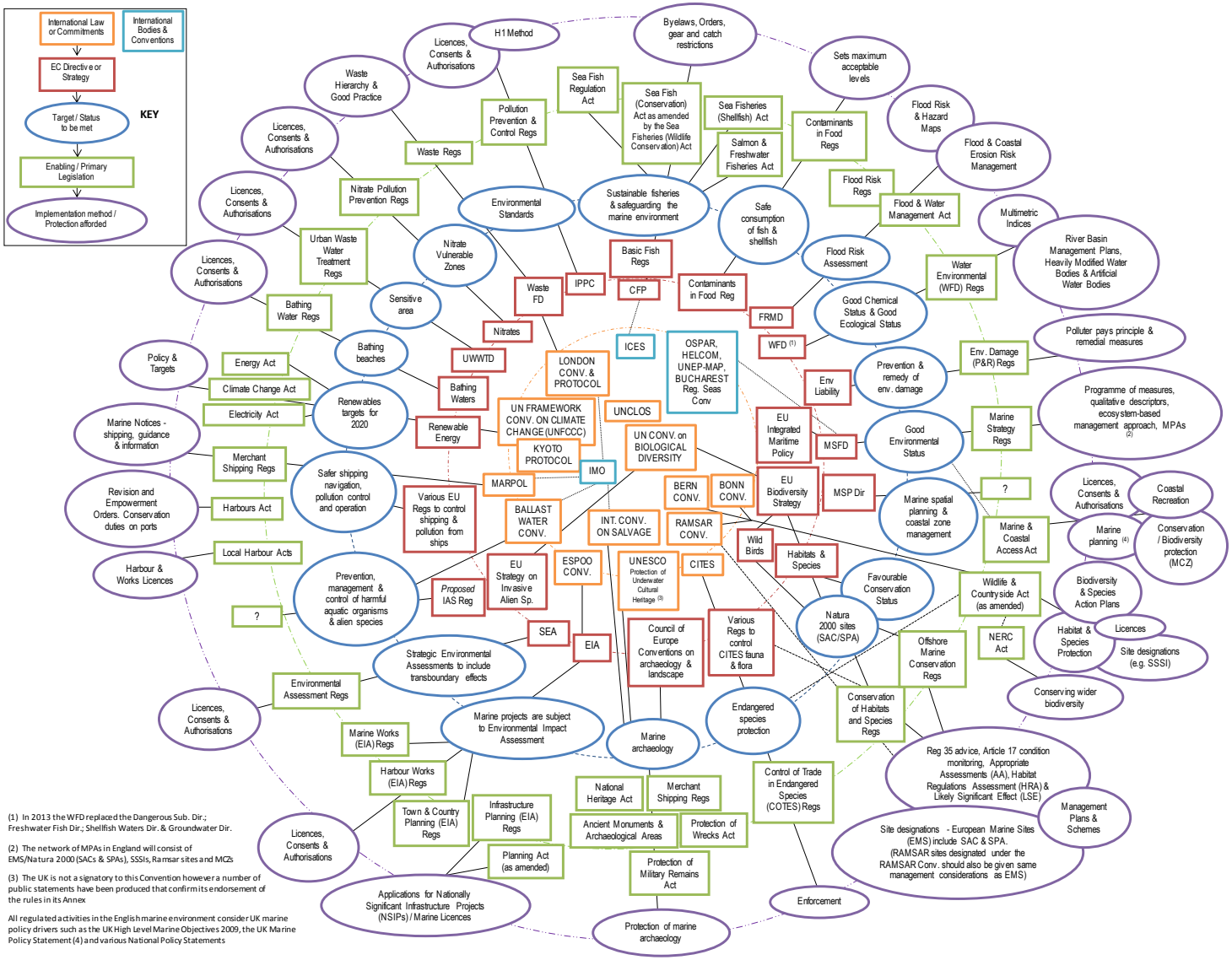

Fig 1 International, European and English legislation giving protection to the marine environment.

continental shelf and the waters above the seabed, up to a limit of 200 nautical miles from the baseline (R v. The Secretary of State for Trade and Industry ex parte Greenpeace Limited Case No: CO/1336/1999).

