Paper presented at the 2009 Amsterdam Conference on
the Human Dimensions of Global Environmental Change
"Earth System Governance: People, Place and the Planet"

Amsterdam, 2-4 December 2009.

The Role of ICZM in Informing the Development of Climate Adaptation Policy in Ireland

Maria Falaleeva*, Cathal O'Mahony, Stefan Gray, Margaret Desmond, Jeremy Gault and Valerie Cummins

Coastal and Marine Resources Centre CMRC
Environmenal Research Institute ERI
University College Cork UCC

Irish Naval Base Haulbowline
Cobh, Co. Cork, IRELAND
Int: http://cmrc.ucc.ie

*Contact author, e-mail: m.falaleeva@ucc.ie, tel: 00 353 21 4703134

Draft version, please do not quote without authors' permission.

Abstract

Coastal environments will be susceptible to a range of impacts arising from medium and long-term climate change. Ireland, a mid-latitude island country, will experience climate changes in line with those predicted for the northwest of Europe. However, due to Ireland's maritime character, including the fact that settlement and industrial development are concentrated in coastal locations, Ireland's coastal communities will be particularly vulnerable to the impacts of climate change; thus, the imperative for adaptation is evident. In the last three decades, coastal communities worldwide have increasingly turned to integrated coastal zone management (ICZM) as a process to deliver sustainable development. Despite this momentum, coastal management in Ireland is largely sectoral involving a range of State bodies with little interaction between sectors. Limited opportunities for integration prevail in the absence of a national policy for ICZM. Despite the policy vacuum, ICZM has progressed at the local level with a number of successful initiatives completed or ongoing. The lessons to emerge from these "bottom up" initiatives (e.g. Cork Harbour, Bantry Bay and Dingle Harbour) provide valuable case study material for dealing with adaptation to climate change in coastal areas, at multiple levels of governance.

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. However, it should be noted that a Climate Bill and a National Adaptation Strategy are currently under deliberation by the Government of Ireland, and are expected by early 2010. This paper principally draws upon the analysis of experience of implementation of ICZM at the local level in Ireland to inform the development of national and local adaptation policies. It is suggested that emerging climate adaptation strategies provide an opportunity for improved coastal governance.

Mapping the architecture of ICZM and climate governance in Ireland, we identify 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.

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. 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 (IPCC, 2007). 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 seeing as inadequate (Folke 2006, Moser 2008; Biermann 2007, Bierman et al. 2009). Conflict, complexity and uncertainty are ever-present factors in deliberations on climate-related issues (Moser and Dilling 2007), yet the urgency with which such issues must be addressed precludes the luxury of taking slow steps. Instead, lessons must be quickly grasped, and innovative approaches adopted, if scientists and public policy practitioners are to optimise the efficacy of climate adaptation measures (Armitage et al 2009; Olsson 2006; Tompkins and Adger 2004).

A comparable case study offered by the implementation of ICZM in Europe (COM/2000/547) shows that the challenges faced by the coastal managers are remarkably similar to those now confronting climate adaptation designers. Both policy domains stipulate the integration of sectoral, administrative and geographical governance (Few, Brown & Tompkins 2004; 2002/413/EC). Both advocate subsidiarity and participatory decision making (Christopolos et al. 2009; van Aalst et al. 2008; 2002/413/EC). Both also posit an adaptive governance approach and ecosystems-based problem framing as essential ingredients for long term sustainability (Cummins et al. 2004; Tompkins & Adger 2003; 2002/413/EC, Forst 2009; Gunderson 2009). Such commonalities cause the evident opportunity for the experiences of implementation of ICZM to inform that of climate adaptation.

In an Irish context, the commonalities between integrated coastal zone management and climate adaptation are perhaps even greater. As an island nation, the coastal zone is home to approximately one third of the Irish population (Devoy 2008). Decisions taken in relation to coastal matters or climate adaptation response must thus inevitably overlap.

