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Working Paper IV – Summary

The Shannon Estuary – A Case Study

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THE IMMERSE PROJECT

Integrated Management and Monitoring of Estuarine and Coastal Ecosystems (IMMERSE), is a research project aimed at informing an Integrated Environmental Management and Monitoring system (EMMS) for Irish estuarine and coastal ecosystems. It is funded by the Irish Environmental Protection Agency's Research Programme (grant no. 2013-B-PhD-11). The methodology for the EMMS will be applicable on a national scale, and will aim to align with the requirements of the Water Framework, Marine Strategy Framework, Habitats, Birds and Floods Directives.

Working Paper IV: Shannon Estuary - A Case Study

This is the fourth in a series of six working papers to be generated by the project. Each paper reports on the research findings to date and are available to access on the [IMMERSE website](#). The purpose of this document is to summarise Working Paper IV (*The Shannon Estuary – A Case Study*), and reflect upon the experience and lessons learned of exposing the proposed framework of EMMS to the critique of key stakeholders within the Shannon Estuary.

The main objectives of Working Paper IV are to provide the following:

- An overall account of the Shannon Estuary stakeholder workshop proceedings and key emerging themes in terms of estuary management;
- A summary of stakeholders' feedback and critique of how the proposed framework performed when applied within the context of the Shannon Estuary; and
- An overview of benefits and constraints of the framework as well as possible challenges to its future use and make suggestions on how such challenges might be overcome.

A copy of Working Paper IV (*The Shannon Estuary – A Case Study*), the main report is available to access on the [IMMERSE website](#).

It should be noted that Working Paper IV is one part of *Stage 2: Data Gathering and User Engagement* and a more detailed analysis will be conducted following the publication of *Working Paper V: Dublin Bay – A Case Study*. This will lead into *Stage 3: Analysis, Synthesis and Dissemination*. Therefore this paper is an indication of where the research needs to go next and what are the key emerging themes to be explored.

Therefore Working Paper IV is an initial description of the Shannon workshop. A more detailed analysis of the Shannon Estuary and the Dublin Bay case studies will follow in final Working Paper VI.

The need for an integrated approach to estuary management

Estuaries and coasts are important ecologically, economically and socially. They are amongst the most productive natural habitats in the world; have traditionally been important places of navigation; their land banks are prime locations for urban development; and historically, have been important areas for fishing and recreational activities. In more recent times, however, population growth, food and energy requirements, increased economic activity and improved standards of living are resulting in unprecedented levels of demand for coastal and marine resources.

Given their important natural features and the demands placed on them by human activities, estuarine and coastal resources must be managed in a way that allows sustainable development. Furthermore it is important to acknowledge that it is not possible to plan and manage marine

ecosystems or components of ecosystems, and that only human activities are 'manageable' (Ehler & Douvère, 2009).

Current governance frameworks, wherein management is fragmented among sectors and institutions with little attention to conflicts or complementarities among social, economic and environmental objectives, are insufficient to address the issues described above (Holden, 2012; Mitchell, 2005). Fragmented institutional arrangements complicate effective environmental management by: narrowing criteria in decision-making; encouraging competing and contradictory objectives; increasing duplication of effort; and introducing disconnects between national, regional and local-level activities (Edelenbos & van Meerkerk, 2015; Kidd & Shaw, 2007).

The adoption of more integrated approaches have been advanced to manage the critical inter-relations between users and users and the environment. It also encourages greater synergies between different activities, leading to more effective spatial planning (Healey, 2006; Kidd & Shaw, 2007; Tewdwr-Jones & Allmendinger, 2006). Therefore in order to have a healthy and productive ecosystem in which human uses and the environment may be synchronised there is a need to move from the current sectoral approach to a more holistic one of management (McLusky & Elliott, 2004).

