Sectoral Interactions in the Firth of Clyde

Scottish Sustainable Marine Environment Initiative

SSMEI Clyde Pilot

Sectoral Interactions in the Firth of Clyde

Report of Sectoral Interactions Survey

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GLOSSARY

BMF	British Marine Federation
BSAC	The British Sub Aqua Club
CBD	Convention on Biological Diversity
CFA	Clyde Fishermen's Association
CPA	Coast Protection Act 1949
CYCA	Clyde Yacht Clubs Association
EIA	Environmental Impact Assessment
FEPA	Food and Environment Protection Act 1985
FoCMSP	Firth of Clyde Marine Spatial Plan
FRS	Fisheries Research Services
GIS	Geographical Information System
HS	Historic Scotland
ICZM	Integrated Coastal Zone Management
IFG	Inshore Fisheries Group
IRPCS	International Regulations for Prevention of Collision at Sea
KSB	Keep Scotland Beautiful
MARPOL	Convention for the Prevention of Pollution from Ships
MCA	Maritime and Coastguard Agency
MCS	Marine Conservation Society
MLWM	Mean Low Water Mark
MSP	Marine Spatial Plan(ning)
NGO	Non Governmental Organisation
OSPAR	Convention for the Protection of the Marine Environment of the North East Atlantic
RSPB	Royal Society for the Protection of Birds
SCA	Scottish Canoe Association
SCAD	Scottish Creelers and Divers
SEPA	Scottish Environment Protection Agency
SFSA	The Scottish Federation of Sea Anglers
SNH	Scottish Natural Heritage
SOLAS	Convention on Safety of Life at Sea
SPA	Special Protection Area
SRF	Scottish Renewables Forum
SSAC	Scottish Sub Aqua Club
SSMEI	Scottish Sustainable Marine Environment Initiative
SSSI	Site of Special Scientific Interest
UKCoS	UK Chamber of Shipping
WFD	Water Framework Directive (2000/60/EC)
WoSAS	West of Scotland Archaeology Service
WQ	Water Quality

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This study also formed the basis of an MSc dissertation submitted by Kate Thompson as part of her postgraduate course in Environmental Studies at the David Livingston Centre for Sustainability (formerly Graduate School of Environmental Studies), University of Strathclyde (Thompson, 2007). Kate would like to thank the staff at the Centre for their support and encouragement, and especially Dr Elsa João for her insightful supervision.

1 INTRODUCTION AND REPORT STRUCTURE

1.1 Study Purpose and Context

This report describes a study of interactions among key sectors utilising the marine environment of the Firth of Clyde. This study will assist the development of a strategic marine spatial plan (FoCMSP) for the Firth of Clyde. The FoCMSP is being prepared and implemented as part of the Scottish Sustainable Marine Environment Initiative (SSMEI), which is intended to inform marine management policy development in Scotland.

Marine spatial planning is widely perceived as a valuable tool for conflict resolution in the marine environment (GHK Consulting and Scott Wilson, 2004; MSPP Consortium, 2005a). International experience has repeatedly highlighted the value, indeed necessity, of stakeholder involvement in the marine spatial planning process and the potential of such engagement to assist in conflict resolution among sectors (MSPP Consortium, 2005a; Rutherford *et al*, 2005, Douvere *et al* 2007). Hence, the purpose of the study reported here was to engage with stakeholders to gain an understanding of *perception*s of interactions, both positive and potentially negative, among sectors operating within the Firth of Clyde. The results will inform marine spatial planning in the Firth of Clyde; specifically, the integration of forward sectoral development plans within the FoCMSP.

1.2 Report Structure

The context for the study is further described in section 2, which outlines the aims and objectives of the SSMEI and the Firth of Clyde pilot project and details the rationale for the sectoral interactions study. Section 3 describes how the study was undertaken while the data collected are briefly described and summarised in section 4. Section 5 summarises the results for each sector while section 6 draws on these sectoral summaries to identify a number of themes underlying the perceived interactions among sectors and to outline current management mechanisms. Section 7 considers the potential role of the FoCMSP and other management fora and mechanisms in resolving conflicts among sectors in the Firth of Clyde while section 8 summarises the study results and draws some overall conclusions. The four appendices include details of organisations and individuals who participated in the study (Appendix 2), examples of the data gathering forms (Appendix 3), and stand-alone summaries for each sector, which detail perceptions of interactions with other sectors and consider the potential for the FoCMSP to assist in resolution of conflicts (Appendix 4). A composite matrix of the raw data is downloadable from the project website http://www.clydeforum.org/SSMEI/index.htm (and follow links to the sectoral interactions study from the Marine Spatial Planning page).

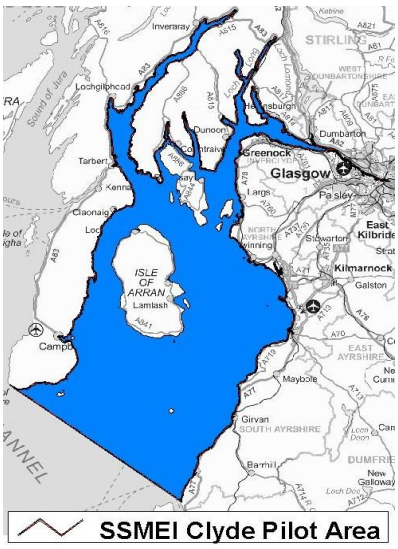
2 RATIONAL AND CONTEXT

2.1 Scottish Sustainable Marine Environment Initiative (SSMEI)

The focus of this study of sectoral interactions is on the development of the Firth of Clyde Marine Spatial Plan (FoCMSP), which is being prepared under the auspices of the Scottish Government's Scottish Sustainable Marine Environment Initiative (SSMEI). The SSMEI was established in November 2002 with the aim of developing and testing the effectiveness of alternative management approaches, including marine spatial planning, to deliver sustainable development in Scotland's coastal and marine environment.

The context for the SSMEI lies in the growing recognition that the current fragmentary approach to marine management is unfit for purpose (WWF and SWT, 2004). Increasing pressures on the marine environment, both from established activities, such as fishing, shipping and mariculture, and from development or rapid growth of sectors such as marine renewables and marine leisure activities, are concurrent with international obligations on the UK and Scottish Governments to protect the marine environment and its natural and historic heritage under instruments such as OSPAR, Water Framework Directive (WFD), Birds and Habitats Directives, Convention on Biological Diversity (CBD) and the Valletta Convention.

2.2 Firth of Clyde Pilot Project and Marine Spatial Plan



Based upon Ordnance Survey Data with the permission of the Controller of HMSO (GD03135G0005)

The Firth of Clyde Pilot is one of four SSMEI pilot projects. The Pilot commenced in July 2006 and will run for three years. It is tasked with the development of tools to deliver more integrated and sustainable management of the marine and coastal areas of the Firth of Clyde. The Firth of Clyde pilot study area extends from the tidal weir at Glasgow Green to a line drawn from Finnarts Point, just north of Loch Ryan, to the southern tip of Kintyre (Figure 1). The land surrounding the study area falls under the jurisdiction of seven local authorities (Glasgow, West Dunbartonshire, East Renfrewshire, Inverclyde, Argyll and Bute, North Ayrshire and South Ayrshire), together with the Loch Lomond and Trossachs National Park Authority. The terrestrial boundary will extend to extreme high water springs. Hence the FoCMSP will overlap with the jurisdiction of terrestrial planning authorities in the intertidal zone.

Figure 1 SSMEI Clyde Pilot Area

A steering group (Appendix 1), which is largely coincident with the core group of the voluntary Firth of Clyde Forum coastal partnership, provides direction for the project team and oversight on outputs. The SSMEI Clyde Pilot's main objectives and associated outputs are:

- Development and implementation of an agreed, multi-sectoral, marine spatial plan (FoCMSP) for natural resource use, development control and management of the marine and coastal areas of the Firth of Clyde;
- Development, within the existing statutory framework, of improved decision support mechanisms for the marine environment of the Firth of Clyde; and
- Development of a web-based common information resource for the Firth of Clyde marine area.

The focus of the sectoral interactions study is on the development of the Firth of Clyde Marine Spatial Plan, and specifically integration of forward sectoral development plans. However, it will also inform the development of improved decision support mechanisms.

2.2.1 Firth of Clyde Marine Spatial Plan (FoCMSP)

The FoCMSP will provide a strategic framework for management of the marine environment of the Firth of Clyde that takes into account the cumulative effects of developments. It will support delivery of a 20-year vision for the Firth of Clyde:

> *"The Firth of Clyde will have a healthy marine and coastal environment, rich in biodiversity and natural resources. This will enhance the quality of life for local communities and contribute to a diverse and sustainable economy for the West of Scotland"*

The Plan will provide an overview of current resources and activities within the marine environment of the Firth of Clyde, managed within a geographical information system (GIS), to enable the production of illustrative maps and the modelling of interactions and impacts. The Plan will also describe linkages to existing terrestrial plans for the surrounding area. A third facet will be the integration of forward development plans for key sectors operating within the marine and coastal areas of the Firth.

In this context, a key objective of the FoCMSP is to integrate and augment forward sectoral plans that take full account of the interests of stakeholders and wider ecosystem issues. The seven sectors identified in SSMEI Phase II and by the Clyde Pilot project team are:

- inshore fisheries
- mariculture
- shipping and transport
- recreation and tourism
- naval defence
- management of environment and heritage
- energy

Forward looking plans will be developed through facilitated workshops of key sectoral representatives. No forward plan is being developed for naval defence as it is recognised that a marine spatial plan on the scale of the Firth of Clyde would have limited input to the development of national defence policy, and detailed information on potential future developments is outwith the public domain. However, given current UK Government policy with respect to retention of a submarine-based nuclear defence capability, the FoCMSP will presume that areas within the Firth of Clyde currently utilised for the Trident fleet will continue to be used in this manner. The study of sectoral interactions included consideration of interactions between naval operations and other interests.

2.3 Rationale for Study of Sectoral Interactions

The marine environment presents particular challenges for spatial planning as, unlike the terrestrial sphere, multiple human activities can potentially occur at the same geographical location. In the context of the FoCMSP, successful integration of sectoral plans is seen as dependent upon gaining understanding of the nature, extent (spatial and temporal) and intensity of interactions among the main sectors and their constituent subsectors operating within the Firth of Clyde. Only by understanding such interactions, and evaluating the ability of existing management mechanisms to address them, is it possible to assess the potential of the FoCMSP to address conflicts or enhance synergies.

The particular focus of this study was on understanding the *perceptions* of the various sectors within the Firth of Clyde of their interactions with others. This approach is different to that taken by other marine spatial planning projects such as GAUFRE (2005) and the Irish Sea Pilot (MSPP Consortium, 2005b), which have principally examined interactions through spatial analysis of sector-specific operational constraints. The information generated by this study is complementary to the application of GIS mapping and spatial analysis tools with respect to visualising interactions within the Firth of Clyde.

3 APPROACH AND METHODS

3.1 General Approach

The approach used to gather information for the sectoral interactions study was informed by a concept, based on techniques used in strategic environmental assessment (SEA) (Glasson *et al*, 2005; Environment Agency, 2005), whereby information on the *nature* of interactions between activities and interests within the Firth of Clyde could be visualised in the form of a colour coded matrix (Figure 2). Each colour-coded cell represents the interaction between the (sub)sectors/activities represented by the intersecting rows and columns (Table 1).

