Supporting **I**mplementation of **M**aritime Spatial Planning in the **Celt**ic Seas

Component: C1.2.4 Establish Case Studies on Approaches to MSP Implementation

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Acronyms

AIS – Automatic Identification System

AtoN – Aids to Navigation

CEA - Cumulative Effects Assessment

CIL - Commissioners of Irish Lights

DAERA – Department of Agriculture, Environment and Rural Affairs [Northern Ireland]

DG MARE – (European Commission) Directorate General for Maritime Affairs

EMODnet - European Marine Observation and Data Network

EU – European Union

GEMET – GEneral Multilingual Environmental Thesaurus (EEA data standard)

GES – Good Environmental Status

GLA – General Lighthouse Authority

IALA - International Association of Marine Aids to Navigation and Lighthouse Authorities

ICES – International Council for the Exploration of the Sea

IMAGIN - Irish Sea Marine Aggregates Initiative

IMO – International Maritime Organization

LDP – Local Development Plans

MCA – Maritime and Coastguard Agency

MMO – Marine Management Organisation [UK]

MRE – Marine Renewable Energy

MSFD – Marine Strategy Framework Directive

MSP – Marine/Maritime Spatial Planning

Nm – Nautical Mile

NOREL - Nautical and Offshore Renewables Energy Liaison

ODEMM - Options for Delivering Ecosystem-Based Marine Management

ORE – Offshore Renewable Energy

OREI – Offshore Renewable Energy Installations

RBMP – River Basin Management Plan

SEA – Strategic Environmental Assessment

SEAI – Sustainable Energy Authority of Ireland

SOLAS – Safety of Life at Sea Convention

TSS - Traffic Separation Scheme

UCC – University College Cork

UNCLOS – United Nations Convention on Law of the Sea

WFD – Water Framework Directive

WMS – Web Map Service

About SIMCelt

SIMCelt - Supporting Implementation of Maritime Spatial Planning in the Celtic Seas is a two-year €1.8 million project co-financed by DG MARE and focussed on promoting the development of transnational cooperation to support the implementation of EU Directive 2014/89/EU in the Celtic Seas. Led by University College Cork, the project consortium comprises both planners and researchers from seven partner institutes representing a mix of governmental authorities and academic institutes from Ireland, France and the UK. This consortium is particularly interested in developing meaningful cooperation between neighbouring Member States to support implementation of spatially coherent plans across transboundary zones of the Celtic Seas, building on previous work and leveraging new opportunities to identify and share best practice on technical, scientific and social aspects of transboundary Maritime Spatial Planning (MSP).

The initiative allowed four thematic case studies to be conducted, covering a number of different geographic locations. These were intended to demonstrate how different aspects of MSP implementation and transboundary working are being carried out in the Celtic Seas region. The case studies provide detailed examples of specific issues in particular locations and their outputs range from numerous individual reports to the innovative use of Story Maps and videos.

This report is not intended to provide in-depth information on the case studies but rather to draw the key findings together with reference to the over-arching objective of supporting implementation of MSP in the Celtic Seas.

1. Introduction

The specific objective of this component was to undertake case studies that illustrate how the challenges to Maritime Spatial Planning implementation, specifically transboundary working, can be addressed. This builds on work conducted in other components of the project and covers a variety of themes and geographic locations. Four thematic case studies were conducted as part of SIMCelt. The case study outputs range from individual reports, Story Maps and videos, all of which are available from the SIMCelt project website.[1] This report is not intended to provide in-depth information on the case studies, which can be found in the individual case study deliverables listed in Appendix 1. Additional information relating to the Story Maps is, however, included. Key findings from all four case studies are presented with a view to contributing to the over-arching project objective of supporting implementation of MSP in the Celtic Seas.

The four case studies are:

- Case Study #1: Understanding specific cross border issues and opportunities: Offshore Renewable Energy and Shipping & Navigation (Deliverable 10, one report)
- Case Study #2: Addressing Cumulative Effects Assessment in Maritime Spatial Planning (Deliverable 11, Story Map and two reports, video and journal paper (in progress))
- Case Study #3: Planning Across Borders (Deliverable 12, five reports)
- Case Study #4: Understanding and Applying Ecosystem Services to Transboundary MSP (Deliverable 13, Story Map)

2. Case Study Overviews

2.1 Case Study #1: Understanding specific cross border issues and opportunities: Offshore Renewable Energy and Shipping & Navigation

Case Study #1 looks at two important transboundary sectors, namely offshore renewable energy and shipping & navigation. It seeks to understand cross border issues and opportunities within MSP and discusses how these issues might be addressed in delivering a coherent approach spanning the borders of marine areas. It specifically incorporates themes such as sectoral interactions, transboundary working and data for MSP to develop an understanding of the issues within both sectors and makes recommendations for coherent planning through the implementation of MSP. These two sectors were selected due to the potential for competition for space in marine areas as Offshore Renewable Energy (ORE) develops: spatial

[1] Due to data restrictions it is not possible to make all outputs fully public at this time.

planning is needed so as not to compromise shipping or navigational safety. The analysis identifies issues within the individual sectors, as well as issues that may arise when they come together in the same marine space and the opportunities for both sectors stemming from the implementation of MSP. Information for the case study is derived from the relevant competent authorities and those authorities directly involved with shipping & navigational safety and offshore renewable energy. As such, the associated report[2] should be used in combination with the other SIMCelt case studies and as an initial high level reference document for marine planners and interested stakeholders tasked with facilitating further engagement with the relevant authorities and all marine users.

Methodology

Review and assessment of the two sectors was based on other SIMCelt outputs such as the Maritime Sector Briefing Notes (Component C1.2.1) and the Initial Assessment (C1.1). The issues identified, and recommendations presented, are based on data collected through semi–structured interviews carried out with the regulatory agencies for shipping & navigational safety and offshore renewable energy planning and development. The case study also includes pertinent information from academic literature, reports and guidelines on shipping & navigational safety and offshore renewable energy. Two questionnaires for semi-structured interviews were developed in order to gather information from the identified competent authorities for shipping & navigational safety and offshore renewable energy. The interviews were carried out in person, via video call or via telephone for a period of eight months (including initial contact to gauge interest in participating). Input was received from the Commissioners of Irish Lights (CIL) and Sustainable Energy Authority of Ireland (SEAI) in Ireland; the Department of Agriculture, Environment and Rural Affairs (DAERA) in Northern Ireland; The Crown Estate[3] and the Marine Management Organisation in England, Marine Scotland; the Préfecture Maritime de l'Atlantique in France, and the Maritime and Coastguard Agency (MCA) in the UK.