The figure also shows how this EU legislation has been implemented in England (including other primary enabling legislation) (green boxes) giving protection to the marine environment (purple ovals). As a consequence, most existing UK environmental law is the product of legislative enactment, often in response to European directives and is therefore related to sector specific activities. However, as the UK Government begins to take a more holistic approach to environmental management and by applying the Ecosystem-Based Approach to the management of human activities, environmental legislation now aims to enforce policies that focus on various policy goals. However not all English national legislation is in response to EU directives, for example, national acts such as the Marine and Coastal Access Act (2009) championed through government by environmental organisations (and the equivalent acts in Scotland (Marine (Scotland) Act 2010) and Northern Ireland (Marine Act (Northern Ireland) 2013) pre-empt the MSFD and the proposed MSP Directive. Despite this, these UK Marine Acts were framed on the basis that they would allow these EU marine directives to be implemented.

4.2. Horizontal integration

By replacing the actual names of the European directives and policies with their generic titles, it is possible to indicate the topics covered (Fig. 2) which although they have been added in an iterative and piecemeal manner, show the comprehensive nature of the system. It is arguable that topics and hence directives were added in response to particular societal concerns at any one time, for example the large emphasis on pollution from land and vessel-based sources in the 1970s which led to the legislation covering shellfish quality and dangerous substances. The Wild Birds Directive (79/409/EEC) in 1979 was possibly the European response and thus the start of the enabling legislation for the 1971 Ramsar Convention, whereas the large outbreaks of bloom-forming algae as the result of nutrient pollution in the 1980s led to the Nitrates Directive (91/676/EEC) controlling diffuse pollution in the early 1990s.

Whereas pollution seemed to be the most important topic needing to be addressed in the 1970s, and perhaps arguably the easiest problem to tackle especially in the case of point-source pollution, an increasing awareness of habitat and biodiversity based management was heightened by the UN Conventions on Biological Diversity (CBD) and Environment & Development (UNCED) (UN, 1992). These were put into EU law through the Habitats and Species Directive (92/43/EEC), which together with the Wild Birds Directive became the Natura 2000 framework. Member States transposed these directives into national legislation, although it is arguable that these were primarily designed for terrestrial areas, in which the management of a site is easier than in aquatic areas where the dynamics of environmental factors on biological components makes management more difficult. For example, protecting the diversity of a chalk grassland can encompass most of the features whereas managing wading bird populations in estuaries requires an understanding of their performance at breeding sites which may be thousands of kilometres away (Elliott and Whitfield, 2011).

The influence of the catchment on the quality of estuarine and coastal waters led to the expansion of control via the Water Framework Directive ultimately leading to catchment management plans and the consideration of hydromorphological barriers upstream which can affect the health of coastal and transitional waters. Just as pollution concerns made the transition from land to freshwaters to estuaries and lagoons and then to the open coast and seas, so did the legislation with the development of the MSFD and now MSP.