		Aquaculture			
		Onshore finfish	Offshore finfish	Shellfish	Processing
Renewable Energy	Offshore Wind	Neutral	Positive	Neutral	Neutral
	Wave	Neutral	Positive	Neutral	Neutral
	Tidal	Neutral	Positive	Neutral	Neutral
Subsea cables and pipelines	Electricity	Neutral	Neutral	Neutral	Neutral
	Oil/Gas Pipelines	Conflict	Conflict	Neutral	Neutral
	Telecomms	Neutral	Neutral	Neutral	Neutral
Inshore fisheries	Nephrops trawl	Neutral	Conflict	Competition	Neutral
	Scallop dredge	Neutral	Conflict	Conflict	Neutral
	Demersal trawl	Neutral	Conflict	Competition	Neutral
	Pelagic trawl	Neutral	Conflict	Neutral	Neutral
	Longline	Neutral	Conflict	Neutral	Neutral
	Creel	Neutral	Conflict	Neutral	Neutral
	Dive	Neutral	Conflict	Competition	Neutral
	Processing	Neutral	Neutral	Neutral	Neutral
Aquaculture	Onshore finfish		Positive	Neutral	Positive
	Offshore finfish	Positive		Competition	Positive
	Shellfish	Positive	Positive		Positive
	Processing	Positive	Positive	Neutral	
Shipping and transport	Tankers	Neutral	Conflict	Conflict	Neutral
	Bulk carriers	Neutral	Conflict	Neutral	Neutral
	Container vessels	Neutral	Conflict	Neutral	Neutral
	Coastal bulk cargo	Neutral	Positive	Neutral	Neutral
	Ferries	Neutral	Conflict	Neutral	Neutral
	Cruise ships	Neutral	Conflict	Neutral	Neutral

Figure 2 Extract from Sectoral Interactions Matrix

This information was gathered by asking (sub)sectoral representatives to populate customised blank interactions matrices with data. Matrices were developed as Excel worksheets and distributed by e-mail. This provided a structured and time-effective means for respondents to provide information on the nature and significance to their sector of interactions with other sectors.

Neutral	Where the activity of the other (sub) sector has no positive or negative influence on your (sub)sector
Competition	Where there is sustainable competition for access to the same resources or areas between the other (sub) sector and your (sub)sector
Conflict	Where conflict arises as a consequence of unmanaged competition between the other (sub) sector and your (sub)sector
Incompatible	Where there is a fundamental and unmanageable incompatibility between the activity of the other (sub) sector and your (sub)sector
Positive	Where the activity of the other (sub) sector has a positive influence on your (sub)sector
	Blank cells indicate no response
Competition	Cross-hatching is used where an interaction may be characterised in one of two ways as indicated by the colours; here competition or conflict. The original designation given to the interaction is shown by the cell text (here, Competition)

Table 1 Definitions and Colour Coding of Interactions Options

One limitation of using an Excel based e-mail survey was the need to gather spatial information on interactions in order to identify both "pinch points" and "gaps" with respect to use of the marine resources of the Firth of Clyde. Hence, a two-stage process was adopted, whereby matrix respondents were invited to participate in a follow up meeting (section 3.4) to enable the project team to develop a greater understanding of the nature, intensity and spatial dimensions of interactions and to explore marine management issues arising from these. In some instances, the phases were combined, with the matrix being completed in the course of a meeting (Appendix 2).

3.2 Identification of Subsectors and Choice of Representatives

3.2.1 Subsectors

For the purposes of the interactions study, each main sector (see section 2.2.2) was subdivided into a variable number of subsectors or activities that might potentially interact with others within the Firth of Clyde. For example, inshore fisheries comprised Nephrops trawl, scallop dredge, demersal trawl, pelagic trawl, longline, creel, dive, and fish processing. Subsectors were identified by the SSMEI Clyde project team in consultation with key members of the project steering group (Appendix 1).

A number of additional interests, such as maritime safety, coastal development, and subsea cables were also included in the interactions study. While these are not encompassed as such by the seven main sectors identified as operating within the Firth of Clyde, they are elements that will need to be considered within the FoCMSP. In all, 73 subsectors or activities were identified at the outset.

3.2.2 Selection of (Sub)Sectoral Representatives and Study Timeframe

Given the strategic nature of the FoCMSP, the consultation was targeted at umbrella bodies within sectors, including business federations, sports associations, central government agencies and major NGOs, rather than at individual businesses, sports clubs or local authorities. Considerable efforts were also made to identify individuals of appropriate seniority within these bodies, who could, ideally, combine strategic understanding of current marine issues and associated regulatory and management regimes with local knowledge of the study area.

No representatives were sought for a number of activities and sectors that are primarily shore-based, but which may nevertheless interact with marine sectors and which were therefore included in the matrix. These included fish processing and tourism infrastructure, as well as general infrastructure developments. Control of such activities falls mainly within the statutory terrestrial planning system; wider consultation with local authorities concerning the interface between marine and terrestrial is ongoing through the SSMEI Firth of Clyde pilot steering group.

Preliminary agreement to participate in the study was obtained by telephone before potential representatives were e-mailed the survey documents (section 3.3). Where no matrix was returned by the requested date (10-14 days after contact), representatives were contacted again by phone or e-mail. Potential respondents were contacted up to four times to seek return of the survey documents. The study was undertaken between the end of June and mid-August 2007. Details of the selected (sub)sectoral representatives and of the data collection schedule are given in Appendix 2.

3.3 Survey Documents

The (sub)sectoral representatives were e-mailed Excel workbooks, comprising a set of instructions, a background questionnaire and a customised blank matrix, together with a set of explanatory notes providing background information on the SSMEI Clyde Pilot and the purpose of the sectoral interactions study. Examples of these documents are in Appendix 3.

The matrix instructions were in the form of a flow chart, incorporating screen shots of the matrix, and were formatted such that they would print off on two sides of A4 paper for ease of reference

when completing the matrix. In addition to the main interactions matrices, representatives were first asked to complete a short background questionnaire that provided information on their organisations and their roles within these bodies.

The blank matrices were customised, such that all 73 subsectors (section 3.2.1) were listed in the rows, but only those of relevance to the potential respondent were included in the columns (Appendix 3). An additional column ("Other") was included to enable respondents to add any additional key subsectors not identified by the project team. Respondents were presented with a choice of five options, as detailed in Table 1, to describe the perceived impact of other subsectors (matrix rows) on their subsectors (as defined in the columns). Drop-down menus were applied to each cell to facilitate option selection. The comments column enabled respondents to elaborate on their choice of options and proved of particular benefit in identifying topics for discussion in the follow-up meetings (section 3.4) and in subsequent analyses. Some limitations of the option choices adopted are discussed in section 4.1.3.

3.4 Follow-up Meetings

The primary purpose of the follow-up meetings was to enable a more in-depth exploration of sectoral representatives' perceptions of interactions. Sectoral representatives were first invited to describe the nature and scale of operation of their (sub)sector(s) within the Firth of Clyde. Spatial information was also sought where appropriate, with respondents being asked to annotate A0 size OS maps of the study area. The second part of the meeting typically focused on the respondent's interpretation of the matrix, to gain further elaboration of comments (e.g. to gauge actual levels of competition or conflict or to gain understanding of existing conflict resolution mechanisms). Any potential misunderstandings of the predefined cell options were also discussed (see section 5.2).

The majority of meetings were recorded, with prior permission, on a digital voice recorder. The recordings were used to enhance and/or correct meeting notes made by the SSMEI project team. Comments relating directly to the characterisation of interactions in the matrix were added to the matrix comments column. The revised matrices and meeting notes were circulated to the representatives involved to check for accuracy before being used in data compilation and analysis.

4 RESULTS: DATA COMPILATION AND GENERAL CHARACTERISTICS

4.1 Data Collected

4.1.1 Response Rate

In total, 34 matrices were sent out, 26 were returned (including four cases where matrices were largely or entirely completed during meetings) and meetings were held with one or more representatives of 21 organisations. In the course of these meetings nine sets of maps were annotated and one additional set was submitted on request by post. Full details are given in Appendix 2.

Perhaps unsurprisingly, given the timing of the consultation in the period following the 2007 Scottish parliamentary elections and resultant change in administration, no responses were obtained from departments within the Scottish Executive dealing with marine consents for cables and pipelines and with strategic issues relating to recreational water quality. The only major sector approached for which no data were returned was naval defence Several smaller recreation (sub)sectors were also under represented, notably jet skiers and surfers; in these instances contacts were self-employed business people.

Conversely, there were a number of sectors for which views were obtained from more than one body e.g. natural heritage management (SNH, MCS and RSPB), leisure boating (CYCA, BMF, Troon Yacht Haven), and recreational diving (SSAC and BSAC).

4.1.2 Composite Matrix

Finalised interactions matrices, including any amendments made during follow-up meetings, were compiled for each sectoral representative. The matrix cells were then colour coded, as detailed in Table 1, to provide a simple visual representation of the nature of perceived interactions. Individual matrices were then combined to produce a master results matrix. This results matrix can be accessed on the project website http://www.clydeforum.org/SSMEI/index.htm (and follow links to the sectoral interactions study from the Marine Spatial Planning page). For clarity of presentation, a single organisation (as indicated in the column headings) was chosen to represent each subsector when compiling the combined matrix. As illustrated in Figure 2, this approach provides an overall picture of the basic interactions data taken from the finalised matrices received from these selected bodies. Reading across a row in the matrix indicates how the given subsector is perceived by other subsectors as interacting with them, while reading down a column indicates how the given subsector perceives other subsectors as interacting with it. The matrix also includes details of the finalised matrix returns from *all* organisations in the form of comments appended to relevant cells. These comments, which can be accessed in the download, provide insights into the main respondents' decisions when characterising interactions and also indicate any differences in perception among various organisations.

4.1.3 Data Limitations

Overall, respondents understood the purpose of the matrix and apparently found it a useful format for characterising interactions. However, some respondents were initially unclear about the underlying concept of the matrix as being intended to characterise their perceptions of the interaction of other (sub)sectors with their own sector. This was particularly problematic with respect to the interactions of natural heritage management, environmental quality management and, to a lesser extent, historic/cultural heritage management with other sectors. In a number of instances respondents presumed that what was being looked for was analysis of how their own sector might impact, for example on biodiversity or water quality rather than their perceptions of how *management* for these interests (e.g. through site designations or application of various water quality standards) interacts with their own sector's activities. Analyses of the comments supplied with the matrices, together with follow-up meetings, were helpful in clarifying any such misconceptions.

Some problems arose from the initial choice of subsectors. For example, within the renewables sector there are fundamental differences between tidal barrage and tidal stream energy capture

projects. The inclusion of the "Other" column in the customised matrices was helpful in identifying such issues and in the course of the study a number of subsectors were added to the original 73.

One of the commonest concerns raised by respondents was that the matrix design and, in particular, the constraints imposed by being forced to select a single category for each interaction, forced the matrix towards an unrealistic "one size fits all" view that failed to capture real life complexities. As shown in Table 1, this was addressed in the composite matrix by using cross-hatching to indicate instances where respondents felt that interactions might fall into different categories depending on specific circumstances (e.g. location, time of year, sensitivity of interests to different impacts). Many of the interactions that subjects found most difficult to characterise when initially completing the matrix were those that subsequently proved of most interest and relevance for discussion during meetings. For example, in some instances, difficulties in assigning interactions to either Conflict or Competition revealed a desire to distinguish theory from practice with respect to the perceived efficacy of existing management mechanisms to address conflicts.