Integrated environmental management (IEM) is one method to capture and deal with such complexities by providing a more coherent approach to environmental issues with increased coordination between different levels, sectors and resource users. In this regard, IMMERSE devised a proposed framework of integrated Environmental Management and Monitoring System (EMMS) for estuaries and coasts which was informed by:

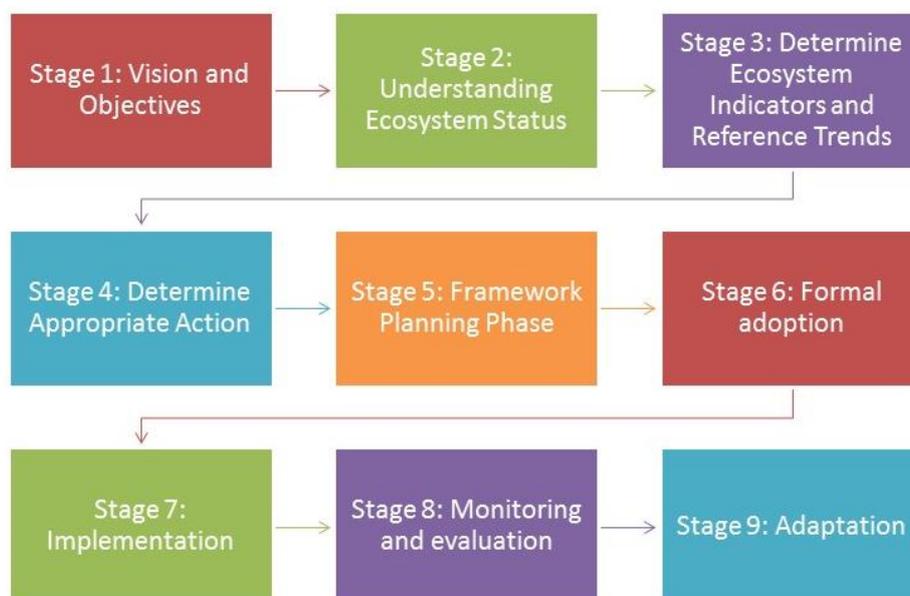
- Principles of Integrated Environmental Management;
- A review of integrated processes related to estuarine and coastal management; and
- An analysis of the practical implementation of these integrated processes within multiple case studies.

Progressing Stage 2 of IMMERSE

Stage 2 (Data Gathering and User Engagement), reported here, was the main empirical element and involved evaluating the proposed framework of EMMS, as illustrated in Figure 1, within two case study areas: the Shannon Estuary and Dublin Bay.

The Shannon Estuary and Dublin Bay provide suitable case studies to test the proposed framework of EMMS. Both are multi-functional, with the waters and adjoining lands supporting a range of functions, uses and activities (Clare County Council et al., 2013). Both are important regions for tourism, leisure and recreation, fishing, aquaculture, heritage and landscape and support important habitats and species. Similarly, the landside of both estuaries and coasts accommodates extensive human settlements. All these changes have impacted on the functioning of the estuarine system. Future port expansion plans and emerging growth in the renewable energy sector also have the potential to cause additional pressures and conflicts in both of these areas. These case studies clearly share a number of similar characteristics and as two of the main estuarine and coastal resources in Ireland are considered ideal sites to test the framework.

Figure 1: The 9 steps involved in the IMMERSE proposed framework of EMMS



The Shannon Estuary

The Shannon Estuary is the largest estuary in Ireland, located on the west coast where the River Shannon meets the Atlantic Ocean. It comprises a water body of some 31,500 hectares (ha), covering a distance of 100km from Limerick City to Loop Head, Co. Clare. The mouth of the estuary is approximately 15 km wide and narrows to just over 3 km between Kilcredaun and Kilconly Headlands. The Gateway town of Shannon and Shannon Airport are located along the estuary to the north, while Limerick City and the port of Foynes are located in the southern part of the estuary. The estuary area is a multi-functional zone, with the waters and adjoining lands supporting a range of functions, uses and activities including: shipping and port; industry; commercial and recreational fisheries; aquaculture; tourism, leisure and recreation; energy generation; fuel storage; aviation; heritage and landscape; and valuable habitats and species.

Policy Context

The management of estuarine and coastal resources in Ireland has until recently, been carried out in an ad hoc manner. This can be explained by the current lack of an overall strategic policy for estuarine, coastal or marine spatial planning in Ireland. Consequently, estuarine management has been conducted on a sector by sector basis with responsibilities divvied up among a plethora of government departments and agencies. The Strategic Integrated Framework Plan for the Shannon Estuary (SIFP) however, is a tangible example of a joined-up approach to integrated management in Ireland (Clare County Council et al., 2013). This particular case recognised the need to manage the estuary holistically.