Accordingly, the value of a comparative analysis of ICZM and climate adaptation governance is clear. The framework by which such an analysis might be undertaken, selected in order to meet the demands of timeliness and clarity described above, is that of the emerging field of Earth System Governance (ESG). The aim of ESG is to provide theoretical and methodological tools to analyse the complex interplay of actors and institutions engaged in the governance of social-environmental systems at different levels – from global to local. *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 seen under an ESG analysis as the unavoidable conditions (or "problem structure") within which contemporary governance takes place (Biermann 2007). Five groups of questions or "research challenges" have been formulated to address key problems of existing institutions, and to guide transformation toward more effective management based on the ESG principles. The five challenges are: the *architecture* of governance; the *agency* of actors and institutions; the *accountability* of agents and operations; the rationale behind the *allocation* of resources; and the *adaptiveness* of institutions.

This paper applies the aforementioned ESG principles to an analysis of climate adaptation governance in the coastal zones of Ireland. Responding to the on-going process of development and application of adaptation policy in Ireland, the study aims to provide a theoretical underpinning for the streamlining of two essential yet currently separate policy domains. The research considers options for institutional learning, drawing lessons from the application of ICZM in several pilot cases in the country. Moreover, we explore the possibilities for developing an integrated "architecture" of coastal climate governance combining locally-based coastal management and overarching national climate strategies.

An evaluation of the Irish coast: the ESG principles applied

Adopting the ESG terminology, Irish coastal environments will be susceptible to a *potential harm of high degree* arising from medium and long-term climate change (Kelly and Stack 2009; McGrath et al. 2009; Sweeney et al. 2008). Ireland's largest cities are located on the coast and the c.6,500km coastline (5,800km in the Republic) is home to approximately 34% of the Irish population (Devoy 2000), and supports key infrastructure (e.g. ports, road and rail networks) and strategic industries (Devoy 2000). Many of the early impacts of climate change in Ireland including severe coastal erosion, higher intensity and changing regimes of storms and floods, sea level rise and resulting 'coastal squeeze' may be most severely

manifest within coastal catchments affecting both socio-economic and ecological systems. (Kelly and Stack 2009; McGrath et al 2009; Devoy 2008; Farrell 2007). 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 (O'Hagan and Cooper 2002; Cummins et al. 2004). Impacts that will likely intensify due to climate change (such as coastal erosion) have historically acted as catalysts for management interventions. Many of these 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.

Irish climate adaptation and ICZM: towards a common architecture?

The complexity of issues and institutions involved in climate adaptation in coastal areas cannot be grasped at the level of single institutions. Rather, it must be understood as a complex "architecture" of governance defined by Bierman et al (2009) 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". Our analysis emphasises ICZM and climate adaptation policies as two principle blocks of a unified architecture of climate-proof coastal governance (Figure 1).

At present, experience of implementing ICZM in Ireland is greater than that of implementing measures in support of climate adaptation. Despite the previously stated lack of a national-level strategy to implement ICZM, integrated management has nevertheless been experimented with at a local scale. (Ballinger et al 2008; Cummins et al. 2004). A more structured approach has been adopted by the Irish Government in designing climate policies. Responding to 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 separate National Adaptation Strategy. However, at the time of writing, the implementation of adaptation responses at the local or sectoral level in Ireland, remain in their relative infancy.

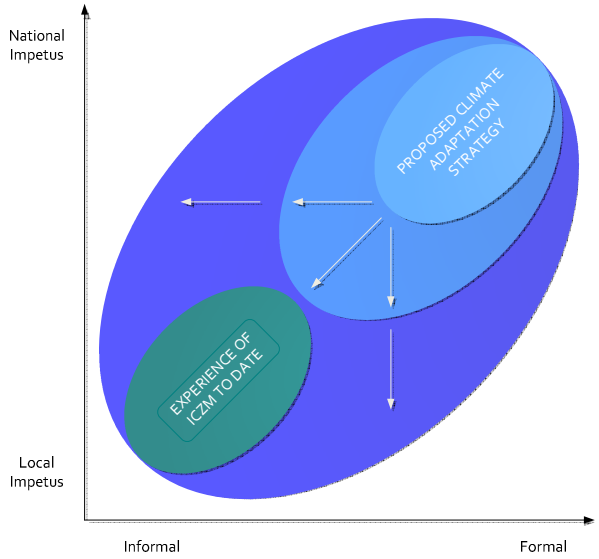

Figure 1: Architecture of climate-proof coastal governance in Ireland.

Thus, in recognition of the need to develop an integrated architecture of coastal climate governance, 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. On the other hand, emerging national climate governance may provide substantial support for the practical implementation of ICZM.

