Marine Policy 35 (2011) 784–793

Contents lists available at ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol

Towards climate adaptation and coastal governance in Ireland: Integrated architecture for effective management?

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ARTICLE INFO

Available online 15 February 2011

Keywords:
Climate adaptation
Coastal zone management
Policy integration
Governance architecture
Earth system governance

ABSTRACT

Coastal environments are susceptible to a range of impacts arising from medium and long-term climate change. However, as Ireland's population and industrial centres are concentrated in coastal locations, Ireland's coastal communities will be particularly vulnerable to the impacts of climate change. Therefore, making the best use of existing knowledge to inform the establishment of governance structures capable of facilitating the measures and actions which may soon be required is a national imperative. Coastal communities worldwide have turned to integrated coastal zone management (ICZM) as a process to deliver sustainable development. This paper explores how experience gained from ICZM implementation can be harnessed to inform the development and implementation of climate adaptation policies, with a particular focus on the coastal zone. Using the principles and conceptual basis of Earth System Governance – an emerging approach to analyse complexity of governance under global environmental change – the paper maps the architecture of ICZM and climate governance in Ireland. The research identifies the main barriers to, and opportunities for, integrated application of the two policy domains. Barriers include the fragmentation of governance structures and responsibilities of key stakeholders, a lack of coordinated support for ICZM implementation at the national level, and a relatively weak awareness of the specifics of adaptation at the local level. Opportunities include the availability of expertise gathered from phases of ICZM implementation in Ireland, which encompasses mechanisms for science-policy integration, and invaluable experience of stakeholder participation and interaction. Current political and scientific support at national and EU levels give an additional impetus to climate research and actions which may bring additional opportunities and resources to coastal governance in Ireland.

1. Introduction

Climate change impacts can no longer be considered the abstract concerns of future generations. Evidence that human activity is triggering significant climate change continues to mount [1,2]. Due to the latency of natural systems, such changes are now 'locked in' for decades to come, regardless of any action taken to mitigate anthropogenic greenhouse gas emissions. Accordingly, the issue of adaptation to climate change has risen steadily in scientific and public policy discourse, yet traditional approaches to the framing of social and ecological change are increasingly seen as inadequate [3–6]. Conflict, complexity and uncertainty are ever-present factors in deliberations on climate-related issues [7], yet the urgency with which such issues must be addressed implies that hesitancy to act is not an option. Instead, lessons that can contribute to an improved understanding must be identified, and innovative approaches adopted, if scientists and public policy practitioners are to optimise the efficacy of climate adaptation measures [2,8,9].

Coasts reflect the transition between terrestrial and marine ecosystems, are dynamic, and support a significant portion of the world's population [10,11]. Coastal and marine areas are particularly vulnerable to effects associated with climate change which drive changes in environmental and social systems [1,12], for example, sea level rise, changing weather patterns, increasing intensity of storms and precipitation, coastal squeeze [13,14].

[1] The views expressed in this article are those of the author and do not necessarily reflect the official position of the EPA.

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doi:10.1016/j.marpol.2011.01.005

Each of the impacts will vary in magnitude for different locations and sectors of the coastal economy. However, vulnerability to climate change is increasingly associated with the preparedness of society to adapt (e.g. by means of planning, policy and behaviour), rather than mere exposure to its effects [6,15]. Those seeking to formulate climate adaptation responses do not face such a challenge in isolation. Lessons to emerge from the implementation of integrated coastal zone management (ICZM) in Europe (COM/2000/547) indicate the challenges faced by coastal managers to be remarkably similar to those now confronting individuals and organisations tasked with the development and implementation of measures to support climate adaptation. Both policy domains stipulate the integration of sectoral, administrative and geographical governance [16] (2002/413/EC), both advocate subsidiarity and participatory decision making [17,18] (2002/413/EC), and also posit an adaptive governance approach and ecosystems-based problem framing as essential ingredients for long-term sustainability [19–22], (2002/413/EC). Therefore, decision-making processes in relation to coastal management or climate adaptation responses will overlap in terms of the institutions and stakeholders involved, and the issues to emerge. Such commonalities present an opportunity for the experiences of ICZM implementation to inform approaches to climate adaptation. In an Irish context, the commonalities between ICZM and climate adaptation are perhaps even greater; as an island nation, the coastal zone is home to approximately one third of the Irish population [23], and contains key infrastructure (e.g. ports, road and rail networks) and strategic industrial locations.

Increasingly, research is demonstrating the necessity of policy integration to stimulate synergetic effects between climate policies, sectoral economic strategies and spatial planning. For example, Rypdal et al. [24] analyse effects of climate policies on pollution reduction; additionally, there are a number of studies exploring synergies between climate adaptation and sectoral policies including agriculture, nature conservation and water management [25–27]. Such a breadth of approaches to governance, giving a complex view of multi-level and multi-sectoral management, can be conceptualised in terms of governance architecture as defined by the developing concept of Earth System Governance (ESG) [4,5].