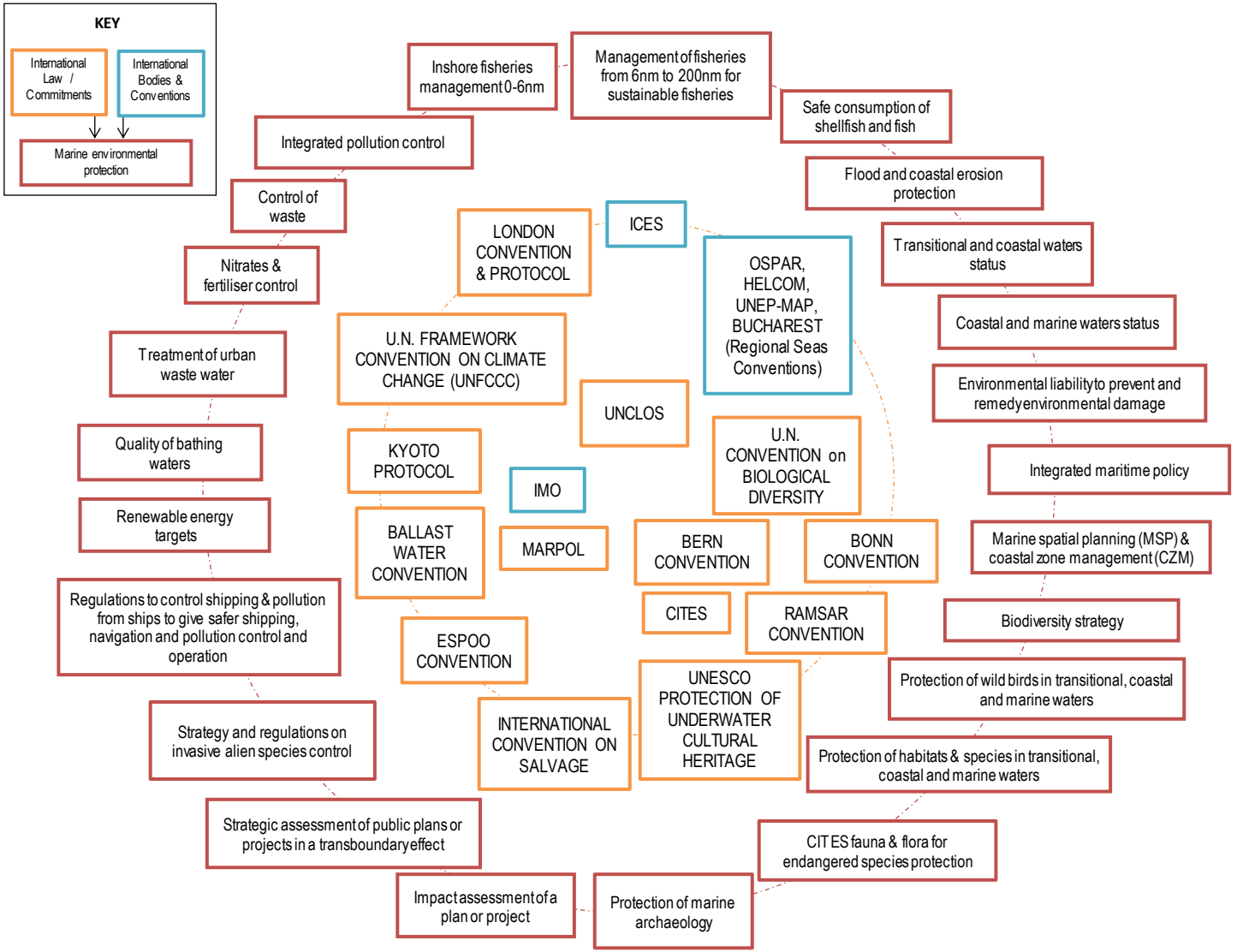

Fig 2 Generic map of environmental protection

The ‘horrendogram’ illustrates the complex nature of the legislation currently being used to manage and protect our transitional waters, coastal and marine environments (Fig. 1). As discussed above, whereas European policies until the 1990s were sectoral in nature, EU legislation has progressively become more holistic embracing the Ecosystem-Based Approach. Long (2011) suggests that one common feature of this new generation of EU legal instruments is that they establish a methodology for the management of natural resources that is ‘science-driven, adaptive and focused on enhanced Member State cooperation and coordination at regional levels’.

The generic figure (Fig. 2) is valuable in allowing the interrogation of and planning of integrating marine management in any coastal state worldwide, allowing all uses and users of the marine environment to be addressed and legislated for. It is important to ensure horizontal integration occurs amongst all the aspects of the marine environment.

5. Discussion

It is important to note that although the new generation of EU law has been adopted, regulatory sectoral instruments such as the Nitrates Directive, the Bathing Water Directive and the Urban Waste-water Treatment Directive that are predominantly focused on preventing specific types of land-based pollution of the aquatic environment, are not replaced by the WFD and MSFD, but make an important contribution towards attaining their objectives. As these framework directives are not prescriptive in nature, Member States still rely on these older generation directives to achieve the new goals for the marine environment (Long, 2011). Therefore sectoral legislation is still in existence with the more holistic new generation law adding to the plethora of legislation which is required to manage the sea with its many uses and users.

Given the total population of the EU coastal Member States, EU environmental directives contain some of the most influential environmental legislation worldwide, and are ‘binding as to the result to be achieved’. However, these directives have been criticised for often being vague in their commitments, lack specific details, and may contain wider-ranging derogations to soften the potential impact of the new legislation (Bell and McGillivray, 2006; Salomon, 2006; van Hoof, 2010; Rätz et al., 2010; van Leeuwen et al., in press). Moreover, the implementation of some of these directives by policy makers has also been rather piecemeal and has failed to meet the more holistic aspirations of the original legislation (Moss, 2008; Wakefield 2010; Holt et al., 2011).