Findings

It is clear from the interviews that experience in, and involvement with, MSP to date varies across the authorities and agencies that were consulted as part of this case study and, indeed, the countries as a

[2] Ansong, J., MacMahon, E. and O'Hagan, A.M. 2018. Case Study 1 – Understanding specific cross border issues and opportunities: Offshore Renewable Energy and Shipping & Navigation (D10). EU Project Grant No.: EASME/EMFF/2014/1.2.1.5/3/SI2.719473 MSP Lot 3. Supporting Implementation of Maritime Spatial Planning in the Celtic Seas (SIMCelt). University College Cork. 59pp.

[3] During the course of the SIMCelt project, Crown Estate Scotland was created to manage land and property owned by the Monarch in right of the Crown in Scotland.

whole. Consequently, their level of previous engagement with MSP is reflective of the stage that each country is at in the MSP process (legislation transposed or not, MSP authority identified, plans under development or Marine Plans in place). All respondents emphasised the need for sectoral and cross sectoral working groups to deal with issues relating to ORE and shipping & navigation. The UK's Nautical and Offshore Renewables Energy Liaison (NOREL) group was heralded by all authorities interviewed as an effective approach to addressing cross-sectoral issues in both a national and transboundary context. Both the Irish and French authorities attend NOREL meetings and cite it as a good practice example.

The key risks identified were collision risk, visual intrusion and noise, marking and lighting of the site, information for mariners, effects on navigational safety and communication equipment, the potential for small craft to stray into the paths of larger commercial vessels, emergency responses to maritime incidents, changes to charted depths and cumulative impacts of multiple activities in any one marine area. Concern over the creation of choke points was also cited. A choke point is a natural point of congestion between two navigable channels. One of the areas in the Celtic Seas that was indicated by the Maritime Préfet for the Atlantic as a major concern for choke points is the English Channel, though only the western approaches come within the Celtic Seas area. The planning and development of OREIs in English Channel will have to make specific consideration for shipping safety and distance from the coast and port entrance. Choke points may substantially increase the risk of additional hazards such as collisions and groundings and therefore need to be considered early in the MSP process. Mitigation of choke points is achieved primarily through good Aids to Navigation (AtoN) strategies, as per international recommendations (IALA) and endorsed by the appropriate authorities in France, Ireland and the UK. AtoN strategies are also an important aspect of managing activities that do not operate exclusion zones. It is important to note that approaches differ between countries: in France, for example, all vessels less than 25m are allowed to transit through wind farms but this is not the case elsewhere. Communication of the systems in operation is therefore vital for users and marine planning authorities.

Data aspects of the Case Study

With respect to data sharing for MSP, competent authorities for marine planning, such as the MMO and Marine Scotland in the UK, publicly share their data via their websites and other national sources. This is not strictly the case in both Ireland and France with certain authorities providing specific data to other public agencies for inclusion in online data portals and atlases but these were not specifically designed for MSP purposes, though such a portal may be developed in due course. The Agencies stated that the major challenge for data harmonisation was the multiple sources, each with different requirements. However, The Crown Estate, MMO and Marine Scotland were of the view that efforts should not be duplicated and there should be an initial and shared understanding of the user requirements and needs before developing

a harmonised data portal for the Celtic Seas. Vessels' Automatic Identification System (AIS) data is the preferred form for representing the density and volume of maritime traffic to inform MSP. The MCA (UK) shares its AIS data with the Commissioners of Irish Lights (CIL), which then assists it in doing navigational risk assessments and consultations for offshore developments. This also helps to establish transboundary communication, which will be important for MSP in the Celtic Seas. The collection of AIS data is relatively standardised though not always made publicly available: this could be an important consideration for MSP as Marine Plans evolve.

Key recommendations

Detailed recommendations are contained in the case study report. An abridged version is given in Table 1.

Table 1 Recommendations for Offshore Renewable Energy, Shipping & Navigation and MSP

Policy and Practice Based Recommendations	Relevant Actors
General Recommendations for the MSP process	
1. Marine planning authorities should enhance cooperation between national and transnational sectoral agencies such as IALA, IMO, General Light House Authorities	Competent Authorities for MSP
2. The MSP process should be adaptable and flexible enough to inculcate changes in maritime activities and advancements in technology	
3. Data and information collated and used during the MSP process should be provided in an easily accessible way and format, particularly for national and sectoral agencies working in a transboundary context	
Involvement of Sectors in MSP	
4. Member States that are beginning to develop Maritime Spatial Plans should harness the experience of sectoral agencies and build upon this in the implementation of MSP	Competent Authorities & Sectoral Agencies
5. Competent authorities for MSP should consult sectoral agencies early. To simplify the process of consultation, Competent Authorities for MSP should identify existing lines of communication and data exchange between national and transboundary agencies	National and transboundary agencies
Planning Evidence, AIS Data and MSP	
6. Planning authorities, shipping and navigational safety agencies should be mindful that small vessels do not have AIS or VMS data during traffic analysis and the implications this might have for adequate representation of traffic density in a particular area	Shipping and navigational safety agencies, Sectoral Agencies & Planning Authorities
7. Planning authorities and sectoral agencies should ensure that mapping and analysis of the marine area and development proposals consider and indicate uses/infrastructure (existing, approved and proposed) within the bounds of their marine area and that of neighbouring countries	
Cross sectoral working groups	
8. Cross Sectoral Working Groups at national level should be encouraged and used as platforms for facilitating transboundary and cross-sectoral engagement for MSP in the Celtic Seas	Sectoral agencies
9. Cross sectoral recommendations from these Working Groups should consider operational transboundary MSP issues	

Navigational Risk from the Development of ORE	
10. MSP and ORE authorities should be aware of the navigational risks and issues from the development of ORE through consultation with the MCA, General Lighthouse Authorities and Direction des Affaires Maritimes and jointly discuss policy measures to address them	Planning authorities and Shipping & Navigational Safety Authorities
11. The AtoN strategy and IALA guidelines on MSP[4] must be applied during the pre-planning and development stage of OREIs to mitigate risks such as choke points and foster cross border coherency	
Co-location within MSP	
12. Member States' sectoral and planning policies should support co-existence and co-location of activities	Planning Authorities and Policy Makers
13. Planning authorities can support co-location by ensuring that planning and design layouts of ORE, especially offshore wind, considers orientation and space to facilitate coexistence with shipping lanes for recreational users, fishing vessels and aquaculture installations	

2.2 Case Study #2: Addressing Cumulative Effects Assessment in Maritime Spatial Planning

Many existing Maritime Spatial Plans and associated policy documents refer to cumulative impacts or effects in some way. The focus of Cumulative Effects Assessment (CEA) is to explore the interaction between human activities, pressures and the marine environment. CEA methodologies have developed over the past 10 years and to some extent matured, hence there has been growing interest among researchers and practitioners about ways in ways in which CEA can be integrated into marine planning processes. The aim of this case study was to develop an approach to CEA for Maritime Spatial Planning.