The aim of the ESG conceptual framework and related core project in the International Human Development Program (IHDP)[2] is to provide theoretical and methodological tools to analyse the complex interplay of actors and institutions engaged in the governance of social–environmental systems. To date, the application of conceptual frameworks, based on the ESG principles, to regional case studies has provided valuable insight when analysing the complex issues involved in climate adaptation. Examples include the analysis of interaction between climate policy, spatial development, planning and water management [27], and climate adaptation and biodiversity conservation [28]. This paper applies the ESG approach to an analysis of climate adaptation governance in the coastal zone of Ireland. Responding to the ongoing process of development and application of climate adaptation policy in Ireland, the study aims to provide theoretical grounds for the streamlining of coastal and climate policy domains. Therefore, application of the ESG conceptual framework in an Irish context serves two objectives: (1) by emphasising the social aspects and integrity of environmental governance, ESG framework provides new perspectives on the problem structure, barriers and opportunities for effective coastal and adaptation management; and (2) by applying ESG approach and terminology, the paper contributes to the pilot practical applications of the new conceptual framework within the global ESG research initiative by the International Human Dimension Program IHDP [5,25,26].

ESG is defined as "an interrelated and increasingly integrated system of formal and informal rules, rule-making systems, and actor-networks at all levels of human society (from local to global) that are set up to steer societies towards preventing, mitigating, and adapting to global and local environmental change and, in particular, earth system transformation, within the normative context of sustainable development" [5]. Persistent uncertainty; intergenerational, functional and spatial interdependence of problems, operations and actors; and an extraordinary degree of potential harm associated with global environmental change are viewed via ESG analysis as the unavoidable conditions (or problem structure) within which contemporary governance takes place. Four principles, credibility, stability, adaptiveness and inclusiveness, have been formulated to guide transformation toward more effective management [4,5]. In order to design and support operational practices (and adjust existing ones) based on these principles, the policy community needs to meet several challenges, including: creating an effective architecture of governance; supporting balanced participation (agency); designing governance structures which are flexible and adaptive to change while maintaining accountability and legitimacy to agents; and securing adequate resource allocation. For the scholarly community these tasks also represent research challenges of Earth System Governance [4,5].

Responding to the ongoing process of development and application of adaptation policy in Ireland, the purpose of this work is to use ESG to underpin the streamlining of two related yet currently separate policy domains: coastal management and climate governance. This paper particularly explores the challenge associated with the architecture for climate governance in Irish coastal areas [5]. This paper explores how to optimise knowledge exchange – based upon the experience gained from efforts to implement ICZM and climate adaptation – for the purpose of fostering the sustainable development of coastal and marine resources in Ireland. It addresses the following questions:

- Whether the ESG concepts can provide an analytical framework appropriate to the specific problems of coastal adaptation in Ireland.
- In the context of institutional learning—whether lessons from the experience of ICZM implementation in Ireland can inform more effective climate adaptation strategies.
- Whether the two policy domains might support each other in combining locally based coastal management and an overarching national climate strategy to develop an integrated "architecture" of climate adaptation and coastal zone management in Ireland?

To answer these questions, the respective policy frameworks of ICZM and climate policy in Ireland were treated as construction 'blocks' for an emerging architecture of climate adaptation and integrated coastal management. To identify the barriers and opportunities for an integrated architecture, the ESG principles of *credibility*, *stability*, *adaptiveness* and *inclusiveness* were applied as criteria for analysis. The approach adopted included the analysis of processes and outcomes of several completed and ongoing research projects (see Appendix A) which was supplemented by: (1) a documentary review of ICZM and climate policy for Ireland and (2) interaction and dialogue with members of the science and policy communities at workshops where integrated coastal management and coastal policy were discussed.

This remainder of the paper is organised as follows: Section 2 describes the theoretical and methodological approach to the

[2] http://www.earthsystemgovernance.org/

analysis; Section 3 offers an overview of coastal climate adaptation in Ireland, contextualised via the ESG problem structure, and outlines the evolution of ICZM (with examples of ICZM projects in Appendix A) and climate policy in Ireland. This underpins the conception of an integrated architecture for climate adaptation and coastal governance. Section 4 provides a more detailed analysis by applying the four principles of ESG as an analytical framework to identify the barriers and opportunities for coastal management and climate adaptation policy integration, including lessons to be learned from previous experience; and, Section 5 provides conclusions of the exercise.

2. Theory and methods

Biermann et al. [5] define governance architecture as "the interlocking web of widely shared principles, institutions, and practices that shape decisions at all levels in a given area of Earth System Governance." Harnessing the empirical experience of more than a decade of outputs from practise and management focused projects, this paper aims to reflect on whether and how this "interlocking web" can be optimised and, in particular, which preconditions exist in Ireland for creating an effective architecture of climate and coastal governance.

There are no 'standard' circumstances for climate adaptation or coastal governance that can be used as a template [29,30]. Under these conditions, it is difficult – if not impossible – to define universal criteria for the identification of an "effective" or "good" architecture of governance. Nevertheless, this paper applies four general principles of Earth System Governance – credibility, stability, adaptiveness, and inclusiveness – as benchmarks for an analysis of the empirical material and published outcomes of completed projects pertinent to coastal management in Ireland. From this analysis, lessons may be derived that will serve to inform the design of a governance architecture aiming to facilitate both integrated management and adaptation to climate change in the coastal areas of Ireland.