Three key questions form the basis of the following integrated analysis of ICZM and climate adaptation strategy in Ireland:

1. What lessons can be learnt from how ICZM and climate adaptation policy have (or have not) been implemented in Ireland?
2. Can prior experience of ICZM inform more effective climate adaptation strategies?
3. How might the two policy domains support each other in contributing to a common architecture of adaptation governance in coastal zones?

To answer these questions, the respective policy frameworks of ICZM and climate policy in Ireland will be treated as construction 'blocks' for an emerging architecture of climate-proof coastal governance. To identify the barriers and opportunities for developing an integrated 'architecture', we apply the ESG principles *credibility*, *stability*, *adaptiveness* and *inclusiveness* as criteria for analysis.

The analysis encompasses several ICZM initiatives (e.g. the COREPOINT project, projects in the Irish Sea region, Bantry Bay, Dingle Bay, and others (CCC, NUI & CIT, 2001) implemented by the Irish research and policy community (academia, state agencies and local government). Documentary review, interview and informal discussions with the academics, policy-makers and consultants involved facilitated a summation of the most recent experience from efforts to implement ICZM. Similarly, key contacts were forged and substantial documentary research undertaken to appraise of the development of national climate adaptation policy. Observation of the IMCORE[1] scoping stakeholder workshop in the Cork Harbour area (May 2009) provided initial insights into stakeholder perceptions of the links between climate change and coastal planning and development (IMCORE, unpublished).

ICZM and Climate Adaptation Policy in Ireland – History, Lessons Learned, Future Perspectives.

ICZM in Ireland

Ireland began to examine the potential of ICZM as a means of arresting the deterioration of coastal environments, and socio-economic resources they support, in the mid to late 1990s. Two Irish projects – the Bantry Bay Charter (Cork County Council, 2001) and Donegal Rural Beaches Project (McKenna et al. 2000) were included in the 35-strong EC Demonstration Programme on ICZM (1996-1999); with the outputs of this programme providing information to shape subsequent ICZM policy in Europe (McKenna et al. 2008). Specifically, these 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 (Brady Shipman Martin 1997; Marine Institute 1996). The report *Coastal Zone Management – A Draft Policy for Ireland* commissioned by the Irish Government proposed a phased approached to the introduction of

[1] IMCORE is an EU Interreg IVB funded project exploring innovation in the management of Europe's changing coastal resource. The project includes partners from England, Wales, Scotland, Northern Ireland, France, Belgium and the Republic of Ireland.

ICZM principles in Ireland (Brady Shipman Martin 1997). However, the Draft Policy of 1997 was not formally adopted by any of the Government departments who commissioned it. In the intervening period, the concept of ICZM received indirect support only (e.g. through commitment in different policy and strategy documents (Heritage Council 2006; DCMNR 2005; DOELG 2002; DAFF 1999; EPA 2000) albeit in the absence of a national programme to deliver, and financially underpin, ICZM implementation.

At the same time, delivery of ICZM became embedded in several local initiatives, which, however, had no statutory basis. The initiatives were exclusively project-based, funded via European bodies and, in many cases, led by academics rather than local actors or agencies (c.f. Ballinger et al. 2008; Cummins et al. 2004). At present, there is no dedicated Government department with responsibility for marine issues, which instead fall under the remit of various departments and semi-State agencies.

The evolution of Irish climate policy

In line with the approach of most nations and supra-national bodies such as the UN and EU, climate policy in Ireland has to date dealt mainly with the issue of mitigation and meeting the national goals of the Kyoto Protocol (DEHLG 2006). Following a period of public consultation, this publication fed into a subsequent National Climate Change Strategy (NCCS) (DEHLG 2007), which outlined a range of principles and policy options aiming to deal with climate issues in an integrated manner (see figure 2).