A cautionary tale for those isolationist groups who criticise the excessive legislation at both the European and national levels, is they should remember that even without this, all these components and activities still need managing and regulating and so a maritime state still requires a broad amount of legislation. Hence, a country’s marine legislation would still require the elements to cover land and vessel pollution, dredging and aggregate extraction, fisheries and mineral exploitation etc. Similarly, the cross-boundary nature of marine problems will always require cross-boundary solutions.

At the Member State level, progress to protect the marine environment has been hampered by reactive sectoral policy. Current sea space management has often led to overregulation and complexity (EC, 2013a) and hence there has been a demand by industry for a ‘one-stop-shop’ to minimise the amount of legislation to be tackled before development can occur (Boyes and Elliott, in press). Furthermore, for some Member States boarding regional seas, the fact that purely national measures cannot influence the activities of other countries bordering the same marine area is frustrating. For example, regional cooperation poses many challenges for MSFD implementation, including obtaining support for regional outcomes by non-EU nations who are not required to ratify the MSFD (Freire-Gibb et al., 2014).

In addition, the plethora of marine legislation, can lead to what may be called the paradox of uncertain governance. Countries are struggling to keep up with the amount of EU legislation and require an increasing set of competent bodies and administration to enact the legislation (Boyes and Elliott, in press). Because of this, it is argued that each of those bodies can become competent in their own field (e.g. the nature conservation bodies tackle nature conservation only, and the environmental protection agencies tackle only pollution control) but they do not have the resources to tackle fields outside their own remit. However at least the new directives and recommendations are more holistic and less sectoral in nature.

Given the evidence above, we can now address the questions posed at the beginning of this paper:

1. Is there sufficient marine legislation to adequately manage the marine environment, giving protection to the natural system whilst providing ecosystem services and societal benefits?

There seems to be sufficient marine legislation to adequately manage the marine environment in that all elements are covered, although there needs to be greater cross-border coordination around those instruments. As EU legislation has historically been made sectorally, throughout a series of different decades and reactively to solve problems, some of the current policies conflict with each other. An example of this is the conflict experienced between managing activities in the marine environment to achieve GEnS under the MSFD and other policy aspirations that aim to develop social and economic growth in Europe. An increase in the renewable energy sector activities will cause pressures on the ecological characteristics of predominant habitats, increasing the risk of failing to achieve GEnS for Seafloor Integrity under the MSFD (Knights et al., 2011).

In essence, cross-border governance is required to be more effective so that it has a greater impact on users of the sea and its environment. Linking the MSP, Integrated Coastal Zone Management and Strategic Environmental Assessments may provide a powerful tool to integrate governance across sectors and help to attain the aspiration on attaining GEnS in the MSFD (Borja et al., 2013).

Despite a move to an Ecosystem-Based Approach to marine management, data are still collected sectorally and there is no 'one-stop-shop' to obtain data on the marine environment and thus provide more cost-effective mechanisms for the users to sustainably exploit the seas (Boyes and Elliott, in press). Similarly, it remains to be seen whether the proposed MSP Directive adds to or merely duplicates the existing controls.

2. Are all sectors adequately managed or do we require better management or better implementation of the current legislation?

To cope with changes (e.g. climate change) and their impacts on marine governance, future legislation may change (be amended) or be revoked (repealed) (e.g. the WFD repealing the four former directives of the Dangerous Substances Directive (67/548/EEC), Freshwater Fish Directive (2006/44/EC), Shellfish Waters Directive (2006/113/EC) and Groundwater Directive (80/68/EEC)) based on changes in policy. The enforcement of EU directives by the Com-mission or the enforcement of International law by the respective governing body may also change depending on future changes to the marine environment. Countries may choose to step away from the obligations of the law or make it a secondary concern to other environmental or economic issues or may require derogations (exclusion clauses) in implementing the directives. For example, the MSFD contains Descriptor 2 covering non-indigenous species (NIS) and hence a Member State would be in breach of the Directive such NIS caused the non-attainment of GEnS. Despite this, for the Mediterranean Sea, NIS entering through the Suez Canal will be outside a Member State's control and hence a Member State may ask for a derogation.

The Blue Growth Agenda (e.g. large-scale offshore aquaculture, seabed mining, and blue biotechnology) has been highlighted as a rapidly developing sector for which there is currently limited regulation and little is known about the ecosystems in which the activities take place. This developing marine sector may require additional governance if amendments to existing legislation are unfeasible.