The selected criteria have been formulated by Biermann [4,5] as core principles of "good" governance under decision-making conditions of high uncertainty, intergenerational, functional and spatial interdependence and a potentially high degree of harm (described above as the "problem structure"). A similar set of criteria can be found in a number of environmental governance studies. For example, Moser [31] based on number of studies [3,32–35] states that "…informal and institutional mechanisms for maintaining system in a desirable state despite internal and external fluctuations and uncertainty" refer to robustness of the governance system. This can be related to adaptiveness and stability as described above. Further, Moser notes that institutional flexibility and the ability to adapt institutions, and to incorporate different types of knowledge and stakeholder perspectives [3,33,35] are necessary for maintaining robustness of governance and resilience of the system to climate change. Drawing on a substantial and established academic literature, Gupta et al. [36] define criteria of "fair governance" for building institutional adaptive capacity, as comprising: legitimacy (corresponds to credibility and stability), accountability (credibility and inclusiveness), responsiveness (adaptability) and equity (resulting from inclusiveness). These criteria have been applied in this paper as they are articulated in the ESG literature [4,5]. Their contextual interpretation, and the characteristics used in the analysis of Section 4 are detailed in Table 1. Based on the existing literature, projects' outcomes and communication with stakeholders in Irish coastal zones, characteristics for each criteria has been derived as applied to Irish coastal audiences.

More than ten years experience of completed and ongoing research projects and policy initiatives in the area of integrated coastal zone management and national climate policy provided material for identifying the barriers and opportunities for an integrated architecture of coastal and climate governance. Fig. 1 represents the overall structure of the analysis with references to the sections of the paper.

The majority of the projects selected for analysis and represented in the Appendix A address coastal management in Irish conditions. Moreover, the latest projects (e.g. IMCORE and CLAD)

Table 1
Evaluation criteria for potential integrated architecture of climate and coastal governance in Ireland (based on ESG principles).

Criteria and description	Characteristics
Credibility Actors perceive the governance structures and institutions as legitimate and trustworthy, and are willing to support it by following rules, committing resources and replying of reciprocity [27,37]	• Adequate official support of local implementation (e.g. policies, institutions and practices) • Perception of the management system by actors as influential and trustworthy (see e.g. [38])
Stability Actions are consistent across different time scales; actors are able to rely on the normative governance frameworks notwithstanding political or other change [4,25] and committed to follow decisions even if the expected outcome outlives their current interests, political or physical life span	• Capacity of existing governance structures to address different time lines in decision-making (e.g. by possessing adequate information and supporting continuation of policies at different levels and sectors) • The commitment and ability of local implementation practices to support policy persistence
Adaptiveness Actors must have the ability to change governance elements to respond to new environmental and socio-economical situations (predictable and unexpected) without harming both credibility and stability of the system [27,37] and to be prepared to constantly reflect on the effectiveness of their governance interventions, correcting plans, actions and institutions as circumstances demand [3]	• Adequacy of information regarding system changes available to decision-makers • Capability and flexibility of the instruments of existing institutions to react to changing circumstances [39]
Inclusiveness Governance and planning processes should support identification of relevant stakeholder groups (direct and indirect stakeholders) and facilitate involvement of different actors, views and knowledge in the decision-making and implementation process [4,5,6,20,40,41–42] (COM (2001) 428 final, COM (2009) 147/4 final, COM (2007) 354 final).	• Existence of the (official) procedural backing of stakeholder involvement • The adequacy of relevant experience and information available to participants and their influence on decision making [43–45]

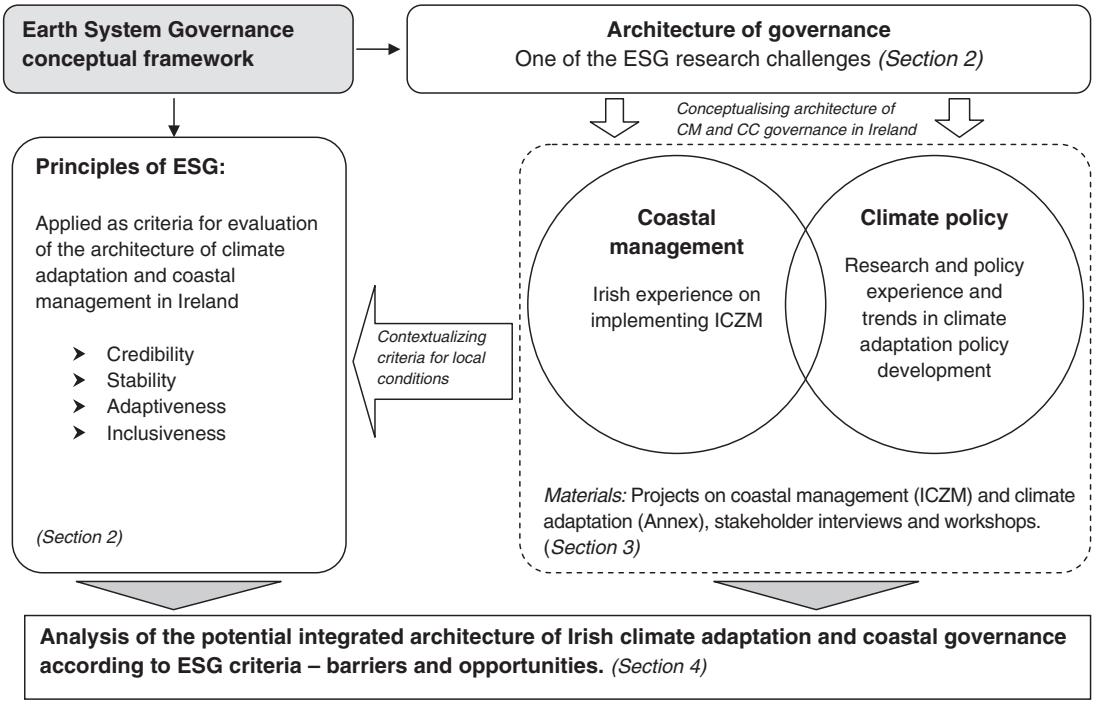

Fig. 1. Analysis of the potential for integrated architecture of climate adaptation and coastal governance in Ireland.