Two Pilot projects were carried out in the Celtic Seas region. Existing CEA methodologies were applied in the Irish Sea and off the coast of Brittany. As part of the Irish Sea Pilot Project a web mapping tool (Leaflet story map) was developed to show how the CEA outputs could be assimilated by stakeholders, planners or developers. It is available at https://maps.marine.ie/simcelt/ (password protected). An associated video has been uploaded to YouTube (https://www.youtube.com/watch?v=XNyWYq2tO2A), which summarises how CEA can be addressed as part of the Marine spatial Planning Process.

The marine environment in the Celtic Seas is heavily used by industrial, transport, energy and tourist sectors. Fishing is the primary activity. The pilot projects assessed seabed disturbance caused by the occurrence of multiple activities. The fundamentals of any cumulative effects assessment process are spatial data. In both areas, we analysed spatial data about human activities, existing pressures and the sensitivity of the receiving environment. There were strengths and challenges of applying CEA to the MSP process.

[4] IALA Guideline G1121 – Navigational Safety within Marine Spatial Planning. Edition 1.0 June 2017

Methodology

A Pilot Project was carried out in the north west of the Irish Sea, extending from Dublin Bay to Carlingford Lough, on the east coast of Ireland. The pressures associated with these activities were identified and assessed using the ODEMM Pressure Assessment tool. Using the interactions between human activities, resultant pressures and ecological components, the tool helps to determine which activities to prioritise for management. It calculates an Impact risk score based on five criteria: spatial extent, frequency, degree of impact, persistence and resilience. To illustrate the results spatially, the data were pre-processed using SQL, Excel, ArcGIS and Python. A Python-based model was developed for spatial analysis. Vector datasets were converted to grid-based raster files with presence/absence values or value counts for each activity assigned to each raster grid cell. A weighting to indicate the significance of its relationship to the pressure was then applied to each activity. The activities and their weightings are combined via a series of calculations to present an overall representation of the cumulative impact of Abrasion. The spatial analysis methodology for the Irish Sea CEA pilot is available in a separate report.[5]

The CEA analysis in Brittany was based on structuring descriptive data on the marine environment. Descriptive statistical and spatial data on human activities, pressures and ecosystem components are summarised, harmonised and distributed across a marine area grid on a 1/60 scale. Each cell has a unique code and can be selected and sorted according to various criteria. Data associated with the cells can be used within 3 free open software solutions. Data are integrated into and used within a spatial database management system, PostgreSQL-PostGIS, and administrated using the pgAdmin software suite. Some data preparation operations and maps are produced using the QGIS software, which very easily interfaces with the database. Statistical analysis is carried out using the R software. See related report.[6]

Findings

For the Irish Sea, fishing activity results in the most significant pressure in the study area; it also causes smothering, species extraction and substrate loss. The predominant sources of pressure from shipping are contaminating compounds, litter, noise, organic enrichment and smothering to a lesser extent. The pressures from aquaculture are localised and are not significant on a broader scale in this area. A pragmatic approach was taken to the Irish Sea CEA case study based on existing methodologies and available data.

[5] Nic Aonghusa, C., Riordan, M. and Girvin, S. 2017. Assessment of Cumulative Effects in Marine Spatial Planning: Irish Sea Pilot Project Methodology (D11b). EU Project Grant No.: EASME/EMFF/2014/1.2.1.5/3/SI2.719473 MSP Lot 3. Supporting Implementation of Maritime Spatial Planning in the Celtic Seas (SIMCelt). University College Cork. 68pp.

[6] Quemmerais-Amice, F., Vanhoutte-Brunier, A. and Alloncle, N. 2017. Mapping risk of cumulative effects – Recommendations from the approach tested within French Celtic Sea waters (D11). EU Project Grant No.: EASME/EMFF/2014/1.2.1.5/3/SI2.719473 MSP Lot 3. Supporting Implementation of Maritime Spatial Planning in the Celtic Seas (SIMCelt). French Agency for Biodiversity. 49 pp.

There are limitations and differences with published methodologies for CEA (Korpinen, 2016). There are gaps in knowledge, data and issues with the scale. Future work should include land-based interactions and climate change. Notwithstanding that, the approach is useful for marine planners and can inform the planning process. Based on the findings of this Irish Sea case study, it is recommended that a CEA for MSP follows an environmental risk assessment approach (Judd et al., 2015).

The Case Study demonstrated important challenges with regards to the implementation of transboundary Cumulative Effects Assessment. These relate to stakeholder involvement and data integration.

Stakeholder aspects of CEA Case Study

Implementation of MSP requires active stakeholder involvement. Existing CEA methodologies do not take stakeholder requirements into account. Published CEA methodologies are technical and do not consider the MSP end-user, planner or developer. In a region such as the Irish Sea, cross-border stakeholders are key; each country bordering the Irish Sea has different sectoral and developmental priorities. A CEA stakeholder workshop was held as part of the final SIMCelt conference in November 2017. The objective of this workshop was to establish wider stakeholder views on the practicalities of integrating CEA methodologies within MSP processes. It was attended by 30 participants with representation from the Celtic Seas countries (UK, Ireland and France), as well as the Netherlands, Portugal and Italy. The majority that attended were from Government departments and agencies involved in MSP and/or CEA related activities. There was also representation from academic institutions, NGOs and businesses with interests in the field. Given the importance the MSP Directive places on stakeholder engagement, there was much discussion about developing an EU wide/cross border approach to using CEA in MSP. Here there were calls for overarching guidelines aimed at making it possible to compare CEA findings both within and between sea basins and enabling multinational cooperation. In terms of the style of guidelines many participants favoured a ‘common principles’ approach rather than a standardised (one size fits all) methodology. A prototype web mapping tool (Story Map) was developed to show how the CEA outputs in the Irish Sea Pilot could be assimilated by stakeholders, planners or developers. This could be used to help future transboundary work on Cumulative Effects Assessment.