The SIFP was commissioned by Clare County Council, Kerry County Council, Limerick City Council, Limerick County Council, Shannon Development and the Shannon Foynes Port Company in 2011. It was overseen by a multi-agency Steering Group comprising of the aforementioned, and other key

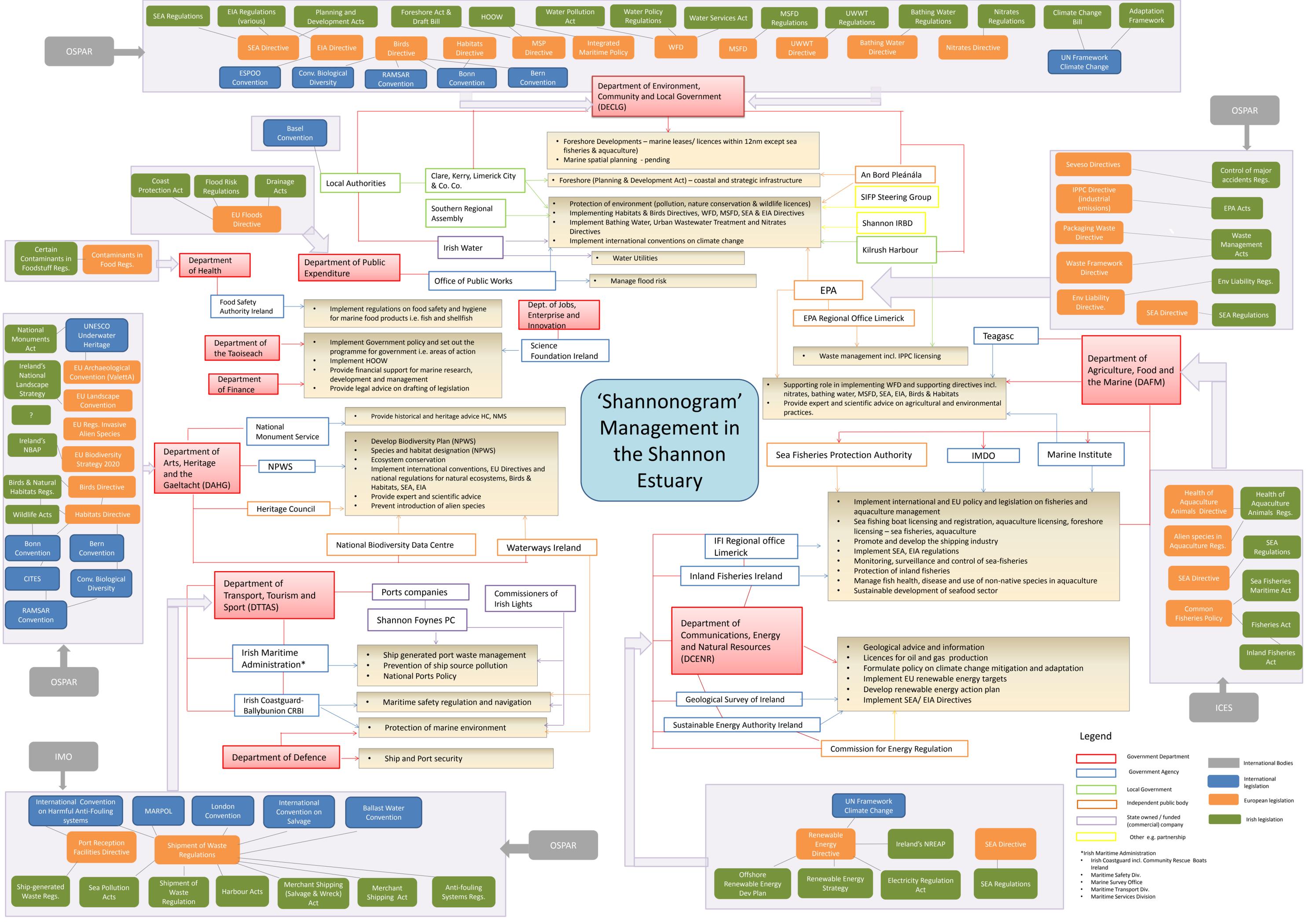
stakeholders with an interest in the Estuary, with Clare County Council as lead authority. The SIFP is an example of an attempt at an integrated approach to estuarine and coastal management in Ireland. The SIFP represents a collaborative approach to coastal zone management within the Shannon Estuary. The SIFP is “an inter-jurisdictional land and marine based framework plan to guide the future development and management” of activities within the Shannon Estuary (Clare County Council et al., 2013, p.1.). The SIFP was published in 2013 following consultation and environmental assessment and is currently being adopted into the relevant statutory county development plans by way of a formal variation. However, it is acknowledged that the SIFP has no immediate statutory remit within marine waters and consequently the land use zoning will remain within the terrestrial environment.