Despite the plethora of marine legislation, it is possible to list some aspects of marine governance which still need to be addressed (Table 1). As an example, implementing the directives requires a large financial commitment not least in the monitoring and assessment required and the provision of data. This increases if changes to the marine environment due to local pressures have to be detected over those due to climate change. Borja and Elliott (2013) questioned the ability of countries to implement these directives in the current difficult economic climate.

Table 1 Problems still to be addressed.

Problems to be addressed	**Examples**
Climate change affecting the ability to fulfil the directives	All directives which rely on assessing change and status against a baseline will be affected by that baseline shifting due to climate change, such as MSFD, WFD, HSD, EIA (e.g. Elliott *et al*., submitted)
Jurisdictional overlap between Directives	e.g. coastal zone and especially that in important conservation areas is subject to overlapping jurisdiction of MSFD, WFD, MSP, HSD, SEA etc
Remit overlap between directives	e.g. Nitrates Directive and the Eutrophication Descriptor in MSFD
Compatibility of spatial coverage	HSD – at the level of a conservation area; WFD – at the level of a water body; MSFD – at the level of an ecoregion or regional sea sub-area
Cross-border harmonisation	More directives are addressing this issue e.g. MSFD, SEA and proposed MSP however are still problematic
New activities	Blue Growth activities e.g. seabed mining, biotechnology, large scale offshore aquaculture
Different directives with different competent authorities even for one area	e.g. nature conservation bodies for Natura 2000 Directives, EPA-style bodies for land-based pollution whereas other bodies for sea-based (vessel discharge and disposal) activities
Compatibility of EU resource-use policies with environmental protection directives	e.g. Common Agricultural Policy and nitrate run-off, Common Fisheries Policy and the inability to treat fisheries as an extractive industry requiring EIA etc.
Compatibility of status assessments	e.g. whether Favourable Conservation Status of HSD, Good Ecological Status and Good Chemical Status of the WFD and Good Environmental Status of the MSFD are synonymous which is required for harmonising the directives in an area
Compatibility of methods of assessment of environmental change	e.g. whether the Appropriate Assessment of HSD, and the environmental and cumulative impact assessments and strategic environmental assessments of their directives are compatible
Compatibility and harmonisation of time scales and reporting cycles	MSFD – achieve GES by 2020, reporting every 6 years WFD – achieve GEcS & GCS by 2015, updating/reporting every 6 years HSD – achieve FCS, reporting every 6 years.
Impact of the economic downturn	Sufficient funding to implement the directives.

3. Is there an important piece of legislation missing?

The analysis here suggests that all areas of the marine environment are currently being managed by some piece of legislation and that currently there is no legislation missing. However, whether this is integrated in the best possible way is open to discussion. There are areas of the marine environment which could be better managed through existing legislation. For example, the issue of cross-border co-operation is deemed important although the time-frame available for such transnational co-ordination is often prohibitively short. The MSFD (and the proposed MSP Directive) is seen as a way forward for cross-border co-operation as it makes it obligatory for Member States to work at the regional seas level, hence requiring more emphasis on cross-border co-operation.

4. Are the levels integrated both vertically (from globally to nationally) and horizontally (in all aspects within one geo-graphical area)?

Fig. 1 indicates that for specific sectors, there is vertical integration, for example following the chain of legislation for conservation from the UN Convention for Biological Diversity through the EU Natura 2000 directives to local regulations, the chain for climate change initiatives from the Kyoto protocol through the EU and national renewable legislation, and for underwater cultural heritage from UNECSO through EU and national legislation. However, the analysis shows that as yet there is incomplete vertical control over ballast water and on diffuse pollution, arguably intractable marine problems.

Within each horizontal level (international, European and national), the analysis indicates a comprehensive coverage. However, there is the proviso that in order for that coverage to be successful then it requires the administrative bodies to be coordinated (Boyes and Elliott, in press).

6. Concluding remarks

Firstly it is emphasised that in compiling and widely discussing the analysis here, it has been notable that observers have been surprised by the complexity and amount of current marine legislation, even though they were aware of the large number of marine activities which required controlling. Environmental protection requires adequate legislation but on condition that a fit-for-purpose and not disproportionate bureaucracy is provided.