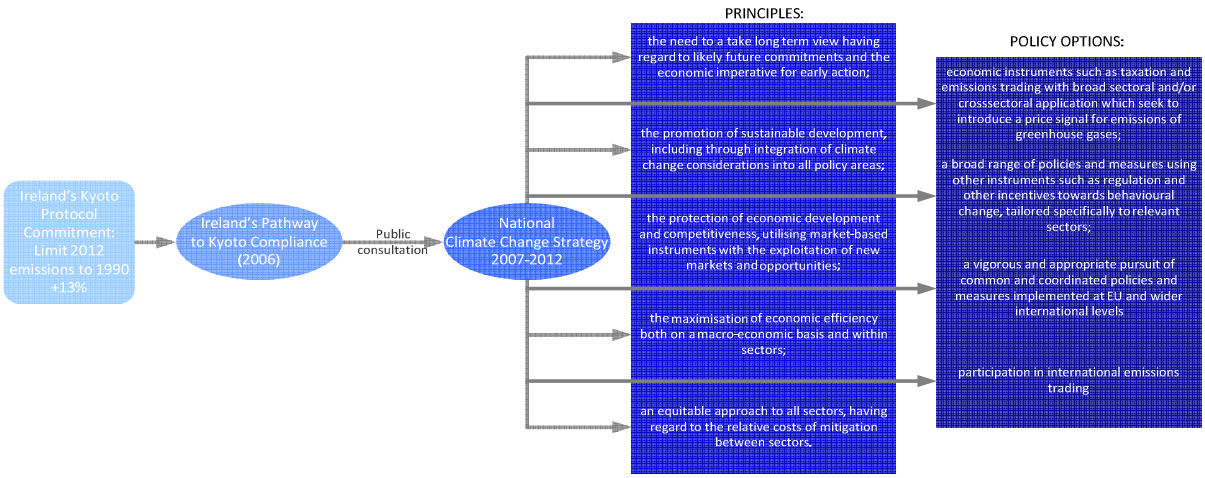

Figure 2: Illustration of Irish climate policy development process Ireland signed (1998) and ratified (2002) the Kyoto Protocol.

The NCCS also broached the subject of adaptation policy in Irish climate governance, stating that the Irish Government is "committed to developing a national adaptation strategy over the next two years" (DEHLG 2007). As presaged by the NCCS, an Irish National Adaptation Strategy (NAS) is scheduled for imminent publication. It's development has been strongly guided by the European Commission White Paper on Adaptation to Climate Change (COM (2009) 147/4 final) on climate adaptation in Europe, and has gained significant political traction in the wake of a number of recent extreme weather events, including severe flooding in Dublin, Cork and the south and western counties of Ireland. The development of the NAS is being supported by the EPA's Climate Change Research Programme (CCRP) which is steered by a high level inter-departmental committee. The programme is divided into four thematic areas: mitigation and sinks; impacts and adaptation; socio-economics and technologies; and trans-boundary air pollution and environmental observation (Figure 3).

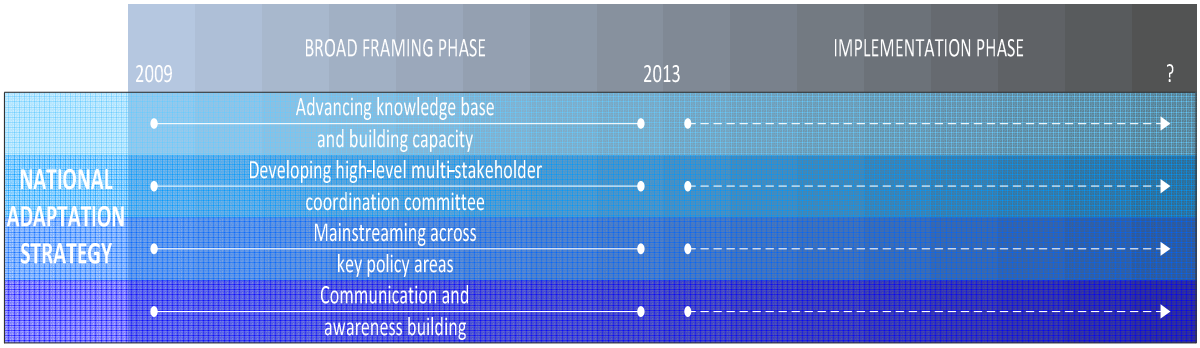

Figure 3: Outline structure of National Adaptation Strategy for Ireland, currently under preparation and due for imminent publication.

Towards Climate-Proof Coastal Governance in Ireland: an Integrated Architecture for Effective Governance?