The SIFP is being implemented in accordance with a plethora of international and national legislation. Furthermore, the management of the estuary is the responsibility of numerous governmental departments and agencies as illustrated in Figure 2 – ‘Shannonogram’.

A formal system of integrated estuary management would serve to further strengthen the integration of both land and marine planning systems. The SIFP is an indication that a holistic approach to estuarine and coastal planning in Ireland is possible and a good example of vertical (organisational), horizontal (cross-sectoral) and territorial (land-sea) integration. Therefore at a time of new emerging national coastal and marine legislation, it is timely to reflect on the best and most effective ways of sustainably governing and harnessing our natural resources for the benefit of all.

The SIFP is a valuable resource in terms of providing wide-ranging data and information on local environmental, economic and societal- related estuarine issues. It is also a forum for sharing of knowledge, experiences and lessons learned during the SIFP process. It is therefore regarded a practical case study to expose the proposed framework of EMMS to the critical evaluation of stakeholders who have experience in attempting an integrated approach at this scale. This will help to inform the development of a general template that can be transferable to any national estuarine environment.

The IMMERSE proposed framework must firstly undergo an experiential review which relies on actions, trial and error and feedback to identify potential benefits and constraints, with the input of a wide range of stakeholders being an essential component of judging the challenges and opportunities for an integrated approach to estuarine management.



'Shannonogram' Management in the Shannon Estuary

Legend

 Government Department	 International Bodies
 Government Agency	 International legislation
 Local Government	 European legislation
 Independent public body	 Irish legislation
 State owned / funded (commercial) company	
 Other e.g. partnership	

*Irish Maritime Administration
 • Irish Coastguard incl. Community Rescue Boats Ireland
 • Maritime Safety Div.
 • Marine Survey Office
 • Maritime Transport Div.
 • Maritime Services Division

International Bodies: OSPAR, IMO, ICES, UN Framework Climate Change, Adaptation Framework, Climate Change Bill.

European Legislation: SEA Directive, EIA Directive, Birds Directive, Habitats Directive, MSP Directive, Integrated Maritime Policy, WFD, MSFD, UWWT Directive, Bathing Water Directive, Nitrates Directive, IPPC Directive, Packaging Waste Directive, Waste Framework Directive, Env Liability Directive, SEA Directive.

Irish Legislation: SEA Regulations, EIA Regulations (various), Planning and Development Acts, Foreshore Act & Draft Bill, HOOW, Water Pollution Act, Water Policy Regulations, Water Services Act, MSFD Regulations, UWWT Regulations, Bathing Water Regulations, Nitrates Regulations, UN Framework Climate Change, Adaptation Framework.

Government Departments: Department of Environment, Community and Local Government (DECLG), Department of Health, Department of Public Expenditure, Department of Agriculture, Food and the Marine (DAFM), Department of Arts, Heritage and the Gaeltacht (DAHG), Department of Transport, Tourism and Sport (DTTAS), Department of Communications, Energy and Natural Resources (DCENR), Department of Defence.

Government Agencies: EPA, EPA Regional Office Limerick, Teagasc, Sea Fisheries Protection Authority, IMDO, Marine Institute, IFI Regional office Limerick, Inland Fisheries Ireland, Geological Survey of Ireland, Sustainable Energy Authority Ireland, Commission for Energy Regulation, National Monument Service, NPWS, Heritage Council, National Biodiversity Data Centre, Waterways Ireland, Ports companies, Shannon Foynes PC, Commissioners of Irish Lights, Irish Maritime Administration*, Irish Coastguard-Ballyunion CRBI.

Local Government: Clare, Kerry, Limerick City & Co. Co., Southern Regional Assembly, Irish Water, Office of Public Works, Science Foundation Ireland.

Independent Public Bodies: An Bord Pleánála, SIFP Steering Group, Shannon IRBD, Kilrush Harbour.

State owned / funded (commercial) companies: National Monuments Act, Ireland's National Landscape Strategy, Ireland's NBAP, Wildlife Acts, Bonn Convention, CITES, RAMSAR Convention, UNESCO Underwater Heritage, EU Archaeological Convention (ValetTA), EU Landscape Convention, EU Regs. Invasive Alien Species, EU Biodiversity Strategy 2020, Birds & Natural Habitats Regs., Wildlife Acts, Bonn Convention, Bern Convention, CITES, Conv. Biological Diversity, RAMSAR Convention.