The basic matrix data cannot in themselves indicate the intensity or ubiquity of interactions within the Firth of Clyde. However, in combination with respondents' comments, plus notes and maps compiled during follow-up meetings, they do provide valuable insights as to where attention might most usefully be focused in addressing conflicts or enhancing synergies (see section 7).

4.2 Analyses of Responses

The composite matrix summarises the perceived nature of interactions among sectors. This basic visual representation of the raw data highlights a number of points. Firstly, the majority of interactions are perceived as neutral (53% of cases where an interaction was characterised). Secondly, while a third (33%) of interactions are perceived as *potentially* negative (i.e. Incompatible, Conflict or Competition), the majority (73%) of these are characterised as Competition, implying, as opposed to Conflict (Table 1), that some form of management exists to address them. Overall, fewer interactions were characterised as Conflict or Incompatible (9% of total) than were characterised as Positive (14% of total). Finally, the spread of non-neutral interactions is not evenly distributed through the data set. For example, as might be anticipated, there are a lot of positives associated with lifeboats and coastguards (rows 36 and 37), whereas some other sectors are generally less favourably perceived by others.

This is further illustrated in Figure 3. The position of each named subsector on the Y-axis indicates the percentage of interactions with other subsectors that it perceived as *potentially* negative (i.e. categorised as Incompatible, Conflict or Competition in the matrix). Conversely, the position of each subsector on the X-axis indicates the percentage of interactions with it that were perceived as potentially negative across all the other named subsectors. Only those subsectors where more than 45 interactions were characterised in both directions (i.e. in both relevant rows and columns in the final composite results matrix) were included. This excludes subsectors from which no responses were solicited (e.g. coastal development), or received (e.g. naval defence), or which were amended or added to the matrix after the main consultation period (e.g. tidal barrage/tidal stream).

This presentation highlights a number of characteristics of the data set. Firstly, the position of subsectors on the plot is indicative of their overall levels of potentially negative interactions. For example, there are several (sub)sectors, sitting in the upper right area of the graph, which both perceive themselves (y-axis), and are perceived by others (x-axis), as being associated with relatively high frequencies of potentially negative interactions. These include: mariculture industries (salmon and shellfish); management for various marine nature conservation interests (birds, intertidal, seabed); sewage and rubbish disposal; trawl or dredge fisheries (scallop dredge, Nephrops trawl, demersal trawl); and, shipping.

Conversely, sectors sitting at the bottom left of the graph were perceived both by themselves and others as having few potentially negative interactions associated with them. These include:

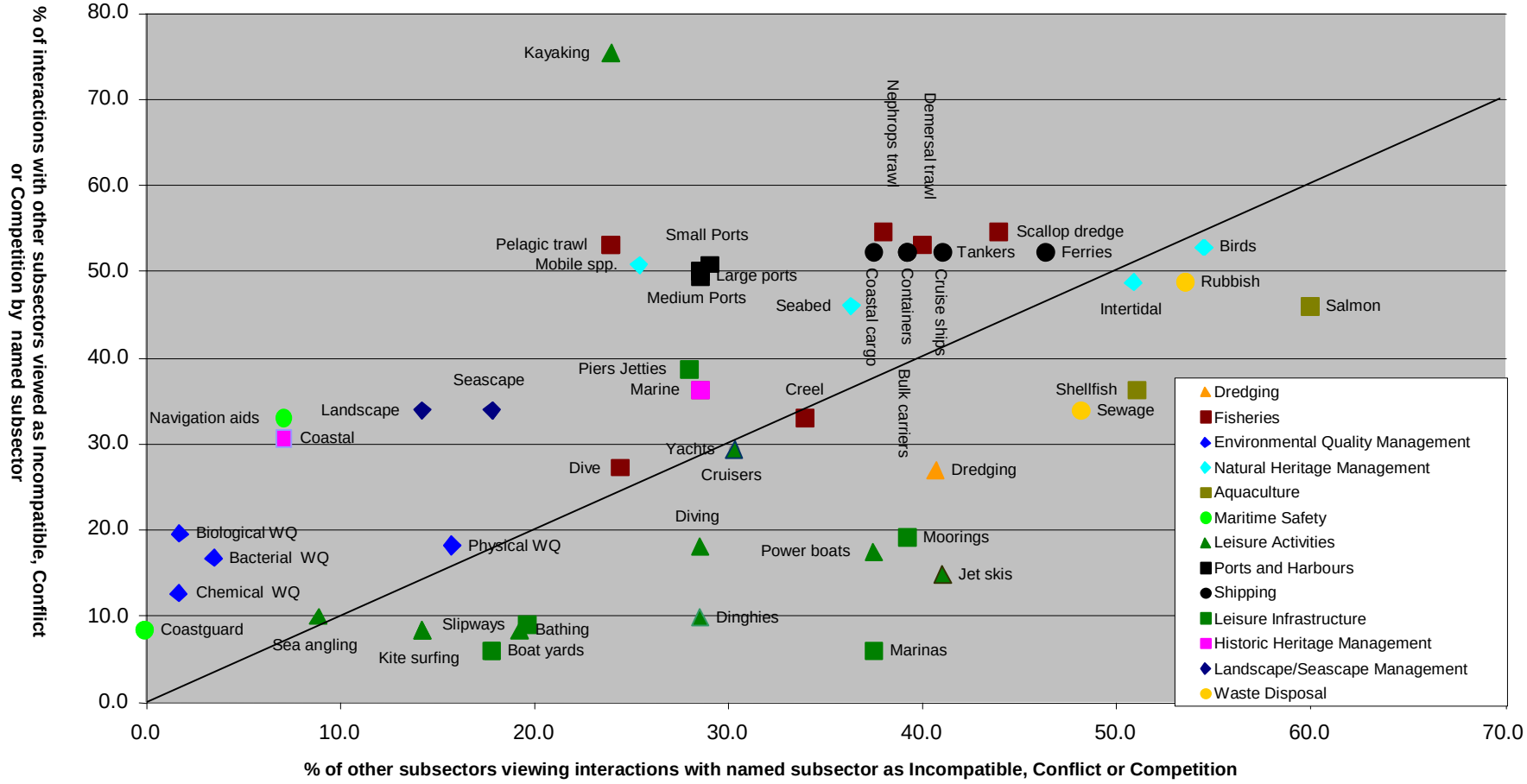


Figure 3 Frequencies of Potentially Negative Interactions between Subsectors

maritime safety (coastguard); environmental quality management (chemical WQ, bacterial WQ, biological WQ, physical WQ); several primarily coastal recreation interests (sea angling, kite surfing and bathing); and, the presence of slipways and boatyards.

Secondly, the plot reveals disparities between subsectors in their perceptions of interactions with other subsectors. Subsectors lying above and left of the diagonal line perceive more potentially negative interactions with other subsectors than other subsectors perceive as arising from them. For example, while only 24% of other subsectors regard interactions with sea kayakers as Incompatible, Conflict or Competition, sea kayakers perceive 74% of interactions with other subsectors in this way. Similar disparities are apparent for management of landscape and seascape, trawl fisheries, historic heritage management, ports, and environmental quality management.

Conversely, some subsectors perceive substantially fewer potentially negative interactions with other subsectors than are in turn associated with them. For example, 38% of interactions with marinas are seen as Incompatible, Conflict or Competition, while marinas perceive only 6% of interactions with other subsectors in this way. Mariculture and various recreational activities (e.g. jet skiing, power boating, kite-surfing, dinghy sailing, and recreational diving) are similar in this respect. Note that the further a point is from the diagonal line, the greater this overall discrepancy in perceptions.

It may be seen, from Fig 3, that (sub)sectors vary considerably in the extent to which they may potentially compete or conflict with the interests of other (sub)sectors operating within the Firth of Clyde and also that perceptions of such potential varies among the affected (sub)sectors. The underlying reasons for such variations in perceptions may perhaps arise from a number of factors, such as: the relative vulnerability of different interests to impacts from other activities (e.g. it is perhaps not surprising that kayakers are more concerned by the presence of other larger vessels than *vice versa*), or from the extent to which activities are relatively localised (e.g. kite-surfing, dinghy sailing) as opposed to more widespread in scope (e.g. trawl fisheries, natural heritage management), or from the degree to which activities are currently regulated (e.g. concerns among biodiversity conservation interests about disturbance impacts on wildlife associated with leisure craft).

However, it is important to remember that potentially negative interactions cover a very wide range of actual situations, ranging from very low intensity managed competition, perhaps confined to one or two locations, to widespread and intense unmanaged conflict or fundamental incompatibilities. Again the kayaking example is relevant here; while there is considerable *potential* for other subsectors to have a negative impact, there are in practise very few instances where such potential has been realised (R. Mather, SCA). Similarly, the level of potential for negative interactions does not necessarily correlate with the ease or difficulty of managing such interactions.

5 SUMMARY OF KEY INTERACTIONS BY SECTOR

This section provides brief summaries of key interactions among and within sectors, for each of the six main sectors for which forward sectoral plans will be prepared, namely:

- inshore fisheries
- mariculture
- shipping and transport
- recreation and tourism
- management of environment and heritage
- renewable energy

The text is drawn from a series of more detailed descriptions of interactions for each of the main sectors (Appendix 4). The stand-alone documents in Appendix 4, which also consider the potential role of the FoCMSP with respect to each sector, will inform the development of sectoral plans and their subsequent integration into the FoCMSP.

Following on from the summaries below, section 6 examines cross-cutting thematic aspects underlying perceived interactions and section 7 examines the potential role, and limitations, of the FoCMSP in addressing potential conflicts.

5.1 Inshore Fisheries

5.1.1 Sectoral Perceptions

Many of the inshore fisheries sector's perceptions of interactions arise from a wider cultural perception of the rights of fishermen to fish common stocks wherever they wish, without impedance from other interests. Hence, there is concern, particularly among trawl fishermen, about any developments, such as marine energy capture devices, fish farms, leisure moorings, or creation of protected areas for natural or historic heritage interests, that might restrict access to fishing grounds. There are also ongoing conflicts within the sector between static and mobile gear fisheries.

Current mechanisms for management of potential collision risks between fishing and other vessels (including naval craft) are seen as effective. Continued affordable access for fishing boats to ports, harbours, jetties and slipways is identified as important to the industry.

5.1.2 Perceptions of Other Sectors

Perceived conflicts with fisheries arise mainly from concern about damage to natural and historic heritage interests through trawling or dredging of the seabed and potential depletion of target or non-target stocks.

5.2 Mariculture

5.2.1 Sectoral Perceptions

Both the marine finfish and shellfish farming industry representatives perceived relatively high levels of potential conflict with other sectors. These stemmed largely from three underlying concerns, namely: maintenance of high water quality, particularly at near shore sites with relatively low flushing rates; access to suitable locations, free of disturbance from other users, both at sea and on the coast; and, potential of noise and vibration from other activities to cause stress and ill-health in salmon.