Data aspects of CEA Case Study

The first step in the CEA process is to compile high quality spatial data and information on marine activities and the receiving environment. There is comparatively good availability of data in the Celtic Seas of relevance to CEA. There are a number of useful international web portals that were useful as a source of

data. The European Marine Observation and Data Network (EMODnet) is a long term marine data initiative from the European Commission's DG MARE underpinning its Marine Knowledge 2020 strategy. EMODnet is a consortium of 160 organisations assembling European marine data, data products and metadata from diverse sources in a uniform way. The International Council for the Exploration of the Sea (ICES) has a well-established Data Centre, which manages a number of large datasets related to the marine environment. Maps and spatial layers are used extensively in ICES to aid in the organisation of data. ICES manages a number of maps related to the North-East Atlantic; these are used extensively in ICES Expert Groups for the planning of data collection and the visualisation of data. These datasets are also valuable to MSP purposes. The process of compilation of information and data on the human activities and the receiving environment in the Irish Sea, however, demonstrated a range of transboundary issues relating to CEA.

Table 2 Transboundary issues and examples encountered in Case Study #2

	Transboundary issue	***Example***
Accessing data on human activities	Data available to download directly via a spatial data portal; in other jurisdictions it was only available by request to the data custodian.	• Ireland: Marine Atlas is a web-based viewer; data are viewable and downloadable. • England: MMO's marine planning evidence base is a web viewer and data are accessible through this and data.gov.uk. • Scotland: MS has a web mapping interface (NMPi) and a marine data portal. • Northern Ireland is currently developing a web-viewer and data are available by request.
Accessing data on marine protected areas	Each jurisdiction has different ways of defining and reporting Marine Protected Areas	
Licensing of spatial data	Issues arose with accessing data due to licensing arrangements. IP rights in data that prevent third-parties from using, reusing and redistributing data without explicit permission.	• Ireland has a Creative Commons open data policy. • The UK has introduced customised Open Data licences.
Data use agreements and data citation	No standards for data citation requirements.	For example, in the Irish situation…use the following format to cite data accessed through Ireland's Marine Atlas: *"Data from the [Insert details] theme accessed through Ireland's Marine Atlas at http://atlas.marine.ie/, [insert date]"*
Data Harmonisation	Combining the spatial datasets from each jurisdiction into an integrated, consistent layer is important for transboundary CEA.	Different approaches to reporting similar data Naming conventions Quality of data No standardised styling for mapping
Data Cataloguing	Approach to metadata differs	

Examples of issues encountered while collating data on human activities are given by sector below.

Aggregates

There are two spatial aspects to Aggregate Extraction that should be considered for MSP data sources; the distribution of the resource and location of any existing legal agreements or applications to extract the resource. All potential sources of data were explored. OSPAR and ICES have no information on Aggregate extraction. While the EMODnet human activities portal has a layer for Aggregate Extraction, it is an incomplete dataset and only provided estimated data for the two points identified in the Irish Sea. To create the most complete data set for all jurisdictions in the Irish Sea, two data sources were used. All up-to-date data for English, Welsh and Northern Irish waters are available from The Crown Estate and can be downloaded from data.gov.uk. The Irish data were from an EU (INTERREG) funded research project that assessed the sustainable management of marine aggregate resources - The Irish Sea Marine Aggregates Initiative (IMAGIN). The aggregate datasets used different methods of classifying the resource and cannot be merged into a seamless layer, without revisiting the original datasets. Where there is common data (North Wales), there are discrepancies in distribution. The Crown Estate reports aggregate data according to five categories: Construction Aggregate – Coarse; Construction Aggregate – fine (coarse sand); Construction aggregate – fine (fine sand); Fill aggregate; and No resource. Irish aggregate data is reported according to three categories: Gravel, Sand, and Sand & Gravel.

Aquaculture (finfish and shellfish)

There is an active aquaculture industry along the coasts surrounding the Irish Sea, providing a vital source of employment and economic activity. It is primarily shellfish farming on the Irish and English coasts. There are certain areas within higher concentrations of aquaculture, including Carlingford Lough and Co. Wexford in Ireland. Farmed salmon is Scotland's most valuable food export. The key spatial information requirements to demonstrate the scale of aquaculture activity are the location of aquaculture licences issued by the licensing authority and the type and the volume of aquaculture activity. All potential sources of data were explored. OSPAR and ICES have no information on aquaculture activity. The EMODnet human activities portal has a mariculture activity data source (finfish and shellfish) but the provenance of this dataset is unclear. Quality GIS data are available for Scotland (NMPi) and Ireland (Marine Atlas). Data for Wales and England are viewable via the MMO WMS. Data for Northern Ireland is currently being compiled for the Marine Plan for Northern Ireland.

Marine Renewable Energy

Wind energy production is predominant in the Irish Sea. EMODnet and OSPAR have planned and production data sources for MRE in all jurisdictions. The OSPAR data matches the EMODnet data except for Gwynt y

Mor, North Wales. Wind Energy data for Irish waters shows wind energy zones (data comes from the Irish Marine Atlas). Data from The Crown Estate shows the areas under lease and areas under agreement for English, Welsh and Northern Irish waters. Marine Scotland's NMPi shows the leased sites for tidal and wave energy in Scottish waters.

Oil & Gas

All UK data come from the Oil & Gas Authority and the Irish data from the Petroleum Affairs Division of the Department of Communications, Climate Action and Environment (DCCAE). They are exploration datasets but use different zoning definitions. Ireland references an 'exploration licence' and the UK 'offshore fields and licensed blocks.' The UK offshore fields in NW Irish Sea are the only area of relevance to CEA.

Cable Routes

MMO have KIS ORCA data, which is a 3rd party data source. Currently this data for the SIMCelt project can only be viewed, not downloaded, and this presents limitations for analysis of data for Cumulative Impacts. There is a data gap, where it is missing Irish cables (i.e. Arklow Bank wind farm). EMODnet has data available to download, but it is not up to date and is missing data on cables between the UK and Ireland.