Key Management Functions:

- DECLG:** Foreshore Developments – marine leases/ licences within 12nm except sea fisheries & aquaculture; Marine spatial planning - pending; Foreshore (Planning & Development Act) – coastal and strategic infrastructure; Protection of environment (pollution, nature conservation & wildlife licences); Implementing Habitats & Birds Directives, WFD, MSFD, SEA & EIA Directives; Implement Bathing Water, Urban Wastewater Treatment and Nitrates Directives; Implement international conventions on climate change.
- EPA:** Water Utilities; Manage flood risk; Waste management incl. IPPC licensing.
- DAFM:** Supporting role in implementing WFD and supporting directives incl. nitrates, bathing water, MSFD, SEA, EIA, Birds & Habitats; Provide expert and scientific advice on agricultural and environmental practices.
- Sea Fisheries Protection Authority:** Implement international and EU policy and legislation on fisheries and aquaculture management; Sea fishing boat licensing and registration, aquaculture licensing, foreshore licensing – sea fisheries, aquaculture; Promote and develop the shipping industry; Implement SEA, EIA regulations; Monitoring, surveillance and control of sea-fisheries; Protection of inland fisheries; Manage fish health, disease and use of non-native species in aquaculture; Sustainable development of seafood sector.
- DCENR:** Geological advice and information; Licences for oil and gas production; Formulate policy on climate change mitigation and adaptation; Implement EU renewable energy targets; Develop renewable energy action plan; Implement SEA/ EIA Directives.
- DTTAS:** Ship generated port waste management; Prevention of ship source pollution; National Ports Policy; Maritime safety regulation and navigation; Protection of marine environment; Ship and Port security.
- DAHG:** Provide historical and heritage advice HC, NMS; Develop Biodiversity Plan (NPWS); Species and habitat designation (NPWS); Ecosystem conservation; Implement international conventions, EU Directives and national regulations for natural ecosystems, Birds & Habitats, SEA, EIA; Provide expert and scientific advice; Prevent introduction of alien species.

International Conventions: International Convention on Harmful Anti-Fouling systems, MARPOL, London Convention, International Convention on Salvage, Ballast Water Convention, Port Reception Facilities Directive, Shipment of Waste Regulations, Ship-generated Waste Regs., Sea Pollution Acts, Shipment of Waste Regulation, Harbour Acts, Merchant Shipping (Salvage & Wreck) Act, Merchant Shipping Act, Anti-fouling Systems Regs.

Other Key Elements: UN Framework Climate Change, Renewable Energy Directive, Ireland's NREAP, SEA Directive, Offshore Renewable Energy Dev Plan, Renewable Energy Strategy, Electricity Regulation Act, SEA Regulations.

Workshop Design and Application

The methodology for Stage 2 was agreed in consultation with the IMMERSE Steering Group (ISG), and involved data collection, interviews and facilitating a workshop event to present and critique the proposed framework of EMMS among future potential users.

Data and information collection

In addition to a review of academic literature and international case studies of estuarine and coastal management, information relating to the SIFP was also gathered. This included the suite of information submitted with the SIFP i.e. the SIFP written statement, SEA Environmental Report, Natura Impact Report and supporting appendices including mapping. This extensive information indicated the baseline knowledge available for the Shannon Estuary at the time of its publication and also highlighted data gaps and requirements including bird surveys and cetacean monitoring for future actions as part of the ongoing implementation of the SIFP. The workshop presented another opportunity to identify additional information and data gaps.

Scoping interviews

During spring 2015 seven interviews were conducted with key national and local stakeholders to scope issues around estuarine and coastal management in Ireland and in particular, the Shannon Estuary. Those interviewed included local authority planners and ecologists, NPWS officers and national marine policy and licensing professionals.

The interviews were informative in identifying pertinent topics for discussion and helping to design interactive workshop tasks. The key issues raised during the interviews related to: identifying opportunities for integrated management such as the joined-up approach used during the development of the SIFP; challenges in implementing integrated management such as governance and resources; stakeholder engagement; data and information collection; indicators and monitoring; and framework adoption and implementation.

Shannon Estuary Stakeholder Engagement Workshop

The Shannon Estuary stakeholder engagement workshop was held in the Limerick Strand Hotel on 25th June 2015 and was a one-day event attended by 34 participants. A list of attendees is available in the Appendix. The main aim of the workshop was to present the proposed framework of EMMS to key stakeholders and seek their feedback and critique of how it performed when applied within the context of the Shannon Estuary.