Credibility

In Ireland, political and administrative support at the national level are perceived as 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 (negative) experiences of ICZM implementation support this vision. Despite European (2002/413/EC) and national (Brady Shipman Martin 1997) strategic documents demonstrating the importance of ICZM, and

articulating its main principles (Cummins et al. 2004), little progress has been made in operationalising this strategic vision. At lower levels of governance, the absence of instruments and institutions has been perceived as proof of ICZM's relatively lowly status.

From this perspective, the top-down stance of climate adaptation governance under the NAS, supported legislatively at national level, might enjoy greater credibility than the bottom-up voluntarism of ICZM. The Climate Bill and planned NAS can provide a legitimate policy framework for climate-proof coastal management, particularly if adequate scientific and informational support, implementation capacities and guidelines can be provided through the first and fourth pillars of the NAS (Figure 3). Prior ICZM experience shows that an absence of substantive guidance and criteria to be used in the decision making process might result in a lack of transparency to interested parties (McKenna et al. 2008). The third pillar of the NAS - mainstreaming climate adaptation across policy areas – has 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. The second pillar of the NAS implies that a requisite level of coordination between stakeholders necessary for trust and credibility might be forthcoming. The Irish EPA, who, among others, have contributed to the design of the NAS, is currently seen by most actors as a credible and non-partisan source of information and guidance at the national level. At the same time, 'expert couplet nodes' designed initially as science-policy platforms for ICZM implementation (Ballinger et al. 2008), may support credibility at the local level through enhancing uptake and implementation of adaptation decision-making.

Stability

The failure of ICZM implementation is often attributed to a lack of stability in supporting institutions. As outlined earlier, ICZM has never received an adequate legal, political and financial framework to support local strategies which extend beyond the time limits of research or demonstration projects. Primarily implemented via bottom up, grass roots activity, delivery of ICZM has been characterised by a lack of continuity.

The experts involved in ICZM implementation in Ireland note that experience gained through the Demonstration Programme on ICZM[2] had significant impact in terms of knowledge gained regarding new forms of (integrated) management, fostering of social capital, and the forming of local networks. However, 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' was largely missed. The erosion and fragmentation of marine oversight at Ministerial level since the late 1990s has led to coastal and marine management falling under the jurisdiction of numerous different departments and agencies.

In contrast, the top-down approach anticipated of climate adaptation governance in Ireland promises a much greater degree of stability. As environmental decision makers will be legally obliged to undertake local level adaptation strategies, the process will undergo institutionalisation over long time lines, in many instances outliving the actors involved. Moreover, the third pillar of the planned NAS (Figure 3) stipulates mainstreaming climate adaptation across key policy areas which may support connections between climate adaptation and different aspects of coastal management. If successful, the NAS therefore might serve as an overarching framework providing official support to climate-proof coastal governance in Ireland.

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 an 'environmental' issue, doubts may be raised as to the degree of commitment it might enjoy. The experience of ICZM shows that a lack of stable financial support, human resources and knowledge input significantly undermined implementation of 'environmental' policies. 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 transfer and capacity building necessary for stable management it will be interesting to see how government support for research on coastal management and climate change persists (or not) in the current economic climate. To date,

[2] http://ec.europa.eu/environment/iczm/demopgm.htm

the EPA Climate Change Research Program (CCRP) continues 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.

Adaptiveness

At present, a significant proportion of the data necessary for monitoring eco-socio system conditions at the coast, and the development and evaluation of integrated coastal management strategies, is available from existing sources. These include scientific programmes at both national and international levels, local data about environmental, economic and social conditions garnered from ICZM implementation sites, and the tacit knowledge of local people involved in Ireland's ICZM demonstration projects. Nevertheless, due to a lack of coordination 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.

Those formulating Irish adaptation policy aim to foster a more consistent approach; sufficiently robust to address the complex issues attendant to climate governance, whilst simultaneously advancing the adaptation knowledge base (the first pillar of the NAS) and communicating information (the fourth pillar). 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 (Sweeney et al. 2008), an assessment of risks, and their perception, across different regions (McGloughlin 2009), sectors (DCMNR 2007; TCD 2009) and enhancing capacities for climate adaptation in coastal areas[3]. A National Climate Informational Portal is also under development.

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, for example on a basis of the emerging National Climate Portal. At the same time, along with

[3] http://cmrc.ucc.ie/pages/research_project_page.php?project_code=clad

institutional coordination, an integrated information and research platform would require stable support and continuous funding. In the current unfavourable economic conditions (see section on Stability) this will require substantial political will and the commitment of all actors.