Shipping

All jurisdictions use AIS data. The MMO has AIS data for the entire Irish Sea; Scotland has AIS data for Scottish waters and Ireland has it for Irish Waters. Each jurisdiction reports the AIS in different ways:

- Ireland – Irish Coastguard AIS tracks 2012
- England – Shipping Density (2014), average weekly shipping density for the whole of the UK at a 2km grid resolution. Also broken down into types of vessels (weekly average)
- Scotland - Average weekly density of vessel types - Data displayed as #transits

The SIMCelt case study used the MMO data for CEA as it has the best coverage, but there is a data gap where vessels are travelling from/to Ireland to non-UK ports.

Tourism and leisure

There is no consistency across the jurisdictions on how recreational activity is represented. Scotland has a significant amount of data viewable via the Marine Scotland WMS service. They also carried out a Marine Recreation and Tourism survey in 2015. England (MMO) did an interesting modelling exercise of potential recreation around Liverpool Bay. Ireland has no specific up-to- date spatial data.

Key considerations for future transboundary work on CEA

The results of the Irish Sea case study identified key considerations for future transboundary work on CEA relating to challenges with data coherence, cross-border stakeholder involvement in the CEA process, integration of policies into the CEA process and inclusion of management options. Projects like SIMCelt can assist future transboundary work on CEA through:

- Involvement of cross-border stakeholders in future Cumulative Effects Assessment
- Development of an awareness of transboundary stakeholder requirements, different sectoral and developmental priorities.
- Development of a EU wide/cross border 'common principles' for CEA
- Development of CEA decision support tools (e.g. Story Map) for end-users

SIMCelt can also contribute to data coherence aspects of future transboundary work on CEA through:

- Improved centralised mechanism for access to relevant high quality spatial data datasets and information about human activities and the receiving environment;
- Awareness of data and information in other jurisdictions, what exists and how to access it, including providing mechanisms for on-line accessibility;
- There should be a policy that all publically collected data are open access with Creative Commons Licence to ensure the legal grounding for its potential reuse;
- Standards in place for data use agreements and data citation;
- Data harmonisation of relevant datasets, e.g. naming conventions, reporting quality of data, styling; Could potentially use INSPIRE Directive, GEMET.
- Ensure the standards for data cataloguing and metadata are applied.

2.3 Case Study #3: Planning Across Borders

It is a fact that wherever boundaries are drawn, there will be challenges in achieving coherent approaches on either side of that boundary. This case study looked at the specific example of the Solway Firth, which straddles the border between Scotland and England, has a third boundary with Northern Ireland at 12 nm and another with the waters surrounding the Isle of Man. Each area has different legislation setting the requirements, parameters and objectives of marine planning within its administrative boundaries. As a result, there are multiple challenges in ensuring the achievement of different national objectives for sustainable economic development as well as securing those set out in overarching UK policy and EU Directives.

Methodology

The case study looked at a number of aspects in detail, each documented in an individual report:

- Initial comparison of requirements of, and differences between, primary UK legislation pertinent to marine planning (D12.1)
- References to marine and coastal planning within Local Development Plans (D12.2)
- Report on Sectoral Interactions around the Solway Firth in relation to marine planning (D12.3)
- Particular cross border issues for the Solway Firth (D12.4)
- Options for the Solway Marine Region in terms of marine planning (D12.5)

The first report (D12.1) describes the different provisions in the pertinent legislation and policy, including the Scottish National Marine Plan, and culminates in an analysis of differences in primary legislation relating to marine planning. This report is intended to assist the process of planning across borders by identifying the distinct requirements of each piece of legislation and analysing where synergies exist between the different approaches. The second report (D12.2) examines how existing local plans affecting the Solway Firth (including terrestrial development plans for Scottish and English Local Authorities' areas, inshore fisheries and River Basin Management planning), take account of marine and coastal issues in order to address land/sea interactions across the interface between the terrestrial and marine planning regimes.

The third report in the series focuses on the perceptions of interactions between sectors operating in the Solway Firth. It draws on information first gathered in 2011 and revisited during the SIMCelt project (2017) after marine planning was in place at the national level in Scotland and its development was under way in England. The results from both years are compared and then discussed creating a snapshot of the human-scale complexities relating to the use of a cross border ecosystem. The report also considers reasons why such interactions occur, and the implications for marine plans in the area.

The fourth report considers cross-border issues that are of particular relevance to marine planning in the Solway Firth. Finally, the fifth report in the series considers options for the Solway Marine Region in terms of marine planning with a number of specific recommendations.

Findings

A comparison of requirements of and differences between primary legislation relevant to marine planning considers the situation relating to marine planning in the Solway Firth during the SIMCelt project. It does not address what may happen beyond the lifetime of the project. The study found that although each piece of national legislation is focused slightly differently and has some different requirements, the different

Marine Acts adhere to the requirements of the UK's Marine Policy Statement and set parameters for economic, social, climate change and marine ecosystem objectives. The legislation requires cooperation and coordination across boundaries to responsibly and sustainably licence and manage activities in the UK marine area. Not all the development, implementation and review periods are scheduled for the same timescales, which may lead to difficulties as cross-border ecosystems are subject to different planning requirements at different times. Any conflicts arising from different policy objectives need to be resolved to facilitate an effective ecosystem-based approach to marine planning. The limited available evidence of possible differences in approach between marine planning regimes, or the importance given to different issues on either side of a boundary, may affect decisions in marine planning at the time they were made and may have on-going impacts, particularly for the first few years of Marine Plan implementation. Report D12.2, on references to marine and coastal planning in Local Development Plans, found that LDPs around the Solway Firth contain a distinct coastal element but fewer plans explicitly define a coastal zone, instead referring to an ambiguous 'coastal area'.

The study on sectoral interactions found that sectors that vary in scale often perceive each other differently; in other words, an individual may perceive their interests to be significantly and adversely affected by a large-scale, semi-permanent offshore feature whilst the same may not be true in reverse. Static gear fishermen, for example, viewed all offshore renewable energy as incompatible with their interests but offshore wind developers viewed static gear as a positive interaction offering an opportunity to improve habitat. Interactions may also change over the life of an activity and this should be considered when developing plans: marine plans need to consider the underlying drivers for change in sector development and cumulative impacts may need to be dealt with in future iterations of both terrestrial and marine plans. Respondents unanimously stated that they thought there is scope for greater integration between sectors they interact with and that coherent planning could help facilitate this. The case study highlighted the importance of the role of local coastal partnerships in acting as a neutral body as well as gathering data for the purposes of marine planning.