The participation of key stakeholders in the workshop contributed to an overall SWOT analysis of this first version of the framework, which was also applied within a Dublin Bay context. Stakeholder feedback helped to identify the potential benefits and constraints of the framework as well as considering possible challenges to its future use which will contribute to future suggestions on how such challenges might be overcome.

Figure 3: Participants at the Shannon Estuary Workshop on 25th June 2015



The workshop event comprised the following key stages:

- Briefing participants on the purpose and scope of the workshop
- Overview of IMMERSE progress to date
- Plenary Session with Sue Kidd, University of Liverpool and Walter Foley, Celtic Seas Partnership in Dublin Bay
- Tasks A-D: Developing and refining the framework of EMMS within the Shannon Estuary using small group tasks
- Wrap-up to confirm workshop outcomes and outputs

A more detailed account of the workshop proceedings and tasks is included in the main report available on the [IMMERSE website](#).

Case Study Initial Outcomes

The IMMERSE Shannon workshop provided a forum to expose the proposed framework to the critical evaluation of key stakeholders. The outcomes of the workshop allowed the framework to be appraised based on the feedback from the participants.

A number of key issues were raised by participants in the workshop which will need to be addressed before the framework can be progressed any further.

What is the framework?

One of the key challenges will be to decide what the framework is trying to achieve. Examining questions such as whether it will be a model, framework, process, best practice guidance are all valid considerations and were all highlighted as possibilities during the workshop. At the workshop the framework had meant different things to different stakeholders. It appeared that for some stakeholders it would be a strategic 'plan' and was referred to as such on a number of occasions. To others it was a decision-making tool however, from examining hypothetical development proposals

in Task C it was evident that in its current format, it could not be used for this purpose. Other stakeholders felt that the framework should be more of a technical instrument which would be used for addressing potential spatial conflicts, identifying interactions among the estuary users and considering potential risks and impacts. This availability of spatial data and evidence becomes another issue which will be discussed in the following section. However it is clear that when the framework was presented to the participants it appeared ambiguous as to what it was trying to be. Therefore it is imperative to determine what the framework is trying to achieve and what it is likely to achieve given a number of potential future scenarios. What will be key is to keep the framework relevant and adaptable to changing demands and legislative requirements. This will be an important issue to be addressed in the next stage of the analysis.

Governance

In terms of governance, the success of the framework will be dependent on: who takes the lead responsibility for its management; how it is financed; and how it is resourced in terms of staff. The participants in the workshop had different opinions on who should be the lead organisation, which ranged from the local authorities, the regional assembly to a newly formed partnership. In the absence of any overarching legislation or policy for ICZM or estuary management in Ireland, it will be difficult to assign responsibility to any one organisation without any strategic guidance or support mechanism in place.

Data and Information

The collation of baseline data was highlighted as a positive output from the SIFP. From the workshop it appeared that many of the participants were, however, unsure as to who held the SIFP data, who was responsible for its continued upkeep and who would host it in the future as part of the framework. There were many other sources of data provided during Task B which will be analysed further in terms of how these could be co-ordinated in the future to assist with integrated estuary management.

It was evident that there is strong support among the stakeholders for an online portal or web-based resource which hosts and disseminates data relating to estuarine-based environmental, social and economic information. The management of this dataset will be key to its successful delivery. As noted by some of the workshop participants, there will never be enough data collected. The important aspect is making sure that whatever data is collated is relevant, up-to-date and accurate i.e. quality assured. This will require resourcing including specialist GIS and IT skills to ensure it is effectively and efficiently managed on a regular basis.

It was noted on several occasions by the participants that further data was required to populate and inform the framework. Specific examples of data gaps mentioned included data on priority estuarine species; recreational and cultural uses; and coastal, fluvial, velocity and oil spill modelling. Other participants proposed the inclusion of additional data to allow for spatial analysis such as sensitivity mapping and modelling to identify areas of opportunity for development and to avoid conflicts.

The collection and collation of data is an important aspect of environmental management but it is one step in the process. The next stage of the analysis will be to investigate how to build on the information collected, identify relevant information gaps, explore the level of expertise required to assist with spatial analysis and consider potential solutions to address these challenges. It cannot be emphasised enough however, that one of the key elements to data collation is data management

which ensures that whatever data is collated is relevant, up-to-date and accurate i.e. quality assured. The successful application of data management will be dependent on a lead agency or personnel to take responsibility for this task. Participants in the workshop did not propose who should be responsible for this element however it was clear that many considered the hosting of the data online was a potential opportunity to disseminate information.