Inclusiveness

In their critical analysis of the principles of ICZM recommended by the EC (413/2002/EC), McKenna and colleagues (2008) note that unless decisions made through participatory processes will become a part of statutory management practices, the effectiveness of stakeholder involvement in integrated coastal management will remain low. Irish experience of ICZM implementation shows that non-statutory character of ICZM, its 'soft' non-binding management approaches, and absence of a national policy framework provide important obstacles for overcoming institutional fragmentation and creating effective and stable practices for participatory coastal management. The pilot ICZM projects in Ireland made an important step in demonstrating the benefits of a participatory approach. However, without steady support and capacity building, even successful participatory practices are usually terminated by the end of the project's duration. According to the interviews, 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 NAS have strong (declared) elements of inclusiveness across all the levels through the second pillar of the NAS. 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 are still to be developed.

Conclusions

Whether positive or negative, the significant experience of ICZM projects gained in the specific conditions of Irish coasts can provide Irish climate governance with invaluable lessons and practical support. The concept of Earth System Governance and, in particular, the notion of the governance architecture, can provide a conceptual and analytical framework for development and assessment of a coordinated system for climate-proof coastal management.

Problems with implementation and continuation aside, the ICZM processes in Bantry, Cork Harbour, Dingle and Clew Bay offer examples of successful cross-sectoral interaction, stakeholder engagement, partnership building, awareness raising, research and education. Conflict avoidance has been a motivating factor for many local level ICZM activities and lessons can be learned on conflict resolution, managing trade-offs, distribution of resources and responsibilities. The last is especially important for the next stage of climate policy development, wherein overarching national strategies will be transferred into the actions and plans that will likely result in difficult trade-offs and negotiations at all levels – from local to national.

Moreover, mainstreaming climate adaptation into coastal planning and management implies (and has been driven by) significant overlap of "climate" and "coastal" issues. Expert Couplet Nodes, as proven to be successful local platforms for science–policy interaction, could be employed as tools of mainstreaming climate adaptation and delivering the objectives of the national climate policy. With an adequate support from the national level (i.e. via statutory character of the NAS, and methodological and informational support under the auspices of currently strong climate policy domain) such platforms can effectively promote integration of coastal governance.

Application of the ESG concept has proven useful to identify a number of opportunities and existing barriers for developing an integrated system of climate and coastal governance. Moreover, a vision of the two governance systems as a common "architecture" helps to identify (at least at the conceptual level) the pathways for creating a coordinated framework of climate-proof coastal management. Nevertheless, our experience shows that in order to achieve sound scientific and practical outcomes from such an analysis, the system of criteria and benchmarks - for e.g. effective governance architecture - must be carefully designed. In this paper "four challenges" of ESG (credibility, stability, adaptiveness and inclusiveness) have been applied as such benchmarks, however a more detailed system of criteria needs to be developed.

Acknowledgement

The authors gratefully acknowledge the support of the Irish Environmental Protection Agency EPA sponsoring the CLAD project.

References

ARMITAGE, D. R., PLUMMER, R., BERKES, F., ARTHUR, R. I., CHARLES, A. T., DAVIDSON-HUNT, I. J., DIDUCK, A. P., DOUBLEDAY, N. C., JOHNSON, D. S., MARSCHKE, M., MCCONNEY, P., PINKERTON, E. W. & WOLLENBERG, E. K. (2009) Adaptive co-management for social-ecological complexity. *Frontiers in Ecology and the Environment,* 7**,** 95-102.

BALLINGER, R., CUMMINS, V., O'HAGAN, A. M. & PHILIPPE, M. (2008) The Point of COREPOINT: Improving Capacity for Integrated Coastal Zone Management in North West Europe. Cork, Corepoint.

BIERMANN, F. (2007) 'Earth system governance' as a crosscutting theme of global change research. *Global Environmental Change,* 17**,** 326-337.

BIERMANN, F., BETSILL, M. M., GUPTA, J., KANIE, N., LEBEL, L., LIVERMAN, D., SCHROEDER, H. & SIEBENHUNER, B. (2009) Earth System Governance: People, Places, and the Planet - Science and Implementation Plan of the Earth System Governance Project. *International Human Dimensions Programme on Global Environmental Change.* Bonn, The Earth System Governance Project.