Particular cross-border issues for the Solway Firth identified in the fourth report include the different timescales for developing plans in separate but adjacent areas, the different geographic scales of the Marine Plans in operation and under development, data sharing and governance arrangements including methods of stakeholder engagement. The fifth report in the series recommends that the planning regimes in England and Scotland consider the Solway marine ecosystem in its entirety, highlighting that MSP can successfully combat issues associated with fragmented governance. The need for marine plans on both sides of a border to meet the needs and activities of people and organisations that may operate in one jurisdiction but live and experience the effects of policies in another was also emphasised.

Data aspects of the Case Study

Whilst this case study did not focus specifically on data aspects of MSP it was found that habitat and species distribution, data quality and resolution and the uncertainty around cumulative effects of activities are all areas where additional data gathering is required but will take time to collect and feed into the decision-making process for marine planning. In transboundary contexts, it is essential that competent authorities share data and information during the plan-making process. Data collection, production and visualisation methods differ between countries and dissemination can be limited by national rules. This can mean there is a lack of consistent data on basic environmental conditions. Increasing marine activities will result in additional pressures on the marine environment; hence, the need for improved geographical data on seabed disturbance, eutrophication, pollution, and invasive non-native species is becoming more necessary. Generally sectors collect and collate data related to their own sectoral activities and are not used to thinking holistically, especially if data they hold is financially or commercially sensitive.

Key considerations for transboundary MSP

Key **issues** for marine planning in cross-border areas, e.g. the Solway Firth are:

1. A single marine ecosystem may be subject to multiple administrative boundaries: the Solway Firth is single marine ecosystem with two national boundaries running laterally through the middle and a third at the western limit at 12 nm.
2. Administrations may have separate legislation in place, may take different approaches to marine planning/maritime spatial planning and may be at different stages of implementation: this is the case in the Solway Firth where a National Marine Plan has been in place in Scottish waters since 2015 and the Marine Plans for the English Marine Management Organisation's North West Marine Plan Area are currently under development.
3. Marine planning/MSP regimes may not yet be aligned with each other; linkages to terrestrial planning regimes to take into account 'land/sea interactions' may also be a further consideration.
4. Staggered implementation of plans at different scales and in different areas leaves the ecosystem vulnerable and results in uncertainty for developers.
5. Contrasting policies/objectives/priorities of different planning jurisdictions can impact/conflict with each other and may adversely affect the underlying ecosystem, leading to unintended cumulative impacts.
6. Marine plans must accommodate effects of climate change on the underling ecosystem: they should also take account of Plans that relate to the ecosystem for different purposes: the Solway Tweed River Basin Management Plan provides an example of how transboundary planning for a

water body can be achieved.

7. Stakeholders are at risk of engagement fatigue from multiple planning regimes, especially if plans are developed over a long period of time: duplication of stakeholder effort should be avoided if possible.
8. Stakeholders may live or work in one jurisdiction but live or work and experience plan effects in another: use should be made of any existing mechanisms, such as the Solway Firth Partnership, to access local knowledge, expertise, experience but avoid
9. Coastal communities can be particularly vulnerable to environmental or economic changes: in areas of high social deprivation, such as parts of the Solway Firth hinterland, this may drive decisions relating to terrestrial and marine planning.

These issues may have significance to other cross border systems within other Member States that adhere to the same European legislation. Lessons can be learned from the approaches of the UK authorities in planning for an ecosystem bisected by artificial administrative boundaries.

2.4 Case Study #4: Understanding and Applying Ecosystem Services to Transboundary MSP

As MSP requires an ecosystem-based approach it is critical that ecosystem services are taken into account in plan-making and implementation. The final SIMCelt case study focused specifically on understanding and applying ecosystem services to transboundary MSP. The final output is a Story Map available at http://daera-ni.maps.arcgis.com/apps/MapJournal/index.html?appid=a8ae0dbccc7a4844af90dc7ca418804b which was developed by DAERA (Northern Ireland) with assistance from University College Cork (UCC). The challenge arising with respect to ecosystem services is that they remain poorly understood in such a way as to be useful to marine planners for decision makers. Accordingly, this case study built upon previous projects that concentrated on understanding the services provided by ecosystems but focused on the applied aspects of the subject, presenting examples of provisioning, regulating and cultural ecosystem services.

Methodology

Spatial datasets used to inform MSP often vary significantly between adjacent jurisdictions, primarily because they have been collected or created for purposes other than MSP. Within the Celtic Seas there can be as many as seven different datasets for the same subject, each relating to the information held by each jurisdiction (Scotland, England, Wales, Northern Ireland, Republic of Ireland, Isle of Man and France). This presents challenges for harmonising data across borders, which is time consuming and expensive. For the purposes of this Case Study, the ecosystem services selected utilise datasets that are inherently harmonised

across OSPAR Region III: Celtic Seas region and which are readily available. The three examples are (1) ICES data to measure the relative importance of fishing areas across the Celtic Seas OSPAR Region and economic values of certain types of fishing activity, (2) the use of EMODNET Seabed Habitat maps to enable consideration of the contribution a marine area may have in mitigating climate change and (3) the use of the social media to provide an insight into the cultural ecosystem services of a transboundary lough of the Irish Sea. Further information on the full methodology and limitations of the ICES datasets can be found in the Story Map along with locations for data download.

Findings

The ICES datasets provide a basis from which an economic valuation of mobile bottom contact fishing activity and, therefore, the economic valuation of provisioning services in the OSPAR III Region can be made. It should be noted, however, that the method in which maps with a large range of values are categorised can greatly influence the way in which the map is displayed and interpreted. In this case Standard Deviation is used in order to show the relative importance in terms of economic value of fishing activity across the Celtic Seas. A second provisioning service relates to the *Nephrops* fishery in the Irish Sea. Using data from ICES, the Story Map contains a map with landings values in Euro, meaning every grid square has an associated value in Euro for Nephrops landed in 2016. This type of information could be utilised in MSP for analysing different marine activities provided associated economic information is available.