The discharge of untreated sewage, oil, chemical pollutants, diseases or non-native species from vessels, potential interference with routine operations by leisure users of the water space and dredging works for whatever purpose were seen as potentially damaging to mariculture interests.

With respect to access to suitable locations, particular conflicts were identified with trawl fisheries, while guidance on management for landscape and seascape was perceived as based on somewhat subjective criteria.

Potential synergies were identified with development of marine renewables and coastal power stations and also with growth of marine leisure facilities, where accompanied by improved availability of specialist services such as marine engine repair.

5.2.2 Perceptions of Other Sectors

A number of sectors, notably inshore fisheries, leisure boating and recreational divers identified potential competition with mariculture for access to marine space. Commercial shipping interests also saw access to sheltered bays as a potential source of competition, while the renewable energy sector identified potential competition with respect to offshore wind and tidal barrage schemes. Some concerns were also raised by other interests about maintenance of good practice within the mariculture industry, for example removal of gear such as mooring cables when sites are no longer in operation.

Other concerns arose with respect to the impacts of salmon farming on water quality, biodiversity and amenity values. Regulators and statutory advisers generally perceive these as being managed through existing consents procedures for mariculture developments. However, a number of commercial and leisure interests perceive ongoing conflict with respect to impacts on biodiversity and amenity.

5.3 Shipping and Transport

5.3.1 Sectoral Perceptions

The main concern for the shipping and transport sector is the safe navigation and passage of vessels (commercial, naval, pleasure and fishing) through the Firth. The industry itself perceives that competition within the Firth of Clyde for navigation rights is generally adequately managed, through international agreements (e.g. International Regulations for Prevention of Collision at Sea) and local measures, principally ClydePort byelaws and the Marine Safety Committee. However, particular concerns arise with respect to jet skis, which are not governed by the same legislation as other craft.

The sector also identified some areas of conflict over access to marine space, mainly with respect to renewables, where it is perceived that existing consents mechanisms do not enable adequate consultation on the needs of the commercial shipping industry.

5.3.2 Perceptions of Other Sectors

Overall the majority of potentially conflicting interactions with commercial shipping and ports interests were perceived as managed through various mechanisms. However, some areas of potential conflict were identified, particularly with respect to perceived threats of pollution from chemical (oil) spillage or the introduction of invasive species from ballast water. Safety issues were also identified with respect to wash from ferries affecting other users of slipways. More generally, there is potential for complex interactions between issues such as availability of suitable access points to water for interests such as sea kayakers and their exposure to potentially dangerous interactions with other users such as ferries or commercial shipping.

Dredging operations, including disposal of dredge spoil, associated with maintenance of navigation channels and ports are seen as a source of conflict with a number of interests, because of their impacts on water quality and/or natural heritage features. While the ports sector perceives current mechanisms for managing dredging impacts as being highly bureaucratic, environmental regulators and advisers identified a number of gaps in current provisions for regulation, for example with respect to WFD compliance and safeguard of unscheduled marine archaeology

Possible future land reclamation for ports developments is also perceived as a major threat by natural heritage conservation interests.

The presence of smaller ports was seen as beneficial to interests such as fisheries and leisure craft, although there is potential for competition for access.

5.4 Recreation and Tourism

5.4.1 Sectoral Perceptions

At present, the marine leisure sector is relatively little regulated and there is concern among participants across many different pursuits to maintain a culture of individual freedom to pursue activities without imposition of additional regulation. In this context, some marine leisure sectors, notably leisure boating, are using voluntary initiatives such as The Green Blue to address potential concerns among other sectors.

Given current levels of activity within the Firth of Clyde, there is general agreement that existing mechanisms, such as the Harbour Master, ClydePort byelaws and the work of District Safety Committee, are sufficient to manage any potential conflicts among different interests within the sector as a whole, without the need for initiatives such as zonation of beaches. However, some interests, such as sea kayakers, are perhaps inadequately represented within current management fora for the Firth of Clyde.

Any impedance to navigation e.g. through creation of tidal power barrages was identified as a threat to leisure boating while marine litter and unmarked fishing gear floats have potential to damage leisure craft. Wash from other vessels, including ferries and naval craft, was identified as a potential safety and/or nuisance factor e.g. for kayakers, moored leisure vessels, and for people on slipways.

Provision and maintenance of sufficient suitable access points, especially publicly accessible slipways/beaches with adjacent car parking, is a key concern for a number of sectors, including kayaking, scuba diving and kite surfing. Current consents procedures for operations such as dredging associated with marina development are perceived as very bureaucratic.

Recreational divers are concerned by activities such as dredging, salmon farming and trawling that may damage seabed habitats while sea anglers perceive trawl fishing, and associated discarding, as damaging to stocks of sport fish. Sea kayakers have particular concerns about impacts of renewable energy or mariculture developments on marine amenity and about poor water quality in the Clyde estuary.

5.4.2 Perceptions of Other Sectors

Natural and historic heritage conservation interests expressed concern over impacts of dredging and land claim operations associated with construction of marinas and about seabed footprint of moorings if located in sensitive areas. The potential for leisure activities to cause disturbance to wildlife was a more general concern.

Leisure moorings and anchorages are seen as incompatible or conflicting with trawl fisheries and mariculture. However potential synergies were perceived between expansion of marine leisure sector, with associated opportunities for specialist businesses such as marine engine repair, and sectors such as inshore fisheries and mariculture. The marine renewables sector also identified possibilities for incorporation of microrenewables into marina developments.

Potential water quality impacts of leisure activities, e.g. through discharge of untreated sewage from leisure craft, are of concern to mariculture, especially shellfish growing, interests and to environmental regulators. Jet skis and small power boats were identified as posing safety risks and generating nuisance for a range of other interests including kayakers, divers, creelers and shipping.

5.5 Management of Environment and Heritage

5.5.1 Overview of Perceived Interactions

Management for safeguard of natural heritage interests, including attainment of physical and biological environmental quality standards under WFD, is a major source of potential conflict with a number of other interests within the Firth of Clyde. In the absence of site designations in the subtidal zone and their virtual absence, with the notable exception of the Inner Clyde SPA, in the intertidal zone, such potential conflicts arise principally in the context of consents procedures, and related processes such as EIA, associated with individual applications for developments. In this context, concerns among conservation agencies, NGOs and environmental regulators about potential damage to ecosystems, sensitive habitats and species, and landscapes/seascapes are mirrored by converse concerns from commercial interests such as ports operators and marine leisure interests over perceived barriers to development, with land claim or dredging operations being a particular focus of contention (UK CEED, 2000). There is a perception that some restrictions imposed for reasons of natural heritage conservation, environmental management or safeguard of landscape/seascape may be rather *ad hoc* in nature.

Another generic issue of concern to nature conservation interests, particularly with respect to breeding or wintering waders and wildfowl, is that of disturbance associated with commercial or residential developments and with pursuit of leisure activities on, or near, the shore. Large mobile species such as cetaceans may also be directly disturbed by commercial or leisure vessels, especially powerboats or jet skies, or by sonar devices.

Interactions with mariculture developments are, however, generally perceived as competitive in nature and adequately managed through existing consents procedures and voluntary initiatives such as Area Management Agreements. The impact of the transfer of planning control for fish farms to Local Authorities in April 2007 has yet to be evaluated.

Anxieties among the mobile gear fishing sector about possible future restrictions on their activities for reasons of safeguard of natural heritage or marine archaeological interests mirror concerns among environmental protection and natural and historic heritage interests about the potential impacts of such fisheries on seabed habitats, commercial species, other mobile species taken as bycatch, marine food chains and historic artefacts.

With respect to shipping, nature conservation interests expressed concerns about the adequacy and enforcement of international regulations intended to address pollution risk, including potential introduction of alien species in ballast water. Both shipping and nature conservation interests indicated that absence of locally based consultation on potential impacts of their activities was an issue within a confined area such as the Firth of Clyde.

Management for bacterial and chemical water quality is generally less contentious, and generally viewed as competitive in nature, with many interests themselves identifying high water quality as important. As a corollary, groups such as kayakers, divers and fish farmers view sewage disposal as a conflicting activity. Leisure boating interests are resistant to further regulation and are working to address concerns surrounding pollutants, sewage waste and rubbish disposal from leisure craft through a voluntary initiative.

With respect to management of historic heritage, current statutory mechanisms for managing potential conflict do not apply to unscheduled sites below MLWM, other than with respect to aquaculture developments where local authorities now have planning control. Potential impacts on unscheduled archaeology (which includes the vast majority of wrecks) in the subtidal zone are covered only by a voluntary code of practice for seabed development (P. Robertson, HS).

5.6 Renewable Energy

5.6.1 Sectoral Perceptions

The renewable energy sector is aware of potential conflicts of interest with other interests, particularly with respect to navigation or access (e.g. for sports divers) and impacts on natural heritage and landscape/seascape, but perceives such conflicts as being manageable through consultation and application of existing consents procedures. The sector also identifies potential for synergies with others either through incorporation of generation capacity into structures such as ports, marinas and fish farms or through sharing of technologies and facilities, such as work vessels for servicing offshore structures.

5.6.2 Perceptions of other sectors

Several sources of concern were identified with respect to potential development of renewables. The first was potential restriction of navigation or access for fishing vessels, shipping, larger leisure craft and divers. Renewables were also identified as having potentially damaging effects on natural heritage interests or fish stocks either directly through development footprints or through indirect effects such as alteration to current flows; in this context tidal barrages may conflict with management of intertidal habitats. Potential aesthetic impacts are of concern to landscape/seascape advisers and to interests such as sea kayakers concerned by "industrialisation" of the marine area, while sports relying on waves are concerned by any potential diminution in wave energy. Sea anglers identified creation of artificial structures with restricted access as potentially beneficial to some fish stocks

6 UNDERLYING THEMES AND EXISTING MANAGEMENT

In order to evaluate the potential of the FoCMSP to resolve conflicts among sectors, it is useful to examine the underlying causes of perceptions of potential conflicts. Analysis of comments appended to matrices and notes from meetings suggested that perceptions of *potentially* negative interactions (i.e. Incompatible, Conflict or Competition in the results matrix) between (sub)sectors arise from three main themes, within which various subsidiary issues may be identified, as set out below:

Theme 1: Competition for use of marine space

- (Sub)sectors seeking (permanent) use of same areas of sea(bed)
- Navigation issues: use of marine area may impede navigation through area by other users
- Access issues: use of marine or coastal space may restrict access for other users, especially between shore and sea

Theme 2: Safety issues

- General e.g. wash from vessels endangering other users
- Risk of collision between vessels

Theme 3: Use of and impacts on resources

- Direct: (sub)sectors targeting same resources
- Indirect: activity of one (sub)sector potentially detrimental to resources utilised or safeguarded by another (sub)sector. Such impacts various, but include:
    - Pollution e.g.:
        - contamination of water column or seabed
        - litter
        - noise
    - Disturbance
    - Damage to infrastructure or equipment

The interactions characterised in the composite results matrix as Incompatible, Conflict or Competition are assigned to these various themes in Figure 4.