Secondly, the historical view has shown a compartmentalisation of marine activities and their governance has produced a patchwork of EU directives and policies and national legislation leading to a piecemeal approach to protecting the marine environment. The challenge is now to ensure a vertically and horizontally linked patchwork and to ensure the instruments are integrated within a geographical area.

Thirdly, it is encouraging that the recent development of holistic and framework directives will increase the spatial and temporal integration but there is still an opportunity for rationalising the legislation and removing overlap. There is also the need to ensure that taken together the legal instruments have well-defined and integrated objectives.

Acknowledgements

The authors would like to thank Dr Bob Earll and the delegates of the Coastal Futures 2014 – Review and Future Trends (January 22nd-23rd) for providing their comments and critiques of the earlier drafts of this diagram produced for writing this paper. We hope your views have been taken on board. Despite this, the authors take full responsibility for the figures in this article and would welcome any further comments on their accuracy and completeness.

The research leading to these results has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration (FP7/2007-2013) within the Ocean of Tomorrow call under Grant Agreement No. 266445 for the project Vectors of Change in Oceans and Seas Marine Life, Impact on Economic Sectors (VECTORS), www.marine-vec¬tors.eu. Also from the DEVOTES (DEVelopment Of innovative Tools for understanding marine biodiversity and assessing good Environmental Status) project funded by the European Union under the 7th Framework Programme, 'The Ocean of Tomorrow' Theme (grant agreement no. 308392), www.devotes-project.eu.

References

Apitz, S.E., Elliott, M., Fountain, M., Galloway, T.S., 2006. European environmental management: moving to an ecosystem approach. Integr. Environ. Assess. Manage. 2 (1), 80–85.

Atkins, J.P., Burdon, D., Elliott, M., Gregory, A.J., 2011. Management of the marine environment: integrating ecosystem services and societal benefits with the DPSIR framework in a systems approach. Mar. Pollut. Bull. 62 (2), 215–226.

Bainbridge, J.M., Potts, T., O'Higgins, T.G., 2011. Rapid policy network mapping: a new method for Understanding Governance Structures for Implementation of Marine Environmental Policy. PLoS ONE 6 (10), e26149. http://dx.doi.org/ 10.1371/journal.pone.0026149.

Barnes, R.A., 2012. The law of the sea convention and the integrated regulation of the oceans. Int. J. Mar. Coastal Law, 27.

Bell, S., McGillivray, D., 2006. Environmental Law, 6th Ed. Oxford University Press. Beunen, R., van der Knaap, W.G.M., Biesbroek, G.R., 2009. Implementation and integration of EU environmental directives. Experiences from The Netherlands. Environ. Policy Governance 19, 57–69.

Borja, Á., Elliott, M., 2013. Marine monitoring during an economic crisis: the cure is worse than the disease. Mar. Pollut. Bull. 68, 1–3.

Borja, Á., Elliott, M., Carstensen, J., Heiskanen, A.-S., van de Bund, W., 2010. Marine management – towards an integrated implementation of the European marine strategy framework and the water framework directives. Mar. Pollut. Bull. 60, 2175–2186.

Borja, A., Elliott, M., Andersen, J.H., Cardoso, A.C., Carstensen, J., Ferreira, J.G., Heiskanen, A-S., Marques, J.C., Neto, J., Teixeira, H., Uusitalo, L., Uyarra, M.C., Zampoukas, N., 2013. Good Environmental Status of marine ecosystems: What is it and how do we know when we have attained it? Mar. Pollut. Bull. 76, 16– 27.

Boyes, S.J., Elliott, M., 2014. The excessive complexity of national marine management systems – has this decreased in England since the introduction of the Marine and Coastal Access Act 2009? Mar. Policy (in press). <http:// dx.doi.org/10.1016/j.marpol.2014.07.019>.

Brennan, J., Fitzsimmons, C., Gray, T., Raggatt, L., 2013. EU Marine Strategy Framework Directive (MSFD) and marine spatial planning (MSP): which is the more dominant and practicable contributor to maritime policy in the UK. Mar. Policy, 70, <http://dx.doi.org/10.1016/j.marpol.2013.07.011i>.

Collie, J., Adamowicz, W., Beck, M., 2013. MSP in practice. Est. Coast Shelf Sci. 117, 1–11.

Commission of the European Communities. 2007. Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and The Committee of the Regions. An Integrated Maritime Policy for the European Union. COM (2007) 574 final.