Marine sediment acts as a carbon sink but it can be exceptionally difficult to put a value on this type of regulating service. There is a lack of standardised ecosystem methodologies regarding the assessment of marine sediment carbon storage. The Case Study Story Map is a tool intended to aid decision makers, enabling them to consider the regulating ecosystem service benefit of marine sediment carbon storage and see how this may vary across the various sediment types of the Celtic Seas. The dataset used is based on modelled seabed data, with a number of assumptions. This example will evolve as better data and information from seabed mapping becomes available over time.

Cultural ecosystem services, which are traditionally very difficult to map and quantify were also included in the Case Study. The interactive map in the Story Map is both novel and innovative as it uses outputs from social media to help inform decision makers about how the public make use of the Cultural Ecosystems Services in an area. In this case a selection of Flickr photographs in and around the transboundary area of Carlingford Lough have been used. An examination of these photographs demonstrates a variety of cultural ecosystems services in the area but also illustrates how difficult it is to define what cultural ecosystems services are and indicates that this may be highly subjective. The locations of the photos from social media can be analysed to produce statistics on how the number of pictures decreases dramatically with increasing

distance from the coast.

Stakeholder aspects of the Case Study

The case study focused on a variety of ecosystem services and not stakeholders per se though their images were used with respect to cultural ecosystem services and this demonstrates a novel way of engaging stakeholders in the MSP process in future. All the information used in the case study was purposely included so as to make information on ecosystem services more digestible and useful for decision-making stakeholders. The Story Map approach is also an innovative way of presenting certain complex economic, environmental and social data and information so it could be considered in future for engaging with a wide variety of stakeholders across jurisdictions, sectors and geographic contexts. This could in turn contribute to developing a shared understanding of a marine region and might also be helpful in discussing and deciding upon a shared vision for a particular marine area, one of the first steps in MSP implementation.

Data aspects of Case Study

All spatial datasets must be used carefully and the user should always be clear about why and how the dataset was created and understand its limitations. Notwithstanding this, the Story Map approach demonstrates that there is much potential for existing marine spatial datasets to be used to help marine planners incorporate ecosystem services to make informed and balanced decisions. A significant amount of effort needs to be invested in determining harmonious data before it can be used in a transboundary context. This highlights once again the need for common methodologies and standards to collecting data whilst recognising that there is no one correct approach in many contexts.

Key considerations for transboundary MSP

The Story Map demonstrates that there is much potential for existing marine spatial datasets to be used to help marine planners incorporate ecosystem services into their planning and decision-making processes. Presenting the data in this way also enables the relationships between provisioning, regulating and cultural ecosystem service examples to be observed and better understood. This can contribute not only to MSP but to other legal and policy objectives, such as mapping of pressures for Marine Strategy Framework Directive purposes, and also to monitoring related to the Habitats and Birds Directives. In order to deliver sustainable development of marine regions and protect the resource base and environment upon which most economic activity is based, decision makers must develop holistic, multi-sectoral and transboundary

approaches to marine management that considers and, where possible, incorporates data beyond their own jurisdictional boundaries. Using data that is already in the public domain, and displaying it in the form of a Story Map, for example, could also be used for communicating and engaging with stakeholders in a transboundary context.

3. Conclusions from the Case Studies

The focused case studies in SIMCelt provide real-life examples of how different aspects of MSP implementation and transboundary cooperation are currently approached in the Celtic Seas region. Case Study #1 and Case Study #3 are related in that they focus on stakeholder involvement with the MSP process from a sectoral perspective and in transboundary contexts. Case Study #2 and Case Study #4 concentrated more on data related aspects, both from an assessment of impacts perspective and utilisation of existing information for more ecosystem-based management and decision-making. Novel approaches to communication of such information was achieved through the development of Story Maps, a tool that could be beneficial in raising awareness of the complexities of MSP in a more easily understood manner. Whilst the case study had different specific focus areas it is clear that a number of common themes emerge from their findings that can be broadly categorised under four themes: **procedural aspects, sectoral interactions, stakeholder engagement and data & information.**

Procedural aspects relate not only to how MSP is being conducted in the individual Member States and their administrations but also cover aspects such as timelines for implementation, governance structures and formal consultation requirements and mechanisms. It is evident from Case Study #1 that both the Offshore Renewable Energy and Shipping & Navigation sectors consult with each other, mostly informally, in relation to common interests and concerns but currently this is not done specifically with MSP or its implementation in mind, though it will often have relevance to the wider MSP process. Case Study #3 highlights most strikingly the complexities involved in implementing MSP in the transboundary context of the Solway Firth. Despite the Solway being geographically located in the UK, with its largely common governance framework, there are pronounced differences in implementation between England and Scotland with respect to timelines for implementation, how common issues are considered within their respective marine plans and how stakeholders are involved in the process. In addition to MPS, there are also other legal requirements deriving from both national and EU legislation each with their own schedule for implementation e.g. terrestrial development plans under planning law, Programmes of Measures under the Marine Strategy Framework Directive and River Basin Management Plans under the Water Framework Directive. Arguably, it could be concluded that Member States are currently engrossed in finding an approach to MSP implementation that works within their national contexts but this has yet to evolve to fully consider transboundary aspects. Strategic, proactive cooperation between planning authorities can

reduce duplication of effort in a transboundary ecosystem.

Procedural aspects come into sharper focus when considering common approaches to, for example, Cumulative Effects Assessment, as explored in Case Study #2. CEA is a fundamental requirement for MSP and should be an important area for future development. By their nature, cumulative effects do not fit neatly within administrative boundaries or existing governance structures but rather require an ecosystem-based and holistic approach. The environmental risk assessment approach utilised for CEA in Case Study #2 requires a common approach to a number of the steps within that process such as data collation, determining the risk of impact, interaction with sectors so as to establish their development scenarios, as well as including future management options. This in turn necessitates new procedures within existing departments and ages, which could be challenging to put into practice. CEA also needs to include more than a spatial distribution of pressures. Likewise the scale of the assessment, baseline conditions and temporal changes need to be included. Ecosystem-based management, though a legal requirement under the MSP Directive and MSFD, is still a concept that has yet to fully implemented. Case Study #4 demonstrates just some of the types of ecosystem services deriving from the marine ecosystem with a view to informing regulators as well as stakeholders as to how such information can be used to inform future decision-making.