address both integrated coastal management and climate adaptation. Each project contained stakeholder engagement as a key component. Thus, the cumulative activities of these initiatives provide substantial value in terms of obtaining expert and stakeholder input on possible barriers and opportunities for both ICZM and climate adaptation. Analysis of the projects was supplemented by interaction with members of the science and policy communities, through a series of interviews, informal communications and stakeholder workshops on ICZM and climate adaptation at the local and national scale. The most recent material was obtained through a series of events in 2009–2010 including: a national expert workshop on the assessment of national adaptive capacity (May 2010); scoping workshops on climate related issues and scenario exercises in Cork Harbour (May 2009, May 2010) Tralee Bay (March 2010), and Lough Swilly (June 2010). As the majority of workshop materials and interviews were analysed in retrospect, a statistical analysis of the material relating to each of the criteria has not been conducted. Relevant lessons resulting from each project are summarised in Appendix A.

3. Coastal and climate governance in Ireland

3.1. An evaluation of the Irish coast: the ESG problem structure applied

Irish coastal environments will be susceptible to potential harm arising from medium and long-term climate change [46–48]. Ireland's largest cities are located on the coast and the c. 6500 km coastline (5800 km in the Republic) is home to approximately 34% of the Irish population [23,49], and supports key infrastructure (e.g. ports, road and rail networks) and strategic industries [49]. Early impacts of climate change in Ireland include severe erosion, higher intensity and changing regimes of storms and floods, sea level rise and resulting 'coastal squeeze' affecting both socio-economic and ecological systems [23,46,47,50]. The ambiguities inherent to all forecasts of complex socio-economic systems' behaviour lead to a significant degree of uncertainty. Complex planning and management challenges are not new phenomena to Ireland's coastal communities [20,51]. Impacts that will likely intensify due to climate change (such as coastal erosion) have historically acted as catalysts for management interventions, and in some cases these management (re)actions have been of limited value or even exacerbated the problem. Further intervention will impact future generations in a manner that is as yet difficult to predict, as described by the ESG principle of intergenerational interdependence. By their nature coastal areas are characterised by functional and spatial interdependence which is particularly true in multi-use environments, where interaction at a variety of levels between different groups of terrestrial and marine stakeholders can complicate any planning and/or management intervention.

3.2. ICZM in Ireland

In Ireland, coastal management is characterised by a sectoral approach, and no national policy framework exists for an integrated approach to coastal management [20]. Instead, responsibility for the various sub-system elements and processes that constitute the coastal eco-socio systems of Ireland has fallen under the remit of various central and local government bodies [20,52].

The emergence of ICZM in the mid to late 1990s as a mechanism to reduce the deterioration of coastal areas, and progress sustainable use of coastal resources in Europe, led many European countries, including Ireland, to examine the role of ICZM and potential for its implementation at a national level. The outputs of the EC Demonstration Programme on ICZM (1996–1999) which involved two projects with Irish participation [53] provided information to shape subsequent ICZM policy in Europe [54]. Specifically the findings were taken forward in the Communication from the Commission to the Council and the European Parliament on "Integrated Coastal Zone Management: A Strategy for Europe" (COM (2000) 547 final), and the EC Recommendation concerning the Implementation of ICZM in Europe (2002/413/EC final).

Parallel to Irish participation in the Demonstration Programme on ICZM, specific work was undertaken at the national level to review the potential for implementing a strategic framework for coastal planning and management [55,56]. The report *Coastal Zone Management—A Draft Policy for Ireland* was commissioned by the three responsible central Government departments and presented a series of recommendations on options to overcome the prevalent institutional and administrative barriers of the time: moving towards better integration in the decision making process; overcoming the sectoral approach; and the strong land/marine divide, which then characterised the national approach to coastal management [55]. A phased approached to the introduction of ICZM in Ireland was proposed.

However, the Draft Policy from 1997 was not formally adopted by any of the Government Departments involved and ICZM in Ireland has continued to exist in a policy vacuum. In the intervening period, the concept of ICZM received indirect support through various commitments in policy and strategy documents of public bodies [57–61]. Paradoxically, at the same time, the coastal and marine regulatory and jurisdictional portfolio became increasingly diluted at Ministerial and Government Departmental scales i.e. by 2008 no Government Department had marine or coast within its title.