6.1 Competition for Use of Marine Space

Direct competition for use of marine space is the most common theme underlying perceived *incompatibilities* between sectors (Figure 4). One example is the closure of certain areas to all other uses for naval defence purposes. However, this appears to be generally accepted as a *fait accompli*, and, given the closure of such areas to fisheries is regarded by biodiversity conservation interests as potentially positive. As detailed in section 5.1, there are also perceived incompatibilities over use of space between mobile gear (trawl or dredge) fisheries and marine fish farms or the presence of leisure moorings. These reflect a wider cultural perception of rights to fish common stocks without impedance from other interests. In the Firth of Clyde, these other interests also include the Nephrops creel fishery (see section 5.1.1). Currently, within the Firth of Clyde, there is relatively little regulation of commercial fishing activities at a local level but it is anticipated that the proposed Clyde Inshore Fisheries Group (IFG), (Scottish Executive, 2005), will be the main mechanism through which ongoing conflicts of interest both within the inshore fisheries sector and externally with other sectors will be addressed.

6.1.1 Anchorages, Navigation and Access

There are various perceptions of competition, conflict or even incompatibilities between mariculture and leisure boating interests, focused around navigation and access to anchorages and moorings (Figure 4), e.g. *"recreational vessels and finfish aquaculture installations have for decades competed for sheltered waters with easy shore access. Sometimes…a lease [is awarded] in conflicting circumstances, this leads to ongoing conflict, and potential navigational hazard"* (M. Balmforth, BMF).

Commercial shipping interests also identify sheltered bays as key assets (I. Treblinski, UKCoS) and various degrees of concern were also expressed over potential conflicts with navigation that might arise from any development of marine renewables, particularly tidal barrage schemes.

In this context, the Clyde Moorings Committee has been proactive in working with the Crown Estate to map and classify existing anchorages to inform Section 34 CPA decisions on applications for new moorings and other developments that might potentially impede navigation, including access to popular anchorages.

Access from the shore to the sea is a key issue for interests such as kayakers, divers and sea anglers, who see the presence of infrastructure such as public slipways and car parks adjacent to shallow beaches as positive. These groups share concerns over loss of former access points as well as frustrations over their requirements being overlooked when coastal areas are (re)developed. Bodies such as the SCA are engaging with Local Access Forums, established within each local authority area under provision in the Land Reform (Scotland) Act, 2003, to address issues around access to existing slipways (R. Mather, SCA). However, promoting the provision of new infrastructure, such as slipways or piers for such interests may be problematic as such infrastructure straddles terrestrial planning and marine consents systems.

6.2 Safety and Management of Leisure Activities

Unsurprisingly, maritime safety is perceived as a key issue by many sectors. Multiple mechanisms, from international agreements on maritime navigation (e.g. IRPCS) and safety (e.g. SOLAS) to local agreements are in place to address safety issues around movements of commercial vessels, including fishing boats, and naval vessels. However, maritime recreation is a largely unregulated activity (Southall, 2005), and there is no legal requirement for skippers to undertake any training other than in use of VHF radio. Lack of familiarity with the IRPCS "rules of the road", including understanding of the Flag Alpha system used to indicate the presence of divers in the water, can lead to incidents (W. Speirs, MCA).

Generally within the Firth of Clyde, local mechanisms, principally the local District Marine Safety Committee and Clyde Port byelaws, are used to address potential conflicts arising from the admixture of leisure interests with commercial shipping and ports, ferries, fisheries and naval use. Despite some localised ongoing issues, for example around jet skis, these mechanisms are generally perceived as working well, e.g. "*interactions between the sailing community and the ports and shipping operators are well managed on the Clyde via the Marine Safety Committee, chaired by the Clyde Port Harbourmaster and run by MCA*" (D. McLaren, CYCA), and, "*there is a harmonious relationship between recreational boaters and the port authority*" (M. Balmforth, BMF).

However, this situation is to a considerable extent attributable to the rather unusual situation in the Firth of Clyde, whereby port operations over much of the area, including those parts of the Firth most intensively used for recreational boating, are controlled by a single harbour authority, ClydePort (Fig. 5), which has been proactive in establishing harmonious working relationships with other interests. Elsewhere in the Firth the situation is more fragmented, with a number of smaller port authorities covering limited areas (e.g. Campbeltown and various Caledonian MacBrayne ferry terminals).

Figure 5 Extent of Clyde Port's jurisdiction within the Firth of Clyde
(taken from Clyde Port website www.clydeport.co.uk)

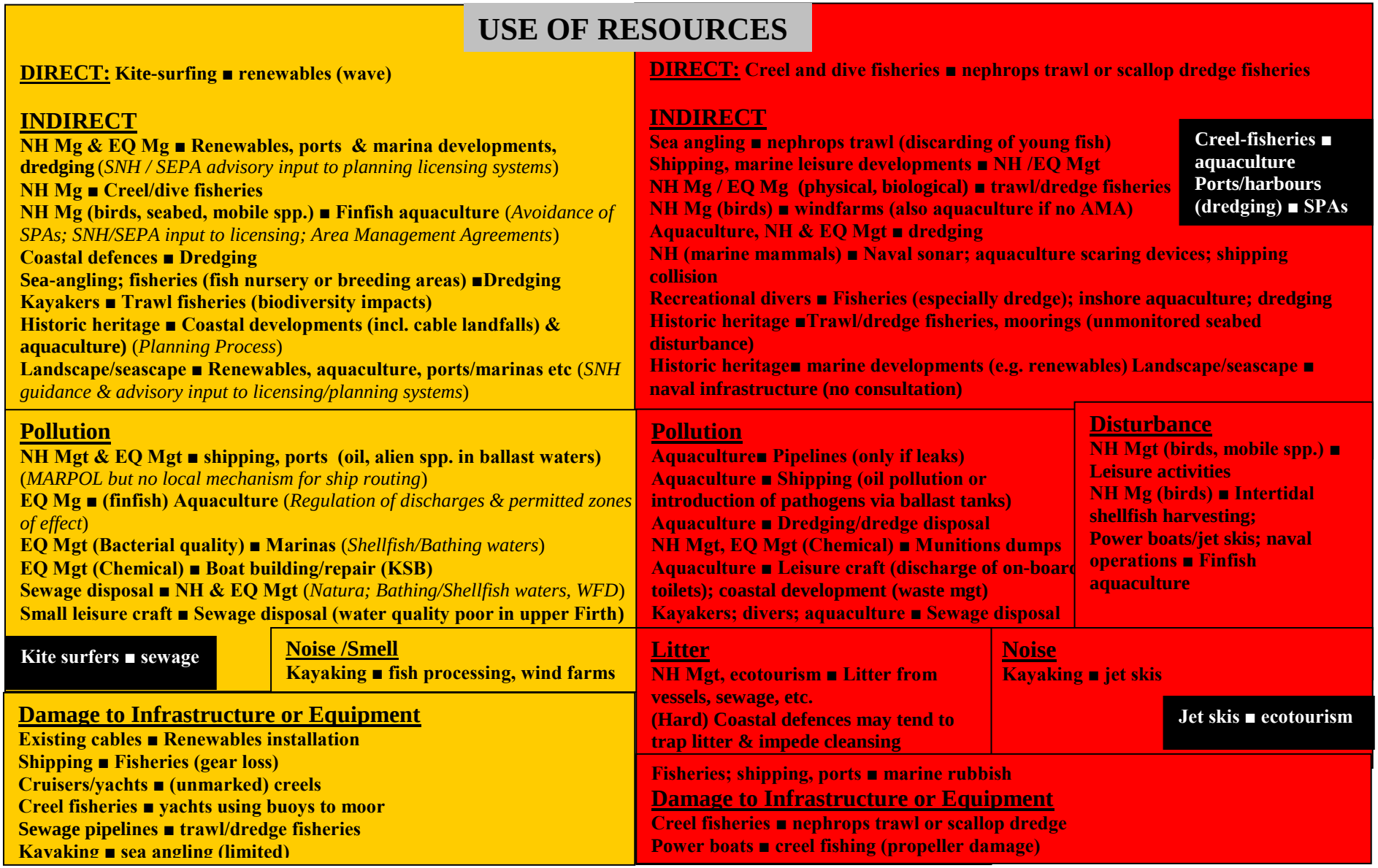
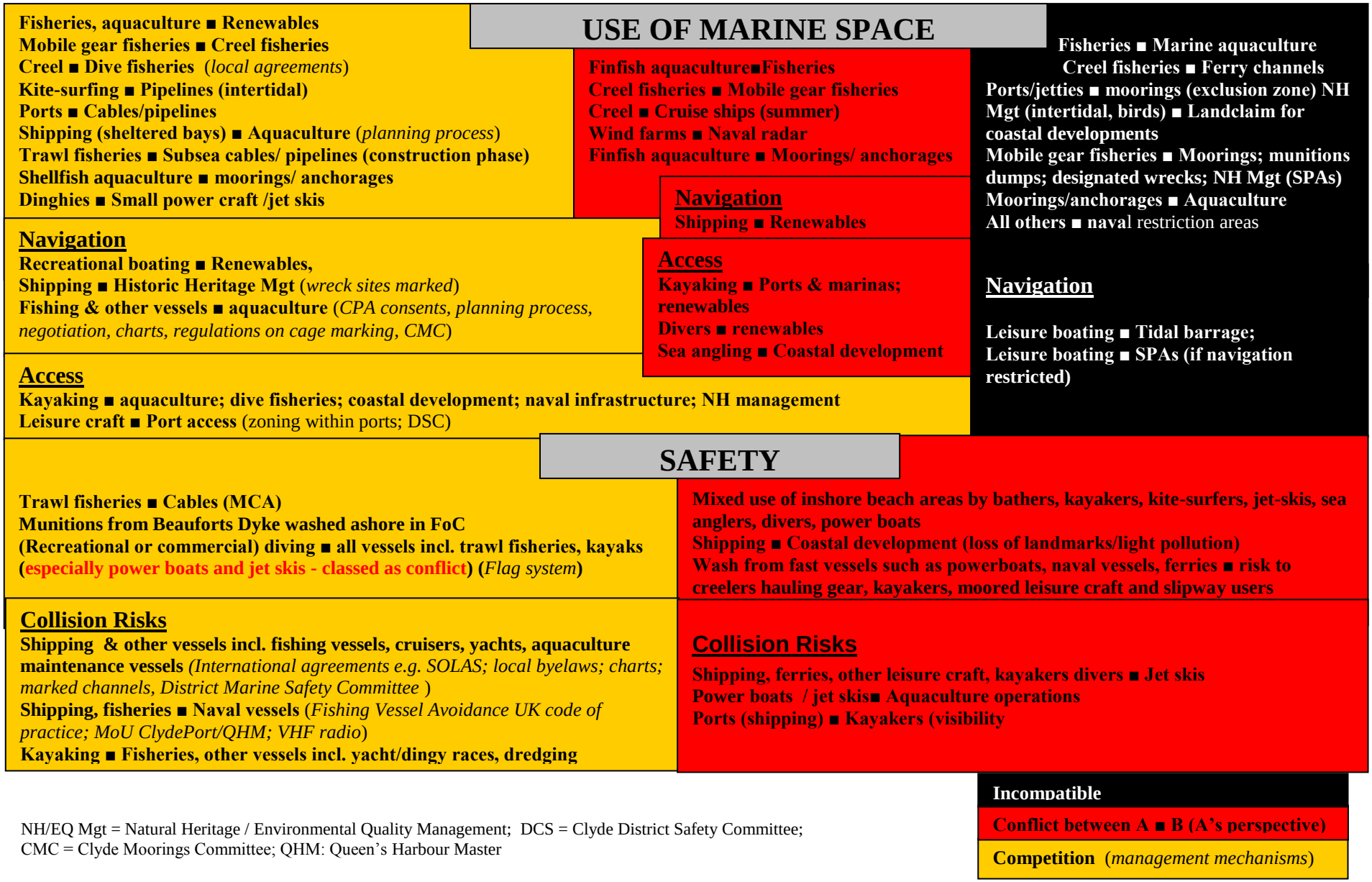


Figure 4 Issues underlying perceptions of negative interactions between sectors

Indirect Interactions: activity of one subsector potentially detrimental to resources used or safeguarded by another.