Indicators and Monitoring

Existing monitoring programmes were deemed to be working well. It was highlighted, however, that the Shannon Estuary is characterised as having medium water quality and this needs to be of good or high status. Therefore better indicators and modelling may be necessary to address this particular management issue.

It was documented during the workshop that there are many other examples of indicators and monitoring used for reporting under the Water Framework, Birds and Habitats, SEA and the Marine Strategy Framework Directives. These examples provide a good starting point in terms of recommending a suite to be considered as part of the framework. A number of website resources were recommended and referenced as part of Task B during the workshop and are included in Table 2, Appendix 5 of the full Working Paper IV. It was noted that further guidance is required for indicators on emerging issues such as marine litter, invasive non-native species and the social impacts of marine developments on the local community. Research is ongoing in these areas and will be explored further as part of the next stage of the analysis.

It was also proposed that spatial data should be used to identify potential user interactions, risks and impacts which would also be useful to assist with monitoring of ecosystem status within the estuary. As discussed in the previous section related to data and information, the application of spatial data will be considered as part of the next stage of the research.

Stakeholder Engagement

Stakeholder engagement has been recognised as a key element which should be incorporated throughout the framework at all stages. In terms of identifying who the stakeholders are, suggestions include national, regional and local government, all agencies and bodies with responsibility for the Shannon Estuary, local industries, sporting and recreational users, tourism groups, locally elected representatives and locally based residents and communities. Furthermore, identifying estuary users and interest groups is not clear-cut. It will not be possible to include all stakeholders therefore some sort of prioritising may be considered necessary. Notwithstanding, as highlighted by the guest speaker at the workshop, Sue Kidd, the framework has the potential to bring stakeholders and data together at the estuary level. By smart working and co-ordinated initiatives, the framework can improve efficiencies in terms of compliance with EU directives. It can be the structure or process to start round table discussions about the integrated management and monitoring of the Shannon Estuary. The type and format of stakeholder and citizen engagement will be analysed in more detail as part of the research.

Adoption and Implementation

The adoption and implementation of the framework is a recurring consideration. There was a division amongst participants in terms of it being a statutory or voluntary instrument. Both cases have pros and cons in terms of implementation. For example, the statutory adoption of the

framework would ensure any objectives included would be adhered to by the relevant regulators, developers and users.

With statutory implementation, a change in legislation will be required. Voluntary instruments do not require legislative modification and have more flexibility over statutory ones in terms of adaptation to changes. The next stage of the research will therefore need to consider the arrangements required to bring into effect either statutory or non-statutory implementation mechanisms for the framework.

Conclusions

The aims of this working paper have been to: provide an overall account of the workshop proceedings and key emerging themes; summarise stakeholders' feedback and critique of the proposed framework; and identify potential benefits and constraints of the framework as well as possible challenges to its future use and suggestions on how to overcome these. The exposure of the framework to the stakeholders at the workshop generated significant and valuable feedback in terms of determining what elements worked, did not work and where additional research is required.

As highlighted in the research so far, the development of integrated estuary management within a national policy vacuum may prove challenging. Without appropriate legislation and designated governance and institutional responsibilities, it will be difficult to facilitate a joined-up approach to management and monitoring within a shared resource such as the Shannon Estuary. The potential to continue the fragmented approach becomes a real outcome. Whilst the SIFP is a tangible example of integrated management, its durability will be a real indicator of its success.

It was highlighted as part of the case studies described in [Working Paper III](#), that the provision of a dedicated agency or partnership to oversee such work is critical to ensuring longevity. The estuary management plans in the UK had mixed success due to a lack of overarching legislation and governance arrangements at the time. However with the introduction of the UK Marine and Coastal Access Act, 2009 and Marine Scotland Act, 2010 there is a renewed emphasis on ICZM and marine spatial planning initiatives. This is now overseen by a statutory single marine body in both jurisdictions i.e. the Marine Management Organisation (MMO) in England and Wales and Marine Scotland in Scotland; albeit in the form of statutory national and regional marine plans or revised voluntary estuary management plans.