Delivery of ICZM became embedded in primarily local scale initiatives (examples provided in Appendix A), with no statutory basis, exclusively project-based and, in many cases, led by academics rather than local actors or agencies. Funding for ICZM was obtained under the various programmes of the European Regional Development Fund (ERDF) (e.g. Cork Harbour) whereas other local scale initiatives (e.g. Dingle Harbour) were funded through local government organisations, voluntary contributions, and grant-aid for community and rural development. For the most part, the aforementioned ICZM initiatives did not have any formal mechanism for interaction or co-ordination; opportunities for knowledge exchange and sharing of experience were limited. The establishment of the Coastal Communities Network (2003) and the Irish Coastal Network (2006) did provide platforms for interaction between communities and practitioners involved in ICZM in Ireland; both these networks were established and administered by university-based researchers.

3.3. The evolution of Irish climate policy

In line with the approach of most nations and supra-national bodies such as the EU, the driving force behind the development of national climate policy in Ireland was a requirement to meet obligations established under the Kyoto Protocol. Following a period of public consultation, publication of *Ireland's Pathway to Kyoto Compliance* [62] fed into a subsequent *National Climate Change Strategy* (NCCS) [42]. The latter outlined a range of principles and policy options to deal with climate issues in an integrated manner (Fig. 2).

Responding to further stimulus at the EU (COM (2009) 147/4 final) and national levels the Irish Government has taken a firm commitment to produce a Climate Bill, and a National Climate Change Adaptation Framework [42] (Fig. 3). The development of the Framework is being supported by the Environmental Protection Agency (EPA) Climate Change Research Programme (CCRP) and other sectoral interests. The process is strongly guided by the European Commission White Paper on Adaptation to Climate Change (COM (2009) 147/4 final) and will follow a similar two-phased approach. Phase 1 will focus on gaining a comprehensive understanding of impacts and vulnerability, and Phase 2 will address adaptation planning and implementation. Notwithstanding these efforts, the practical implementation of adaptation responses in Ireland remains in its relative infancy.

The issue of building adaptive capacities to climate change at different levels gained significant political traction in the wake of a number of extreme weather events, including episodes of severe flooding in many parts of the country over the last decade (e.g. flooding in the areas of Dublin, Cork and the south and western counties in late 2009) (see Box 1). A number of significant recent reports have also contributed to the understanding of climate change impacts, vulnerability and adaptation options in Ireland [46,63–64]. At the time of writing, the EPA is undertaking a national adaptive capacity assessment to inform development of the National Adaptation Framework. The assessment will be implemented with reference to the National Adaptive Capacity (NAC) framework proposed by the World Resource Institute [65] and outlines adaptive capacity for different sectors of Irish economy [65]. In combining the elements of knowledge on

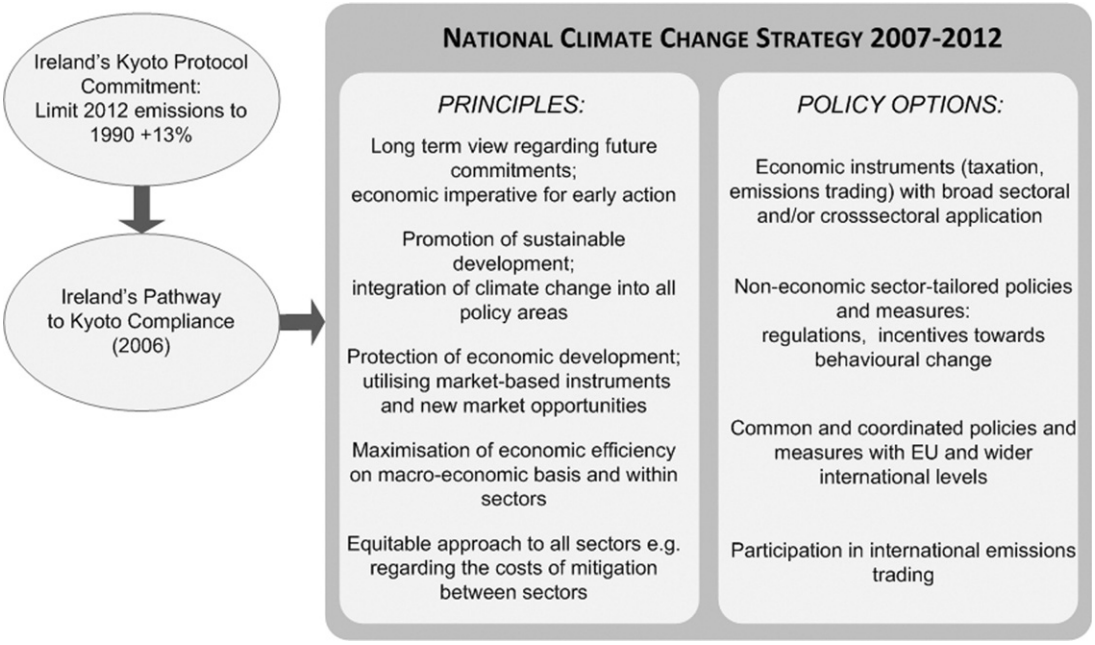

Fig. 2. Development, principles and options in relation to Ireland's climate policy.

Fig. 3. Timeline of milestones for ICZM and climate policy in Ireland at local, national and international levels.

Box 1–Recent flooding events: alleviating damage or preparing for future?