BRADY SHIPMAN MARTIN (1997) Coastal Zone Management: A Draft Policy for Ireland. Dublin, Ireland, Government Publications Office.

CHRISTOPOLOS, I., ANDERSON, S., ARNOLD, M., GALAZ, V., HEDGER, M., KLEIN, R. J. T. & GOULVEN, K. L. (2009) The Human Dimension of Climate Adaptation: The Importance of Local and Institutional Issues. Stockholm, Ministry for Foreign Affairs.

CORK COUNTY COUNCIL (2001) Bantry Bay Coastal Zone Charter: Final Technical Report. Cork, Ireland, Cork County Council/National University of Ireland/Cork Institute of Technology.

CUMMINS, V., O'MAHONY, C. & CONNOLLY, N. (2004) Review of Integrated Coastal Zone Management and Principals of Best Practice. Cork, The Heritage Council.

DEVOY, R. (2000) Implications of Accelerated Sea-Level Rise (ASLR) for Ireland. *SURVAS Expert Workshop on European Vulnerability and Adaptation to impacts of Accelerated Sea-Level Rise (ASLR).* Hamburg, Germany, SURVAS.

DEVOY, R. (2008) Coastal Vulnerability and the Implications of Sea-Level Rise for Ireland. *Journal of Coastal Research,* 24**,** 325-341.

DAFF (1999) Ensuring the Future – A Strategy for Rural Development in Ireland: A White Paper on Rural Development. Dublin, Ireland, Department of Agriculture and Food.

DCMNR (2005) Statement of Strategy 2005-2007. Dublin, Ireland.

DCMNR (2007) Government White Paper: Delivering a Sustainable Future for Ireland - The Energy Policy Framework 2007-2020. Dublin, Ireland.

DELG (2002) National Spatial Strategy for Ireland 2002-2020: People, Places and Potential. Dublin, Ireland, The Stationary Office.

DEHLG (2006) Ireland's Pathway to Kyoto Compliance - Review of the National Climate Change Strategy. Dublin, Ireland.

DEHLG (2007) Ireland - National Climate Change Strategy 2007 - 2012. Dublin, Ireland, Department of Environment, Heritage and Local Government.

DMNR (2001) Making the Most of Ireland's Marine and Natural Resources. Strategy Statement 2001-2003. Dublin, Ireland.

DUNNE, S., HANAFIN, J., LYNCH, P., MCGRATH, R., NISHIMURA, E., NOLAN, P., RATNAM, J. V., SEMMLER, T., SWEENEY, C., VARGHESE, S. & WANG, S. (2009) Ireland in a Warmer World - Scientific Predictions of the Irish Climate in the Twenty-First Century. IN MCGRATH, R., EIREANN, M. & LYNCH, P. (Eds.). Dublin, Met Éireann and University College Dublin.

EC (1999) Lessons from the European Commission's Demonstration Programme on Integrated Coastal Zone Management (ICZM). Brussels.

EC (2000) COMMUNICATION FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT ON INTEGRATED COASTAL ZONE MANAGEMENT: A STRATEGY FOR EUROPE. COM (2000) 547 final ed. Brussels, Commission of the European Communities.

EC (2002) RECOMMENDATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 May 2002 concerning the implementation of Integrated Coastal Zone Management in Europe. 2002/413/EC ed. Brussels, Official Journal of the European Communities.

EC (2007) Adapting to climate change in Europe – options for EU action. COM(2007) 354 final ed. Brussels, GREEN PAPER FROM THE COMMISSION TO THE COUNCIL, THE EUROPEAN PARLIAMENT, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

EC (2009) WHITE PAPER - Adapting to climate change: Towards a European framework for action. Brussels, Comission of the European Communities.

EPA (2000) Ireland's Environment: A Millennium Report. IN STAPLETON, L., LEHANE, M. & TOMER, P. (Eds.). Wexford, Ireland.

FARRELL, G. (2007) Impact on Coastal Areas. IN BEATTY, E. K. (Ed.) *Ireland at Risk - Water.* Dublin, The Irish Academy of Engineering.