In terms of funding and resources, one of the failures of the Clyde Marine Spatial Plan was due to short-term, time-limited contracts which affected staff retention. Conversely, the Shetland Islands' Marine Spatial Plan has a full-time project officer overseeing its implementation supported by additional planning officers. It is the first marine spatial plan in the UK to be adopted as statutory guidance (Kelly et al., 2014).

The workshop highlighted a number of emerging themes and, in particular, data and information collection. Many participants proposed requirements for data management, further data and information gathering, specific estuarine modelling, spatial analysis expertise including sensitivity mapping and more guidance on environmental and operational indicators and monitoring. It is noted however, that for this level of data to be collated, interpreted and managed, certain basic information and structures must be in place first including *inter alia*: up-to-date and quality assured

spatial data on all estuarine activities and uses; estuarine resource modelling; up-to-date information on available technologies and infrastructure; permissions to use data and information as part of publicly available models and datasets; an established working relationship with key estuarine users and stakeholders; local and national expertise willing to validate models, data and methodologies; and the availability of both scientific as well as policy expertise. This will require significant resources in terms of dedicated staff and financial support. Without a lead agency or personnel taking responsibility for integrated estuary management, this may prove to be a significant challenge.

Furthermore the method of adoption and implementation of the framework may have certain implications for its application. With statutory implementation, a change in legislation will be required. Without any overarching policy for ICZM in Ireland, this may prove difficult to apply without political and stakeholder will and commitment to the process. In parallel, voluntary instruments do not require legislative change and have more flexibility over statutory ones in terms of adaptation to changes in the political environment and policy focus. Nonetheless, it will have its own challenges in terms of adherence and compliance issues. Regardless of which method, a sufficient funding and review mechanism is necessary to allow for continued progress and upkeep of any management instrument in light of such changes.

It is evident that there are a number of emerging strategic and technical issues which need to be examined further. Indeed the title of 'framework' at this stage of the research is ambiguous and means different things to different stakeholders which can lead to further complications. Therefore it may be more appropriate to explore a number of transition pathway options which considers delivering integrated management within: the current status quo; short-medium term transitions in national legislation and governance arrangements; and within the longer-term as part of a visioning exercise including significant legislative, institutional, environmental, economic, technological and societal change.

It should be noted that this paper is one part of *Stage 2: Data Gathering and User Engagement* and a more detailed analysis will be conducted following the publication of *Working Paper V: Dublin Bay – A Case Study*. This will lead into *Stage 3: Analysis, Synthesis and Dissemination*. Therefore this paper is an indication of where the research needs to go next and what are the key emerging themes to be examined.

References

Please refer to the main report on the [IMMERSE website](#) for references cited in text.

Appendix

Shannon Estuary Stakeholder Workshop Attendees on 25th June 2015

No.	Surname	First Name	Representation
1	Balfe	Caroline	Clare County Council
2	Butler	Catherine	Bord Iascaigh Mhara
3	Carlton	John	Shannon Foynes Port Company
4	Coughlan	Tom	Clare County Council
5	Flannery	Wesley	QUB
6	Foley	Walter	Celtic Seas Partnership in Dublin Bay
7	Forde	Edwina	Dept. of Agriculture, Food and the Marine
8	Forde Brennan	Trish	LCDC/ Environmental Pillar
9	Grounds	Andrew	QUB
10	Hennessy	Paul	Shannon Airport
11	Jenkinson	Karen	QUB
12	Kelleher	Eoin	Kerry County Council
13	Kelly	Christina	QUB
14	Kennedy	Nelius	RUSAL Aughinish
15	Kidd	Sue	University of Liverpool
16	King	Philippa	Southern Waste Region
17	Leahy	Yvonne	NPWS
18	McCormack	Vincent	GKinetic Energy Ltd
19	McKeown	Martin	Geologist
20	McNamara	Joseph	OPW
21	Merriman	Eamonn	EPA
22	Moroney	Paul	Clare County Council
23	Muinzer	Tom	QUB
24	O'Boyle	Shane	EPA
25	O'Brien	Joanne	GMIT
26	O'Grady	Paul	Limerick City & County Council
27	O'Mahony	Tadhg	EPA
28	O'Neill	Thomas	Limerick City & County Council
29	Peril	Patsy	River Shannon Protection Alliance
30	Siney	Gerry	River Shannon Protection Alliance
31	Walsh	Dominic	Southern Regional Assembly
32	Wilkes	Robert	EPA
33	Brady	Niall	ADCO
34	Tighis	Peter	Oyster Farmer