During the preparation of this paper, the city of Cork on the south coast of Ireland was coming to terms with extensive damage caused by severe flooding brought about by an extreme precipitation event (in turn followed by an unavoidable release of water from an upstream dam). However, the restoration and compensation measures aimed at existing infrastructures are unlikely to prevent future losses and damages from floods of the same intensity, which are projected to become more prevalent in the area according to nationally scaled mid- and long-term climate scenarios for Ireland [23,48]. Lack of synergy between short- and long-term policy responses does not support stability planning and implementation process. The longest planning horizon at the national level is 2020 for the National Development Plan which is hardly enough to provide an overarching strategy for mid- and long-term consequences of climate change. Five-year local plans are concentrated on immediate operational measures, including ''flood protection.'' Overall framing of the issue as ''flood protection'' favours short- and mid-term engineering responses, while the climate change context of the problems and related necessary integration and adaptiveness of planning and institutions are largely ignored.

The Climate Bill and National Adaptation Framework are supposed to provide a base for integrated planning including long-term vision supported by short-term operation plans and mainstreaming climate change adaptation into policy and plans. However, acceptance of the Bill and development of the NAF is being delayed (for the moment of writing). Moreover, capacity building is needed at all levels of governance including information support, communication between institutions and actors, and facilitating institutional and individual learning and knowledge exchange.

climate change impacts, understanding of vulnerabilities and assessment of adaptive capacity, mainstreaming climate change into key policies and communication and awareness raising Irish climate policy process would be in line with four pillars of the White Paper on Adaptation (COM (2009) 147/4 final) and Ireland should be in a good position to produce an effective adaptation policy.

3.4. *Irish climate adaptation and ICZM: towards a common architecture?*

Summarising the development of the two policy domains, it is evident that experience of implementing ICZM in Ireland is greater than that of implementing measures in support of climate adaptation. ICZM has been experimented with at a local scale since the late 1990s, despite the absence of a national-level strategy to support its implementation [20,40]. In contrast, a more structured top-down approach has been adopted by the Irish Government in designing climate policies, though there is a clear lack of experience and strategies for local implementation relative to that of ICZM.

Fig. 3 outlines key milestones in the evolution of the coastal and climate policy domains. The diagram illustrates the strengths and weaknesses of the two policies, including the lack of official ''backing'' for ICZM (e.g. absence of legally binding instruments and dedicated national policy), and the separation of the national climate policy processes from local practices. In recognition of the need to develop an effective governance framework, and in order to avoid the repetition of previously identified pitfalls, there is value in reflecting on the experience of ICZM when considering how a national adaptation strategy might be implemented. Similarly, emerging national climate governance may provide substantial support for the practical implementation of ICZM.

The following section provides an analysis of the barriers and opportunities for developing an architecture of climate adaptation and coastal governance based on the four ESG principles of credibility, stability, adaptiveness and inclusiveness as criteria of effectiveness (as discussed in Section 2).

4. Climate adaptation and coastal governance in Ireland: barriers and opportunities for integrated governance architecture

The discussion below is based on the outputs of the projects presented in the Annex including stakeholder workshops and interviews. In addition to the analysis of the ESG criteria (Table 1), suggestions have been made on how the relevance to each criterion can be enhanced through integrated architecture, lessons learned and capacity to be used from each policy domain.

4.1. Credibility

Stakeholders interviewed stated that political and administrative support at the national level is necessary conditions of credible governance. Proactive measures, such as taking the initiative in assessing climate risks, designing, and then subsequently implementing a climate adaptation strategy, are thus held to be contingent upon legislative edict, rather than initiated by the competent offices of sub-national administration. The often negative experiences of ICZM implementation support this assertion. Despite European (2002/413/EC) and national [55] strategic documents demonstrating the importance of ICZM, and articulating its main principles [20], little progress has been made in operationalising this strategic vision, due in no small measure to the absence of any legislative requirement to do so. At lower levels of governance, this absence of instruments and institutions has been perceived as proof of ICZM's relatively lowly status [66].

From this perspective, the top-down stance of climate adaptation governance anticipated within the forthcoming Climate Bill, supported legislatively at national level, could afford greater credibility than the bottom-up voluntarism of ICZM. The Climate Bill and planned NAF can potentially provide a legitimate policy framework for climate adaptation and support for coastal management, particularly if adequate scientific and informational support can be provided through NAF. Moreover, prior ICZM experience shows that an absence of substantive guidance and criteria to be used in the decision making process can result in a perceived lack of transparency to interested parties [67]. Moreover, mainstreaming climate adaptation across policy areas through the NAF offers the potential to support an integrated approach to local governance which could give an additional weight (and potentially resources) to ICZM efforts. This may naturally resolve the situation where, in the absence of a national policy framework for ICZM, local level activities do not have a political and legal context supporting the credibility of planning and action. Stakeholders interviewed by the authors (unpublished workshop materials) view the Irish EPA – a major contributor to the design of the NAF – as a credible and non-partisan source of information and guidance at the national level.

Similarly, the wider utilisation of 'Expert Couplet Nodes' (ECN) [40], may support credibility at the local level. ECNs are an innovative model of partnership, whereby regulators, practitioners and research organisations co-operate and collaborate with each other to support capacity-building and policy development for coastal management. This approach was developed at a number of coastal sites across Europe under the COREPOINT and IMCORE projects [68,69]. Existing stakeholder engagement through 'expert couplet nodes' in Ireland (e.g. in Cork Harbour) could serve to garner support and progress the implementation of adaptation decision-making.