Figure 4 cont. Issues underlying perceptions of negative interactions between sectors



NH/EQ Mgt = Natural Heritage / Environmental Quality Management; DCS = Clyde District Safety Committee; CMC = Clyde Moorings Committee; QHM: Queen's Harbour Master

This raises the question as to how robust current arrangements are, particularly if there should be future changes in either commercial direction, or indeed key personnel within the main port authority. More generally, sectors such as kayakers, divers and kite surfers are not represented in these fora and there is particular potential for conflict between various leisure users in the near-shore environment, particularly around popular beach areas.

However, while bodies such as MCS and KSB advocate zonation of busy beaches and the sea approaches to them, the general perception among both leisure users and the MCA in the Firth of Clyde, is that current levels of use are sustainable without need for more formal management.

6.3 Impacts on Resources

6.3.1 Natural Resources

Perceived conflicts around indirect interactions between sectors are particularly focussed on management of natural heritage interests (Figure 4), as detailed in section 5.5. Marine developments within the Firth of Clyde are subject to the same consenting and licensing processes as apply elsewhere in Scotland. With the exception of aquaculture developments, these are primarily through CPA and FEPA. Developments such as marinas that straddle marine and coastal areas will also be subject to controls under the terrestrial planning system. This study did not explicitly examine the actual workings of these systems within the Firth of Clyde, although it did indicate that they are perceived by developers to be very time-consuming and bureaucratic, e.g. *"current management framework [for managing potential conflict between nature conservation interests and development of facilities such as marinas] is problematic"* (M Balmforth, BMF).

The Crown Estate has also highlighted these issues with reference to a case study from Wales where the processes of considering an application for a controversial marina development have taken over seven years without final resolution (Crown Estate, 2006).

Conversely, SNH's role as an advisor (rather than regulator) means that its authority to affect decision making is limited; hence the perception that interactions may be competing or conflicting, depending to some extent on the degree to which such advice is weighted in final decision making. The degree of involvement by voluntary conservation bodies in the consenting process for marine developments is also much less developed than is the case for terrestrial developments covered by the Town and Country Planning system (Z. Clelland, RSPB).

6.3.2 Water Quality

Regulation of activities for management of bacteriological or chemical water quality is generally perceived as less contentious than management of biodiversity interests *per se*, although under WFD classification of water quality is partially determined by ecological indicators, such as invertebrate biodiversity. Further, the inclusion in WFD of morphological (including seabed sediments) quality elements may potentially generate future conflicts with other interests including trawl fisheries and developers, particularly if and when regulation of dredging under FEPA is made WFD compliant.

6.3.3 Litter and Disturbance

Marine litter is viewed as problematic by many users, both in terms of aesthetics and of potential damage to property, such as boat propellers, or injury to wildlife. The issue of sewage related litter might potentially be addressed through various practical measures surrounding discharges from treatment works (C. Duncan, MCS), and the Green Blue Initiative aims to discourage dumping of rubbish by leisure craft. However, there is a perceived absence of effective (local) mechanisms to address litter from other sources.

Another issue, which is at present substantially unregulated, is the potential disturbance of sensitive species (e.g. breeding shorebirds) and habitats by recreational users (UK CEED 2000).

Powers are available to SNH under the Nature Conservation (Scotland) Act 1994 to enact byelaws for restriction of access to designated sites for protection of their interests, but these have not been used in practice, with an emphasis instead on education through statutory initiatives such as the Scottish Outdoor Access Code and Marine Wildlife Watching Code (UK CEED, 2000). Groups such as kayakers see themselves as *"low impact"* users of the sea and shore and are resistant to any access restrictions unless these are seen to be "sensible" and of limited area and duration (R. Mather, SCA). Similarly, sport divers are opposed to access restrictions on grounds of natural or cultural heritage interest, e.g. *"Well managed marine ecosystem will improve the quality of diving, as long as it does not result in areas being closed to divers"* (S. Calderan, BSAC).

6.3.4 Historic Heritage

The study highlighted a lacuna whereby, with the exception of aquaculture developments, current statutory development consents mechanisms do not apply to unscheduled sites of historic interest below MLWM. Hence, potential impacts on such assets in the subtidal zone are currently covered only by a voluntary code of practice (P. Roberston, HS).

7 POTENTIAL ROLE AND LIMITATIONS OF THE FOCMSP

7.1 Potential Role of the FoCMSP in Addressing Sectoral Conflicts

The potential for conflicts among sectors in the Firth of Clyde is anticipated to increase in the coming decade, particularly given current trends in the marine leisure (A5.4.1) and commercial shipping (A5.3.1) sectors. Figure 7 is a summary schematic representation of the potential role of the FoCMSP in addressing such sectoral interactions in the Firth of Clyde and its relationship to various other existing or proposed management fora and mechanisms (section 6). It illustrates the potential of the marine spatial planning process to assist various key fora, such as the proposed Clyde Inshore Fisheries Group (IFG), local River Basin Management Planning Area Advisory Groups and Clyde District Safety Committee, in the delivery of their remits with respect to conflict resolution around issues such as navigation and fisheries rights, water quality management and maritime safety. The FoCMSP will also support decision making by regulatory bodies under existing consents procedures contained, for example, within CPA and FEPA.

There are a number of generic aspects of the FoCMSP that are anticipated as assisting regulators, resource users and developers, and the various management fora. Firstly, the bringing together of (spatial) information on key aspects of the environment and usage of the Firth of Clyde as a whole will facilitate a strategic approach to the management of key resources and associated activities (but see section 7.2). More specifically, the sectoral interactions study has highlighted the potential conflicts that may arise between natural heritage conservation and other interests in the absence of a strategic overview of local and national biodiversity conservation priorities within the subtidal areas of the Firth of Clyde. The SSMEI Clyde Pilot is attempting to address these difficulties by commissioning projects to produce an indicative seabed habitat map for the Firth and also to collate and map existing data on priority marine habitats and species across the Firth of Clyde. The outputs of these projects will be incorporated as GIS layers within the FoCMSP to provide a strategic overview, insofar as data limitations permit, of marine natural heritage interests within the Firth. This will assist relevant agencies both in the development of generic policies for the safeguard of priority conservation interests and in the operation of consents procedures with respect to specific developments. Other aspects that this study has identified as appropriate for inclusion in the overview of resources and assets includes the locations of moorings and anchorages, (as previously compiled by the Clyde Moorings Committee) and poor weather refuge sites for shipping.

Secondly, the identification and communication, within sectoral plans, of the Firth-wide aspirations of key sectors for the coming 5-20 years will assist in the identification of potential future pinch points (e.g. over navigation and access in the light of the expansion of the marine leisure sector) or synergies (e.g. with respect to renewable energy generation at aquaculture sites) among potentially competing interests. This will enable the development, within the FoCMSP, of strategic approaches to meeting key resource requirements for all sectors while minimising potential conflicts and maximising positive interactions. Such consideration of future resource requirements may also potentially be informed by constraints mapping (e.g. with respect to technical feasibility of development of offshore wind or tidal stream devices).

Thirdly, the FoCMSP will include policies concerning provision of shore based infrastructure, such as ports, harbours, marinas, and slipways, which recognise the key strategic importance of access between sea and land for a range of potentially competing users including ships, ferries, fishing vessels, leisure craft and support vessels for the mariculture or renewable energy sectors.

The sectoral interactions study also highlighted a number of sector-specific issues that might potentially be addressed within the FoCMSP e.g. through demarcation of coastal zones within which terrestrial planners would be advised to consider the navigational implications of the lighting of developments and to consult with the relevant port authority.

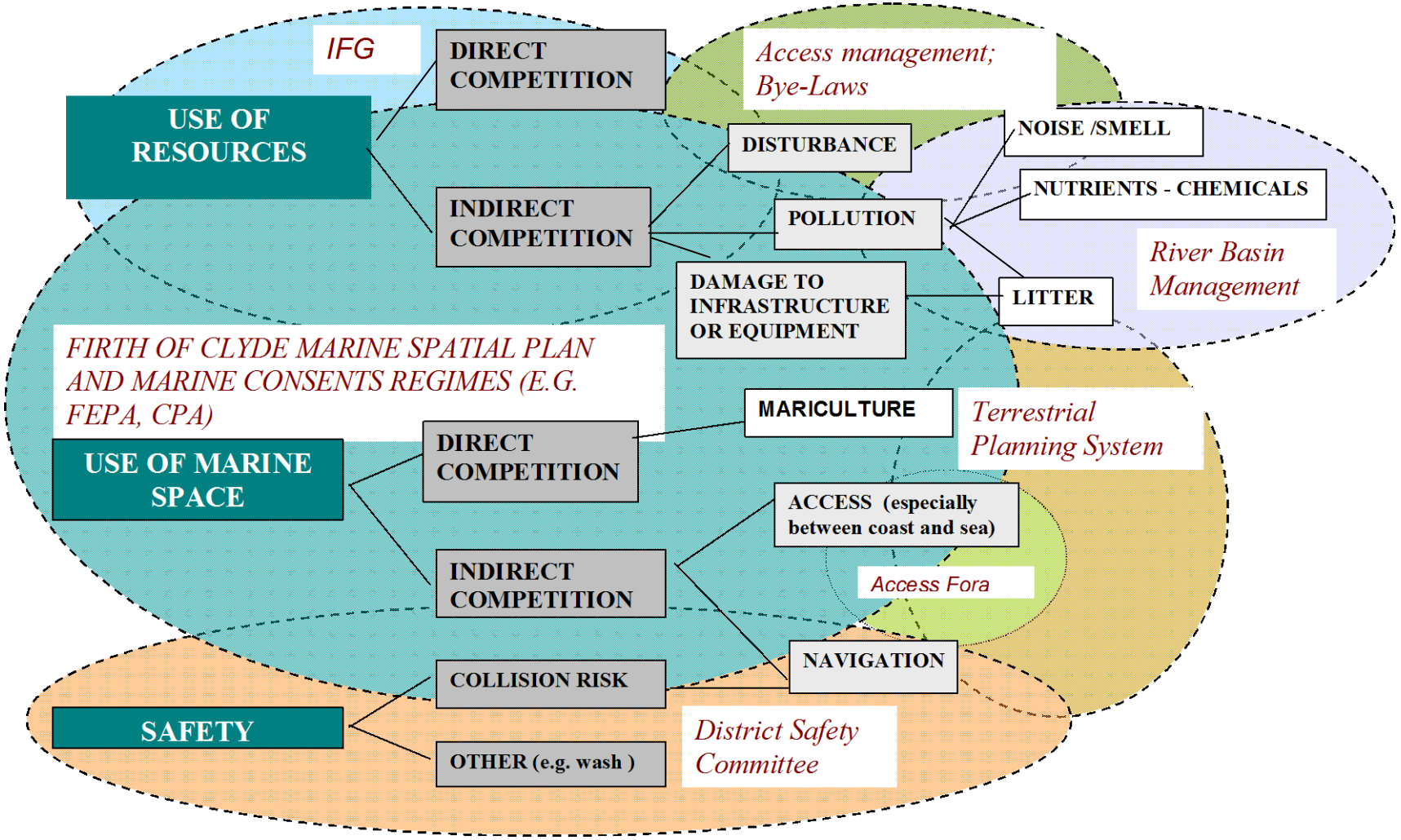


Figure 7 Issues underlying Perceptions of Potentially Negative Interactions among Sectors in the Firth of Clyde and Potential Management Mechanisms

7.2 Limitations of the FoCMSP

The extent to which the FoCMSP can identify geographic areas of potential conflicts among sectors (e.g. pinch points for navigational access) is critically dependent upon availability of spatial data, at an appropriate resolution, on locations and relative intensities of usage of marine and coastal space by different interests. For some sectors, notably use of water space by various recreational interests, no systematic data are collected, although (sub)sectoral representatives have identified some key areas of interest to their various activities. For some other sectors, notably inshore fisheries and shipping, systematic data on intensity of use across the Firth of Clyde are collected but are not in the public domain and are currently unavailable to the SSMEI Clyde project.