FEW R, BROWN K & TOMPKINS EL (2004) *Scaling adaptation: climate change response and coastal management in the UK*, Tyndall Centre for Climate Change Research, Working Paper 60.

FOLKE, C. (2006) Resilience: The emergence of a perspective for social-ecological systems analyses. *Global Environmental Change,* 16**,** 253-267.

FORST, M. F. (2009) The convergence of Integrated Coastal Zone Management and the ecosystems approach. *Ocean & Coastal Management,* 52**,** 294-306.

GUNDERSON, L. (2009) Comparing Ecological and Human Community Resilience. Community and Regional Resilience Initiative.

HERITAGE COUNCIL (2006) Conserving Ireland's Maritime Heritage. Kilkenny, Co. Kilkenny, Ireland, An Chomhairle Oidhreachta/The Heritage Council.

IMCORE (Unpublished) Identifying Coastal Specific Vulnerabilities to Climate Change and Related Issues - Original Process, Outputs, Lessons Learned. CMRC UCC, Ireland.

MARINE INSTITUTE (1996) Towards a Marine Policy for Ireland - Proceedings of the Consultative Process. Dublin, Ireland, Marine Institute.

IPCC (2007) Climate Change 2007: Synthesis Report. *Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge, UK, Cambridge University Press.

KELLY, B. & STACK, M. (2009) Climate Change, Heritage and Tourism: Implications for Ireland's Coast and Inland Waterways. *The Heritage Council of Ireland Series.* Dublin, An Chomhairle Oidhreachta and Failte Ireland.

MCGLOUGHLIN, J. (2009) Co-ordination, Communication and Adaptation for Climate Change in Ireland: an Integrated Approach. [Online] Available from http://icarus.nuim.ie/coco-adapt., Irish Climate Analysis and Research Units.

MCGRATH, R., DUNNE, S., HANAFIN, J., LYNCH, P., NISHIMURA, E., NOLAN, P., RATNAM, J. V., SEMMLER, T., SWEENEY, C., VARGHESE, S. & WANG, S. (2009) Ireland in a Warmer World - Scientific Predictions of the Irish Climate in the Twenty-First Century. IN MCGRATH, R., EIREANN, M. & LYNCH, P. (Eds.). Dublin, Met Éireann and University College Dublin.

MCKENNA, J., COOPER, A. & O'HAGAN, A. M. (2008) Managing by principle: A critical analysis of the European principles of Integrated Coastal Zone Management (ICZM). *Marine Policy,* 32**,** 941-955.

MCKENNA, J., MCLEOD, M., POWER, J. & COOPER, A. (2000) *Rural Beach Management: A Good Practice Guide,* Belfast, Donegal County Council/EU LIFE Environment Programme.

MOSER, S. (2008) Resilience in the Face of Global Environmental Change.

MOSER, S. & DILLING, L. (Eds.) (2007) *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change,* Cambridge, Cambridge University Press.

O'HAGAN, A. M. & COOPER, J. A. G. (2002) Spatial variability in approaches to coastal protection in Ireland. *Journal of Coastal Research***,** Special Issue 36, 8pp.

OLSSON, P., L. H. GUNDERSON, S. R. CARPENTER, P. RYAN, L. LEBEL, C. FOLKE, AND C. S. HOLLING (2006) Shooting the rapids: navigating transitions to adaptive governance of social-ecological systems. *Ecology and Society,* 11**,** 21.

SWEENEY, J., ALBANITO, F., BRERETON, A., CAFFARRA, A., CHARLTON, R., DONNELLY, A., FEALY, R., FITZGERALD, J., HOLDEN, N., JONES, M. & MURPHY, C. (2008) CLIMATE CHANGE – Refining the Impacts for Ireland. *EPA STRIVE Programme 2007-2013.* Wexford, National University of Ireland, Maynooth.

TCD (2009) Phenology - School of Natural Sciences. [Online] Available from: http://www.tcd.ie/Botany/phenology/, Trinity College Dublin.

TOMPKINS, E. L. & ADGER, W. N. (2004) Does adaptive management of natural resources enhance resilience to climate change? *Ecology and Society,* 9**,** 14.

VAN AALST, M. K., CANNON, T. & BURTON, I. (2008) Community level adaptation to climate change: The potential role of participatory community risk assessment. *Global Environmental Change,* 18**,** 165-179.