4.2. Stability

As outlined earlier, ICZM in Ireland has yet to receive an adequate legal, strategic and financial framework on a national basis to support the development of local strategies which extend beyond the time limits of research or demonstration projects. Implementation of ICZM is contingent on the support of relevant institutions and to date has relied on bottom up, grass roots activity, typically characterised by a lack of continuity. A lack of stability, perhaps exemplified by the erosion and fragmentation of the marine and coastal portfolio at Ministerial level since the late 1990s, will likely undermine progress.[3] Factors such as long-term financial commitment, or ongoing monitoring and reportage, are considered not only necessary to support longevity and sustainability—in ICZM implementation, but form one of its core principles of ICZM [70]. According to a number of interviewees from different stakeholders and sector groups, these factors are acknowledged as absent in Ireland.

Experts involved in ICZM implementation in Ireland note that experience gained through the Demonstration Programme on ICZM [67,71] had significant impact in terms of knowledge gained regarding new forms of (integrated) management, the fostering of social capital and the forming of local networks. However, the full value of these outcomes is jeopardised by the current approaches to coastal governance; prospects for continued learning and cumulative understanding are lost when an unstable start-stop approach to implementation of ICZM prevails. Indeed, as momentum is lost due to a lack of continuity within the process, the credibility of the institutions originally facilitating a particular initiative may also suffer, and may be difficult to regain when subsequent efforts to revive an integrated approach to coastal management are undertaken. In retrospect, it would not be an overestimation to say that the opportunity to support integrated management in the coastal areas of Ireland from the 'top' remains unfulfilled and contributes to the challenges of implementation at local and sub-national levels.

In contrast, the anticipated top-down approach to climate adaptation governance in Ireland promises a much greater degree of stability. As environmental decision makers and regulators will be legally obliged to undertake local level adaptation strategies in response to forthcoming climate legislation, the process will undergo institutionalisation in the long-term, in many instances outliving the actors involved. Furthermore, the proposed national climate change information platform may support (e.g. through national, regional and local assessments in relation to vulnerability and impacts of climate change) and capture the key learning outcomes (e.g. guidance and tools) of local climate adaptation actions. It is further anticipated that the platform might facilitate knowledge exchange and vertical and horizontal integration.

Nevertheless, such promising perspectives are balanced by a number of risk factors, including potential deficits of implementation due to relative political and economic instability in Ireland. Although potentially enjoying strong support at the 'top', the precise mechanisms intended to support stable, effective and practical implementation of national climate policy at the local level remain unclear. If local authorities determine climate adaptation to be a wholly 'environmental' issue, doubts may be raised as to the degree of commitment that adaptation will

[3] According to the interviews conducted by the authors in (May–April 2010) evaluating the process and results of Bantry Bay Charter—integrated coastal management strategy (1998–2003).

receive. In the case of ICZM in Ireland, the absence of policy and legal instruments contributed to a situation of instability with respect to financial support, human resources and knowledge input which significantly undermined implementation of 'environmental' policies in the coastal domain. From this perspective it is important to support a vision of climate adaptation as a vital part of economic and social development of coastal areas.

With regard to the knowledge exchange and capacity building necessary for stable management, uncertainty may increase with regard to the persistence of government support for research on coastal management and climate change. To date, programmes such as the CCRP continue to be funded. However, a contraction in funding of local authorities means that the ability to undertake costly climate risk assessments and to integrate scientific knowledge into decision-making will perhaps diminish. Integrated approaches to coastal and climate governance may provide a possibility to use intellectual and human resources more effectively and support management stability.

4.3. Adaptiveness

Timely and adequate supply of knowledge and information is a key element of adaptation to changing conditions [3,27]. At present, a significant proportion of the data necessary for monitoring and evaluating the condition of socio-environmental systems at the Irish coast is available from existing sources [29–33]. These include national and international scientific programmes, local data reflecting environmental, economic and social conditions and the tacit knowledge of local people involved in projects with a coastal management theme. Nevertheless, due to a lack of co-ordination and the 'voluntary' character of Irish ICZM projects, a consistent system of data management and information support has not been established, and formal mechanisms for monitoring progress and incorporating lessons learned into a policy context have not been instituted [40].

The interviews and observation of the overall progress of Irish climate policy process during the past years allows concluding that the intentions of those formulating Irish adaptation policy is to foster a more consistent approach. The approach needs to be sufficiently robust to address the complex issues attendant to climate governance, whilst simultaneously advancing the adaptation knowledge base and communicating information. A series of interdisciplinary scientific projects has been supported at the national level, including a comprehensive analysis of the effect of climate change in Ireland [48], an assessment of risks, and their perception, across different regions [72] sectors [73,74] and enhancing capacities for climate adaptation in coastal areas [75].

The data and research related to coastal areas represent an important part of this work, taking into account the importance of such areas to Ireland, and their particular vulnerability to climate change. From this perspective, both climate policy and coastal management would certainly benefit from an integrated system of knowledge acquisition and management, such as the aforementioned proposal to establish a national climate information portal. Commensurate with institutional co-ordination, an integrated information and research platform would require stable long-term support, and a capacity building programme for its potential users, and should not evolve on a time-bound project basis. However, in the current unfavourable economic conditions (see Section 4.2) national funding to support monitoring and capacity building is uncertain. Developing and maintaining monitoring and decision-support systems require substantial political will, actors' commitment and financial support by alternative funding sources, including local public–private partnerships. However, this would require a high level of awareness and will on the part of local actors—characteristics which are believed to be built through more inclusive and forward-thinking local decision-making processes.