Commission of the European Communities. 2008. Guidelines for an Integrated Approach to Maritime Policy: Towards best practice in integrated maritime governance and stakeholder consultation. COM (2008) 395 final, Brussels.

Cormier, R., Kannen, A., Elliott, M., Hall, P., Davies, I., (Eds.), 2013. Marine and Coastal Ecosystem-based Risk Management Handbook. ICES Cooperative Research Report, No. 317, March 2013, International Council for the Exploration of the Sea, Copenhagen, 60pp, ISBN 978-87-7472-115-1.

De Santo, E., 2011. Environmental justice implications of MSP. Mar. Pollut. Bull. 35, 34–38.

Douvere, F., 2008. MSP in ecosystem-based sea use management. Mar. Pollut. Bull. 32, 762–771.

Douvere, F., Ehler, C., 2009. European experience with MSP. J. Environ. Manage. 90, 77–88.

EC, 2006. Supra note 34 pp. 2–3.

EC, 2008. Council Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive). doiuri=OJ:L:2008:164:0019:0040:EN:PDF (accessed 22.09.11) <http://eur¬lex.europa.eu/LexUriServ/LexUriServ>.

EC, 2009. The Integrated Maritime Policy for the EU –priorities for the next Commission. Report from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions – Progress report on the EU's integrated maritime policy {SEC(2009) 1343} (accessed 09.11) doi=CELEX:DKEY=502415:EN: <http://eur¬lex.europa.eu/LexUriServ/LexUriServ>.

EC, 2011. Study on the Economic Effects of MSP. European Commission, Luxembourg.

EC, 2013a. MEMO – Questions and Answers on proposed Directive on Maritime Spatial Planning and Integrated Coastal Management. Brussels, 13 March 2013.

EC, 2013b. Proposal for a Regulation of the European Parliament and of the Council on the prevention and management of the introduction and spread of invasive alien species. COM(2013) 620 final, Brussels.

EC, 2014. Commission welcomes Council's agreement to improve how seas and coastal areas are used. (accessed 31.07.14) <http://ec.europa.eu/information_ society/newsroom/cf/mare/itemdetail.cfm?item_id=17514&subweb=342& lang=en>.

EDOWA, 2011. Overview of Environmental Law in Western Australia. Environmental Defenders Office of Western Australia, Perth, Fact Sheet 01, pp11. <http://www.edowa.org.au/files/factsheets/iel_introenvirolaw.pdf>.

Elliott, M., 2011. Marine science and management means tackling exogenic unmanaged pressures and endogenic managed pressures – a numbered guide. Mar. Pollut. Bull. 62, 651–655.

Elliott, M., 2013. The 10-tenets for integrated, successful and sustainable marine management. Mar. Pollut. Bull. 74 (1), 1–5.

Elliott, M., 2014. Integrated marine science and management: wading through the morass. Mar. Pollut. Bull 86, 1–4.

Elliott, M., Borja, A., McQuatters-Gollop, A., Mazik, K., Birchenough, S., Andersen, J.H., Painting, S., Peck, M., submitted for publication. Climate change will affect our ability to achieve Good Environmental Status for marine biodiversity. Aquat. Conserv.

Elliott, M., Whitfield, A., 2011. Challenging paradigms in estuarine ecology and management. Estuar. Coast. Shelf Sci. 94, 306–314.

Elliott, M., Boyes, S.J., Burdon, D., 2006. Integrated marine management and administration for an island state—the case for a new Marine Agency for the UK. Mar. Pollut. Bull. 52 (5), 469–474.

Foley, M., Halpern, B., 2010. Guiding ecological principles for MSP. Mar. Pollut. Bull. 34, 955–966.

Freire-Gibb, L.C., Koss, R., Margonski, P., Papadopoulou, N., 2014. Governance strengths and weaknesses to implement the marine strategy framework directive in European waters. Mar. Policy 44, 172–178.

Hering, D., Borja, A., Carstensen, J., Carvalho, L., Elliott, M., Feld, C.K., Heiskanen, A.S., Johnson, R.K., Moe, J., Pont, D., Solheim, A.L., van de Bund, W., 2010. The

European Water Framework Directive at the age of 10: a critical review of the achievements with recommendations for the future. Sci. Total Environ. 408 (19), 4007–4019.