Following from the above, there is no capacity within the resources allocated to the development of the FoCMSP to enable a strategic overview to be prepared with respect of marine historic heritage interests, along the lines of English Heritage "Seascapes" programme, which was first applied within the context of the Irish Sea MSP pilot (MSPP Consortium, 2005b). This is of particular concern with respect to activities such as dredging and bottom fisheries that may potentially damage seabed features of historic interest.

Similarly, there is no provision of resources within the SSMEI Clyde Pilot to enable the preparation of a strategic assessment of landscape/seascape carrying capacity for mariculture or other (e.g. leisure-related or marine renewables) developments across the Firth of Clyde. However, this aspect will be examined within the SSMEI Sound of Mull Pilot (S. Benfield, pers. comm.)

There is limited scope for the FoCMSP to address issues arising from marine litter for inshore fisheries, shipping and transport, recreational boating, tourism and others However, the Plan will identify marine litter as an issue and will seek to promote systematic monitoring to assess scale of the problem in the Clyde and, if possible, to determine, probable origins of marine waste in order to inform future management.

Similarly, disturbance, while potentially damaging to natural heritage interests, is generally difficult to quantify or address at a strategic level. The management of disturbance impacts may require specific actions (e.g. promotion of the Marine Wildlife Watching Code among trainee yacht skippers, rerouting of paths to reduce disturbance of birds feeding on the upper foreshore; seasonal closure of shingle beaches used as nesting sites by terns and plovers) to be taken at local levels, depending upon the precise issues However, the identification of hotspots for mobile species within the Firth may assist in the development of future management options and disturbance impacts will specifically be addressed within the Appropriate Assessment of the FoCMSP with respect to the Ailsa Craig and Inner Clyde Estuary SPAs

The FoCMSP *per se* has limited potential to address concerns among sectors such as mariculture and environmental and natural heritage management as to the adequacy of application of current, mainly internationally determined, regulations (e.g. MARPOL) governing issues such as oil spills and ballast water. However, a set of sustainability indicators will be developed in association with the Plan and these could potentially include measures of the incidence and severity of shipping-related marine pollution incidents within the Firth of Clyde.

8 CONCLUSIONS

8.1 Summary of Key Findings on Perceived Interactions

The majority (67%) of interactions among key interests utilising marine space within the Firth of Clyde are perceived as neutral or positive in nature. In addition, the spatial extent of *actual*, as opposed to potential, conflicts or incompatibilities is currently relatively small, with particular pressures on sheltered bays and on key access points between the outer and inner reaches of the study area, such as Rhu Narrows. However, increasing pressures, for example from rapid expansion of marine leisure industries, growth in commercial shipping, changes in preferred configurations of salmon farms, or potential development of marine renewables is likely to increase the potential for conflicts between different interest groups in the coming decade.

Where potential or actual conflicts do arise, these centre around three themes, namely: use of space, on either a permanent or transitory basis; access to, or potential impacts of others on, key resources (e.g. through pollution); and, safety concerns. Of interactions categorised as potentially negative (incompatible, conflict or competition), three quarters are described as competition, implying the existence of management mechanisms to resolve conflicts. However, the existence of such mechanisms is not a guarantee that potential conflicts will be resolved to the satisfaction of key stakeholders such as developers and statutory advisers, and the perceived nature of interactions may vary according to specific circumstances and conditions. There may also be considerable disparities between the perceptions of (sub)sectors and how others perceive them arising from factors such as the relative vulnerability of different interests to impacts from other activities, their spatial extent and the degree to which activities are regulated with respect to potential impacts on other interests.

A number of sectors are associated with relatively high levels of potentially negative interactions. These include mariculture, management for marine nature conservation interests, sewage and rubbish disposal, mobile gear fisheries and shipping. Potential conflicts between these and other interests may arise from deficits in current management tools (e.g. to resolve conflicts between mobile and static gear fisheries or between natural and historic heritage conservation interests and fisheries) or from the interface of significant data and policy gaps with complex regulatory regimes; this is particularly pertinent with respect to consideration of natural heritage impacts in development consenting processes. Also, while management for (bacteriological and chemical) water quality is currently generally perceived as positive, the inclusion of morphological quality elements within WFD has potential to generate future issues with other interests, particularly if and when regulation of dredging under FEPA is made WFD compliant.

Management of interactions among various leisure uses of the Firth, and between leisure boating and commercial vessels, is facilitated by the proactive stance of the principal port authority and local management forums, including the District Safety Committee and Clyde Moorings Committee. These are generally perceived as effective, but do not encompass all interests and may not be robust to long-term commercial pressures.

The study identified a number of potential synergies between different sectors, e.g. with respect to incorporation energy generation schemes within infrastructure such as marinas and sharing of technologies or facilities.

8.2 Potential Role of the FoCMSP

The results of the study of sectoral interactions, suggests that there are a number of key aspects of the FoCMSP which may be of particular value to resolution of conflicts of interest among sectors, namely:

- Identification and communication of key sectors' aspirations for coming 5-20 years across the Firth at a strategic level, together with provision of multilayered overviews of available information on current usage patterns and constraints mapping (e.g. with respect to technical feasibility of development of offshore wind or tidal stream devices), will

assist in the identification of potential pinch points among various interests and allow development of proactive policies to avoid or mitigate such points of conflict

- Provision within the FoCMSP of a strategic overview of various marine sectors' needs with respect to access between the land and sea around the Firth of Clyde will assist terrestrial planning authorities and industry groups in the development of policies to support the provision and maintenance of appropriate land-based infrastructure such as ports, harbours, piers, slipways and associated transport access.

- Provision of a strategic overview of natural heritage interests, through development of an indicative seabed habitats map and compilation of available data on marine habitats and species of conservation priority, will assist developers, regulators, advisers and decision makers in identifying suitable locations for future developments and in the development of appropriate policies for safeguard of key assets.

The study also identifies some limitations to the potential role of the FoCMSP, as a pilot project, in addressing conflicts. In particular:

- The strategic nature, and relatively coarse spatial resolution, of the FoCMSP is such that it will not address specific localised issues e.g. with respect to potential conflicts of interest among different leisure interests at popular beaches or among sectors such as boating, aquaculture and fisheries within particular bays. Specific locational matters should be addressed through more localised marine spatial plans, such as the Loch Fyne ICZM being developed by Argyll and Bute Council.

- Identification of spatial overlaps in potentially conflicting activities is dependent upon provision of accurate data in appropriate formats to the project team. This may be problematic for some key sectors including inshore fisheries, commercial shipping and leisure activities.

- There is no capacity within the resources allocated to development of the FoCMSP to enable a strategic overview to be prepared with respect of marine historic heritage interests, along the lines of English Heritage "Seascapes" programme, which was first applied within the context of the Irish Sea MSP pilot (MSPP Consortium, 2005b).

- There is no provision of resources within the SSMEI Clyde Pilot to enable the preparation of a strategic assessment of landscape/seascape carrying capacity across the Firth of Clyde.

- Issues such as marine litter, wildlife disturbance, and potential introduction of alien species, while potentially of considerable importance, are extremely difficult to capture quantitatively and spatially. It is anticipated that the main role of the FoCMSP with respect to such issues will recommendations on establishment of appropriate monitoring schemes to collect systematic data.

It is concluded that the application of marine spatial planning in the Firth of Clyde offers considerable potential to address a number of potential conflicts around access to space or resources identified by the case study. However, this potential may be constrained by data and policy gaps and by the extent to which a voluntary marine spatial planning pilot can influence terrestrial management in the coastal zone.

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APPENDIX 1 MEMBERSHIP OF SSMEI CLYDE PILOT STEERING GROUP / FIRTH OF CLYDE FORUM CORE GROUP

Name	Job Title	Organization
Ethel-May Abel		Glasgow City Council
Ron Bailey	Harbour Master	ClydePort Operations Limited
Michael Balmforth	Secretary	British Marine Federation, Scotland
Paul Bancks	Coastal Manager	The Crown Estate
John Bury		Glasgow City Council
Zoe Clelland	Senior Conservation Officer	Royal Society for the Protection of Birds
Jason Combes	Project Officer	Clyde Fisheries Development Project
George Eckton		Glasgow and Clyde Valley Joint Structure Team
Rhona Fairgrive	Coastal Project Officer	Scottish Coastal Forum
Noel Fojut	Head of Archaeology Programmes	Historic Scotland
Isabel Glasgow		CHAIR
Jeremy Glen		Royal Yachting Association Scotland
Ian Johnson	Manager	Ayrshire Joint Structure Plan Team
Kirsteen McDonald		Scottish Enterprise
Steve Marshall		West Dunbartonshire Council
**James McKie*		*FRS Marine Laboratory*
Chris Nevin	Operations South Manager	SNH
Claire Pescod	Project Officer	Firth of Clyde Forum
Lyn Rew		Scottish Enterprise Dunbartonshire
David Ross	Senior Marine WFD Scientist	SEPA
Alistair Sinclair	Chairman	Scottish Creelers and Divers (SCAD)
Mark Steward		Argyll & Bute Council
Patrick Stewart	Secretary	Clyde Fishermen's Association
JohnTaylor	Environmental Protection Assurance Manager	HM Naval Base