Although perceived as credible (see Section 4.1.), the present hierarchical system of governance provides limited flexibility (both in terms of procedures and the experience of managers) to integrate new information into decision-making. Several scientific projects (including those mentioned above) supporting the principles of adaptive management have recently been launched as a part of national capacity building for climate policy implementation. It is expected that the experience of participatory planning gained through ICZM will provide a platform for pilot implementation of new methods for climate adaptation.

4.4. Inclusiveness

A critical analysis of the principles of ICZM [46] outlined in the EC Recommendation (413/2002/EC), states that unless decisions made through participatory [76] processes are integrated into statutory management practices, the effectiveness of stakeholder involvement in ICZM will remain low. Irish experience of ICZM implementation shows that the non-statutory character of ICZM, its 'soft' non-binding management approaches, and absence of a national policy framework, provide substantial obstacles for overcoming institutional fragmentation and creating effective and stable practices for participatory coastal management. ICZM projects in Ireland have made an important contribution in demonstrating the benefits of a participatory approach. However, without sustained institutional support and efforts to continue capacity building, even successful participatory practices usually terminate at the end of the project's duration. According to interview data, a lack of opportunities for knowledge exchange between agents in the various coastal sectors, or between practitioners, policy makers and scientists, are perceived as important barriers to meaningful participation by those involved in ICZM implementations. The absence of guidance and criteria for the decision making process leads to a lack of transparency, and the loss of a sense of "ownership" by those involved. To support continuation of ICZM initiatives, integration with the upper levels of governance and across the sectors needs to be achieved and formal mechanisms for such interaction need to be developed.

Supported by EU policy documents on governance (COM (2001) 428 final) and climate adaptation (COM (2009) 147/4 final), the Irish Climate Act and proposed NAF have strong (declared) elements of inclusiveness across all levels. Along with high level steering committees, mid- and lower level participatory processes are intended to support information provision and the delivery of policy objectives. However, practical mechanisms for top-down integration of Irish climate governance remain to be developed.

5. Conclusions

As an island state located in the north Atlantic, Ireland faces a broad range of climate change impacts. Notwithstanding significant uncertainty regarding the actual character of changes, climate impacts such as sea level rise, storminess, intensity of flooding and coastal erosion are likely to become more severe in the coming decades. The complexity of issues associated with climate change and coastal management causes a notable overlap between the climate and coastal policy domains, calling for an integrated approach to their governance.

The concept of Earth System Governance aims to provide a conceptual and analytical framework for a coordinated system of environmental governance. As a pilot attempt, the application of

the ESG concept has proven useful to identify a number of barriers and opportunities for integrating approaches to climate adaptation and coastal zone management in Ireland. Nevertheless, a more detailed analytical framework (including criteria and benchmarks) is a prerequisite for transferring a theoretical analysis such as that undertaken here to the level of substantive policy recommendations based on the ESG principles. The notion of governance *architecture* has been used to identify (at the conceptual level) the pathways for creating a coordinated framework for climate adaptation and coastal management in Ireland.

ICZM and climate policy have been considered as "building blocks" of a potential architecture of climate adaptation and coastal governance. ICZM initiatives implemented across the country (e.g. Bantry, Cork Harbour, Dingle, Clew Bay) can inform and support Irish climate policy, offering examples – either positive or negative – of cross-sectoral interactions and stakeholder engagement. At the same time, climate policy may provide a requisite component of statutory support for integrated coastal management as this has been a significant contributory factor to the fragmentary nature of ICZM implementation in Ireland.

The ESG criteria of credibility, stability, adaptiveness and inclusiveness have been applied to evaluate the potential of the coastal and climate policy domains in Ireland to support an integrated governance architecture. Thus, difficulties outlined in relation to credibility and stability have been posited as contributing to the lack of continuity, ambiguously defined official status, and issue-led character of ICZM in Ireland. In future, these flaws might be mitigated if ICZM initiatives will be recognised as necessary actions for climate adaptation. Equally, current investments in informational and methodological support for Irish climate policy (e.g. research on effects, decision-making, development of national climate information portal) may also provide a crucial knowledge base for coastal management and the adaptiveness of coastal governance. Experience in stakeholder involvement and institutions for participatory planning and knowledge integration (including successful experience such as Expert Couplet Nodes in Cork and Donegal) are among the most important outcomes of Irish experimentation with ICZM. Harnessing this expertise and the experience of the institutions involved in both climate adaptation and coastal management may compensate the current deficit of inclusiveness of Irish climate policy.

Acknowledgements

The authors would like to thank members of the integrated coastal zone management and climate policy communities in Ireland for their input and feedback. The authors gratefully acknowledge the Environmental Protection Agency (EPA) of Ireland, who supports M. Falaleeva and S. Gray, through funding of the Coastal Climate Adaptation and Development Tool (CLAD) project. Cathal O'Mahony's contribution is supported through the CoastAdapt project part-funded under the Northern Periphery Programme (2002–2013).

Appendix A. Supplementary materials

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.marpol.2011.01.005.

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