Holt, A., Godbold, J.A., White, P.C.L., Slater, A.-M., Pereira, E.G., Solan, M., 2011. Mismatches between legislative frameworks and benefits restrict the implementation of the ecosystem approach in coastal environments. Mar. Ecol. Prog. Ser. 434, 213–228.

Jay, S., 2010. Built at Sea: marine management and MSP. Town Plan. Rev. 81, 173– 191.

Jay, S. et al., 2013. International progress in MSP. In: Chircop, A. et al. (Eds.), Ocean Yearbook, vol. 27. Martinus Nijhoff, Leiden, pp. 171–212.

Knights, A.M., Koss, R.S., Papadopoulou, N., Cooper, L.H., Robinson, L.A., 2011. Sustainable use of European regional seas and the role of the Marine Strategy Framework Directive. Deliverable 1. EC FP7 project (244273). Options for delivering ecosystem-based marine management. University of Liverpool: 2011. 165 pp. ISBN: 978-0-906370-63-6.

Long, R., 2011. The marine strategy framework directive: a new European approach to the regulation of the marine environment, marine natural resources and marine ecological services. J. Energy Nat. Resour. Law 29 (1), 1–44.

Mee, L.D., Jefferson, R.L., d.A. Laffoley, D., Elliott, M., 2008. How good is good? human values and Europe's proposed marine strategy directive. Mar. Pollut. Bull. 56, 187–204.

Moran, D., Dann, S., 2008. The economic value of water use: implications for implementing the water framework directive in Scotland. J. Environ. Manage. 87, 484–496.

Moss, B., 2008. The water framework directive: total environment or political compromise? Sci. Total Environ. 400, 32–41.

Ounanian, K., Delaney, A., Raakjær, J., Ramirez-Monsalve, P., 2012. On unequal footing: stakeholder perspectives on the marine strategy framework directive as a mechanism of the ecosystem-based approach to marine management. Mar. Policy 36, p658–666.

Qui, W., Jones, P.J.S., 2013. The emerging policy landscape for marine spatial planning in Europe. Mar. Policy 39, 182–190.

Rätz, H., Dörner, H., Scott, R., Barbas, T., 2010. Complementary roles of European and national institutions under the common fisheries policy and the marine strategy framework directive. Mar. Policy 34 (5), 1028–1035.

Salomon, M., 2006. The European Commission proposal for a marine strategy: lacking substance. Mar. Pollut. Bull. 52 (11), 1328–1329.

Schaefer, N., Barale, V., 2011. MSP and maritime policy. J. Coastal Conserv. 15, 237– 245.

Tett, P., Gowen, R., Painting, S., Elliott, M., Foster, R., Mills, D., Bresnan, E., Capuzzo, E., Fernandes, T., Foden, J., Geider, R., Gilpin, L., Huxham, M., McQuatters-Gollop, A., Malcolm, S., Saux-Picart, S., Platt, T., Racault, M-F., Sathyendranath, S., Molen, J.v.d. and Wilkinson, M., 2013. Framework for understanding marine ecosystem health. Mar. Ecol. Prog. Ser. 494, pp. 1–27 + suppl. material.

van Hoof, L. 2010. Who rules the waves? Governance and New Institutional Arrangements in Dutch Fisheries Management in the Context of the European Common Fisheries Policy. PhD Thesis, Wageningen University, Wageningen, NL. ISBN 978-90-8585-625-2.

van Hoof, L., van Leeuwen, J., van Tatenhove, J., 2012. All at sea; regionalisation and integration of marine policy in Europe. Marit. Stud. 11 (9), <http://dx.doi.org/ 10.1186/2212-9790-11-9>.

van Leeuwen, J., Raakjaer, J., van Hoof, L., van Tatenhove, J., Long, R., Ounanian, K. in press. Implementing the Marine Strategy Framework Directive: A policy perspective on regulatory, institutional and stakeholder impediments on effective implementation. Mar. Policy (in press) <http://dx.doi.org/10.1016/ j.marpol.2014.03.00>.

van Tatenhove, J.P.M., 2013. How to turn the tide: developing legitimate marine governance arrangements at the level of the regional seas. Ocean Coast. Manag. 71, 296–304.

Wakefield, J., 2010. Undermining the integrated maritime policy – viewpoint. Mar. Pollut. Bull. 60, 323–333.