Sectoral interactions were both a central focus area and recurring theme throughout the case study work. Case Study #1 focused entirely on the interactions between ORE and Shipping & Navigation. This Case Study concentrated on the operational aspects facing both sectors and sought to determine the levels of interaction to date, both in relation to their own sectoral activity but also in relation to MSP more generally. The findings from the Case Study are encouraging in that it is clear communication and discussion already happens but there is an opportunity to build a more systematic approach to this, such as through formal liaison groups e.g. NOREL, where these are necessary. Case Study #3 has a dedicated report on sectoral interactions in the Solway Firth (D12.3). This provides evidence that more sectors are expanding in the Solway Firth than declining, something which could also be true for many other transboundary marine regions. As such, the potential for competition for space also increases and hence it will be necessary to consider successful existing conflict resolution mechanisms and how these could be adapted in future to mitigate other situations. Maritime/marine plans will need to be sufficiently flexible to accommodate emergent activities/technologies, which also brings the timeline for implementation and vision contained in the plan, into focus.

The concept of MSP is focused on **stakeholder engagement and participation** throughout the entire process. The engagement of MSP end users should be a central feature of MSP related activities, such as in CEA, and issues related to effective communication with non-specialist MSP audiences merit particular attention. The two Story Maps produced in Case Studies #2 and #4 represent an innovative way of

communicating complex scientific information and concepts to a range of audiences. This complements approaches such as 'serious gaming' utilised elsewhere in the project (see D9). Experience from the Solway Firth highlights the benefits of using existing pan-estuary stakeholder engagement mechanisms, such as the Solway Firth Partnership. It is good to have a central point for information and contact particularly with respect to MSP in a transboundary context, given the range of activities and actors working in such spaces and the relatively recent advent of MSP. Case Study #4 utilises data in the public domain and for the cultural ecosystem service in the Story Map, photos from social media (Flickr) was used to provide information on how an area was used by the public and others. This type of approach could help to engage citizens and wider society in the MSP process as well as act as a source of information for marine and coastal related activities.

Whilst MSP is a process, that process relies on robust **data & information**. All case studies in the project made reference to data and information covering many different facets of this theme. Access to data can be an issue for different sectors and for wider stakeholder engagement. Certain data is not fully available or there are gaps in coverage which will create difficulties for MSP and subsequent decision-making. In a transboundary MSP context, technical aspects of data interoperability and compatibility are a critical focus. There are definitely areas where new data will need to be collected or updated but support is also needed for continuing experimentation in the use of data for specific steps of the MSP process such as CEA. There is also a need to develop more strategic approaches to CEA in MSP which should be a priority in the next phase of development work. In Case Study #4 ICES and EMODnet data were used both of which illustrate the advantages of having data coverage of large areas for MSP and the potential uses of this for ecosystem-based management approaches.

In conclusion the key **recommendations** for transboundary maritime spatial planning identified from the case study work are to be cognisant of the lessons learned in the planning process from established marine plan authorities. A second recommendation is to engage effectively and in an on-going manner with neighbouring marine plan authorities and terrestrial planners. Whilst MSP is still in the relatively early stages of implementation, there is a need to ensure that the objectives and priorities in policies do not have detrimental effects on neighbouring ecosystems. Plan reporting periods should be aligned to reduce stakeholder fatigue, reduce duplication of effort and improve efficiency. It is probable that there will be a need for additional data collection and collation as implementation of MSP progresses. The case studies demonstrate the challenges of MSP implementation, particularly in a transboundary context. It is also clear that lessons are being learned in relation to specific issues and geographic locations which is encouraging for on-going implementation in the diverse range of contexts within which MSP must occur.

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Appendix 1

Case Study Outputs

Case Study #1

Ansong, J., MacMahon, E. and O'Hagan, A.M. 2018. Case Study 1 – Understanding specific cross border issues and opportunities: Offshore Renewable Energy and Shipping & Navigation (Deliverable 10). EU Project Grant No.: EASME/EMFF/2014/1.2.1.5/3/SI2.719473 MSP Lot 3. Supporting Implementation of Maritime Spatial Planning in the Celtic Seas (SIMCelt). University College Cork. 59pp.

Case Study #2

Quemmerais-Amice, F., Vanhoutte-Brunier, A. and Alloncle, N. 2017. Mapping risk of cumulative effects – Recommendations from the approach tested within French Celtic Sea waters (D11). EU Project Grant No.: EASME/EMFF/2014/1.2.1.5/3/SI2.719473 MSP Lot 3. Supporting Implementation of Maritime Spatial Planning in the Celtic Seas (SIMCelt). French Agency for Biodiversity. 49 pp.

Nic Aonghusa, C., Riordan, M. and Girvin, S. 2017. Assessment of Cumulative Effects in Marine Spatial Planning: Irish Sea Pilot Project Methodology (D11b). EU Project Grant No.: EASME/EMFF/2014/1.2.1.5/3/SI2.719473 MSP Lot 3. Supporting Implementation of Maritime Spatial Planning in the Celtic Seas (SIMCelt). University College Cork. 71pp.

Story Map: https://maps.marine.ie/simcelt/ (password protected and available on request)

YouTube video: https://www.youtube.com/watch?v=XNyWYq2tO2A

Case Study #3

Baruah, E., Fairgrieve, R. and Ross, L. 2017. Initial comparison of requirements of, and differences between, UK primary legislation pertinent to marine planning (D12.1). EU Project Grant Agreement No: EASME/EMFF/2014/1.2.1.5/3/SI2.719473 MSP Lot 3. Supporting Implementation of Maritime Spatial Planning in the Celtic Seas (SIMCelt). Marine Scotland. 49pp.

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Baruah, E., Fairgrieve, R. and Haddon, P. 2018. Particular cross border issues for the Solway Firth (D12.4). EU Project Grant Agreement No: EASME/EMFF/2014/1.2.1.5/3/SI2.719473 MSP Lot 3. Supporting Implementation of Maritime Spatial Planning in the Celtic Seas (SIMCelt). Marine Scotland. 34pp.

Baruah, E., Fairgrieve, R. and Haddon, P. 2018. Options for the Solway Marine Region in terms of marine planning (D12.5). EU Project Grant Agreement No: EASME/EMFF/2014/1.2.1.5/3/SI2.719473 MSP Lot 3. Supporting Implementation of Maritime Spatial Planning in the Celtic Seas (SIMCelt). Marine Scotland.

Case Study #4

Story Map:

http://daera-ni.maps.arcgis.com/apps/MapJournal/index.html?appid=a8ae0dbccc7a4844af90dc7ca418804b