* Sits on SSMEI Clyde Pilot steering group only

APPENDIX 2 DATA COLLECTION SCHEDULE AND DETAILS OF SECTORAL REPRESENTATIVES

Sector	Subsector(s)	Organisation (s)	Representative(s) name(s)	Representative(s) job titles(s)	Location	How Contacted	Matrix sent out	Matrix returned	Interview Details	Lead	Recorded?	Map annotated?
Renewable Energy	Offshore Wind, Wave & Tidal	Scottish Renewables Forum	Catriona Prebble / Morna Cannon (after 16 July) Dr Gareth Davies	Development Officer (Marine & Bioenergy) Chairman, Marine Work group & Managing Director, AquaTera Ltd	Glasgow Orkney	Personal contact KT	08/06/2007	25/07/2007	10 /08/2007, SRF office Glasgow with phone link to Gareth Davies in Orkney	KT	Yes	
Cables and pipelines	Electricity	Scottish Executive	Bruce Stewart Peter Bald	Marine consents under FEPA	Edinburgh	via SSMEI team Scottish Executive	13/06/2007	NO RETURN		(KT)		
Inshore fisheries	Trawl fisheries	Clyde Fishermen's Association	Patrick Stewart	Secretary	Campbeltown	On project steering group	08/06/2007	12/06/2007	13/06/2007, Campbeltown	JED	No	Yes
	Creel and dive fisheries	Scottish Creelers and Divers	Alistair Sinclair	Secretary	Furnace	On project steering group	not sent ahead of interview	N/A	19/06/2007, Furnace	JED	No	Yes
Aquaculture	Finfish	Scottish Salmon Producers Organisation	Gary Sinclair Neil Auchterlonie	Researcher EU Technical Director	Perth	via Firth of Clyde Forum	08/06/2007	24/07/2007	09/08/07, Perth	KT	Part	
	Shellfish	Association of Scottish Shellfish Growers	Doug McLeod	Chairman	Ardvasar, Skye	via SEPA	13/06/2007	28/06/2007	unavailable for interview	(KT)		
Shipping	All	British Chamber of Shipping	Iain Trebinski	Nautical Consultant	London		14/06/2007	02/08/2007	14/08/07 (phone)	JED	No	
	Ferries	Strathclyde Partnership for Transport	Liz Parkes Alan Comrie	Subway and ferry operations manager	Glasgow		13/06/2007	28/06/2007	16/08/07 Govan	KT	Yes	
Ports/harbours etc	Ports incl. navigation aids and dredging	ClydePort	Guy Henderson	Deputy Harbour Master	Greenock	Ron Bailey, Harbour Master, project steering group		N/A	18/07/07 Greenock	JED	No	
Maritime Safety	HM Coastguard	MCA	Bill Speirs Jackie Lewis	Watch Manager Watch Officer	Greenock	via Ron Bailey, Harbour Msater, Clydeport	19/06/2007	28/06/2007	18/07/07 Greenock	KT	No (interview in busy ops room)	Yes
Recreation and Tourism	Cruisers, yachts and dinghies	Clyde Yacht Clubs Association	Donald McLaren	Honorary Secretary	Helensburgh	suggested by Steering Group	13/06/2007	22/06/2007	27/06/07 Clydebank	KT	Yes	Yes
	Cruisers	Royal Scottish Motor Yacht Club	Mrs Rita Hollywood		Greenock	via Donald McLaren, CYCA	22/06/2007	NO RETURN		(KT)		
	Jet skis	Stirling Marine	Alan Stirling	Jet-ski rep. on Clyde River Marine Safety Committee	Linwood	from MCA via CYCA	19/06/2007 and 24 /07/07	NO RETURN		(KT)		
	Sea kayaking	Scottish Canoe Association	Ron Mather	Volunteer Touring Access Representative	Bishopton	Mike Dales (Access & Environment Officer)	08/06/2007	14/06/2007	28/06/07 Bishopton	KT	Yes	Yes
	Lesiure craft and marinas	Troon Yacht Haven	Stephen Bennie	Owner	Troon	via Kirsteen MacDonald (SE Ayrshire) project steering group	18/06/2007	11/07/2007	02/08/07 Troon	JED	No	
	Leisure marine indsutries	British Marine Federation, Scotland	Mike Balmforth	Secretary	Toward, Argyll	Member of project steering group	12/06/2007	28/06/1980	18/07/07, Holy Loch marina	KT	No - interview in café over lunch	Yes
	Recreational diving	British Sub-Aqua Club	Susannah Calderan Jim Watson	Environmental Officer National Dive Officer	Mull Ellesmere Port	via e-mail sent to national dive officer via BSAC website	20/06/2007	29/06/2007	No interview	(KT)		Yes (post)
	Recreational diving	Scottish Sub-Aqua Club	Andrew Murray	Company Secretary	Glasgow	via website	08/06/2007	18/06/2007	No interview	(KT)		
	Sea Angling	Scottish Federation of Sea Anglers	Steve Bastiman	Secretary	Johnshaven		08/06/2007	13/06/2007	26/06/07 Greenock	KT	Yes	Yes

Appendix 2 cont.

Sector	Subsector(s)	Organisation (s)	Representative(s) name(s)	Representative(s) job titles(s)	Location	How Contacted	Matrix sent out	Matrix returned	Interview Details	Lead	Recorded?	Map annotated?
	Bathing and marine litter	Keep Scotland Beautiful (Blue Flag scheme)	Suzanne Roberts	Coastal Campaigns Coordinator	Stirling		19/06/2007	10/07/1980	No interview	(KT)		
	Surfing	Scottish Surfing Federation	Jamie Blair (Clan Surf School)	West coast representative	Glasgow	web search	19/06/2007	NO RETURN		(KT)		
	Wind surfing/ kite surfing	British Kitesurfing Association	James Auld	sales assistant, Extreme Zone	Ayr	via lead from Jamie Blair (see above)	28/06/2007	29/06/1980	Telephone 20/07/07	KT	No	
Naval Defence		MoD	John Taylor		Helensburgh	Nominated MoD rep for project steering group	18/06/2007	NO RETURN		(JED)		
Natural Heritage Management	Biodiversity	SNH	Cathy Tillbrook Chris Nevin	Policy and Advice Manager, Coastal and Marine Operations South Manager	Battleby Clydebank	SNH houses project team and sit on steering group	12/06/2007	Completed at interview	25/07/07 Clydebank	KT	Yes	
	Biodiversity	MCS	Calum Duncan	Scottish Conservation Manager	Edinburgh	via Firth of Clyde Forum	19/06/2007	16/07/2007	19/07/07 Edinburgh	KT	Yes	Yes
	Biodiversity	RSPB	Zoe Clelland	Senior Conservation Officer	Glasgow	Member of project steering group	08/06/2007	22/06/2007	26/07/07 Glasgow	KT	Yes	
Environmental Quality Management	Bacterial quality	Scottish Executive	Iain Morrison	leads on bathing waters and recreation	Edinburgh	Calum McPhail, SEPA	25/06/2007	NR		(KT)		
	All	SEPA	David Ross Calum McPhail	Senior Marine WFD Scientist Environmental Quality Unit Manager	East Kilbride	SEPA employs project team and sits on steering group	08/06/2007	13/06/2007	20/06/07 Clydebank	KT	No	
Historic / cultural heritage management	Marine archaeology	Historic Scotland	Philip Robertson	Senior Inspector of Marine Archaeology	Edinburgh	via Noel Fojut, HS rep from project steering group	08/06/2007	14/06/2007	26/06/07 Greenock	KT	Yes	Yes
	Coastal & marine archaology	West of Scotland Archaeological Services	Dr Carol Swanson	Service Manager	Glasgow	via Philip Robertson, HS	12/06/2007	NO RETURN	26/07/07 Glasgow	KT	No	
Landscape and Seascape		SNH	ClaireMcDougall	Policy and Advice Officer - Landscape	Clydebank	SNH houses project team and sit on steering group	08/06/2007	12/07/2007	02/08/07 Clydebank	KT	Yes	
General Marine Developments	Coastal Defences and dredging	FRS	Peter Hayes		Aberdeen	via SEPA	12/06/2007	28/06/2007	no interview	(KT)		
	Sewage disposal	Scottish Water	Doreen Bell	Environmental Regulation team	Aberdeen	via SEPA	12/06/2007	06/07/1980	unavailable for interview	(KT)		
Freshwater angling interests		Clyde River Foundation	Willie Yeomans		Glasgow	sits on RBMP Clyde Area Advisory Group, contact from SEPA	11/07/2007	NO RETURN		(KT)		

APPENDIX 3 CONSULTATION DOCUMENTS FOR SECTORAL INTERACTIONS STUDY

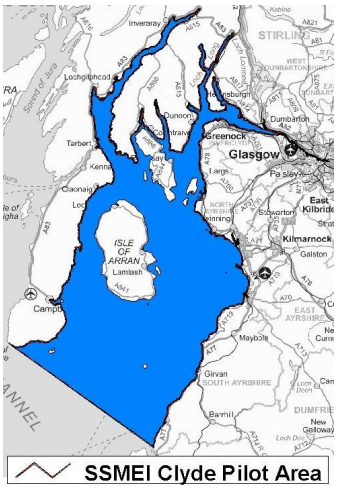
Background Notes, Instructions, Background Questionnaire and Blank Matrix Sent to Sectoral Representative (Historic Scotland)

1 Introduction

You are invited, as a key representative for your sector, to participate in this consultation, which is being undertaken for the Scottish Sustainable Marine Environment Initiative (SSMEI) Firth of Clyde Pilot (see http://www.clydeforum.org/SSMEI/index.htm). **The consultation responses will contribute to the development of a Local Marine Spatial Plan (LMSP) for the Firth of Clyde. This is being funded by the Scottish Executive to inform future policy options for the management of Scotland's marine environment.**

Marine Spatial Planning is emerging globally as a powerful tool for the sustainable management of the marine environment and is anticipated to become a statutory measure under EU and domestic legislation within the foreseeable future. One key role of Marine Spatial Planning is its potential to identify and deliver options for more sustainable management of interactions (both positive and negative) among sectors in the marine environment. However, Marine Spatial Planning can only deliver such benefits where there is informed input from key stakeholders during plan development.

This consultation is a key opportunity for you to ensure that your sector's perceptions and concerns are represented in the Firth of Clyde Local Marine Spatial Plan.



Based upon Ordnance Survey Data with the permission of the Controller of HMSO (GD03135G0005)

2. The Consultation

2.1 Objectives and Outputs

The consultation objective is to capture information on the nature, extent and intensity of interactions among (sub)sectors within the Firth of Clyde now and as predicted to develop over the coming 5 years. The main output will be a matrix summarising the nature and significance of interactions among (sub)sectors. This will be supported by maps and text detailing significant interactions and will be used in the development of sectoral plans and their integration within the Firth of Clyde LMSP. It will also inform an academic study, by a graduate student at the University of Strathclyde, of the potential of marine spatial planning to address sectoral interactions.

2.2 Process

There are two parts to the consultation process:

1) Phase 1: representatives complete interaction matrices for their (sub)sectors

2) Phase 2: follow-up meetings between sectoral representatives and SSMEI Clyde Pilot staff to explore emerging issues in more detail.

Sectoral representatives will also subsequently be given an opportunity to comment on the draft LMSP.

The consultation timetable is summarised below; your receipt of this initial consultation matrix is represented by the shaded column. It would be extremely helpful if you could please return the completed matrix to SSMEI@ClydeForum.org within ten days of receipt.

Consultation matrix and notes sent to sector representative	Representative completes background details and interactions matrix and returns to SSMEI project team	Possible meeting with SSMEI Project Team to elaborate on issues identified by matrix.

2.3 Follow-up Meetings

The purpose of the follow-up meetings is to enable the project team to develop a greater understanding of the nature, intensity and spatial dimensions of interactions and to explore marine management issues arising from these. The meetings will also provide an opportunity to explore how current interactions might be anticipated to evolve over the initial 5 year review period for the LMSP.

The precise issues discussed at the follow-up meetings will depend upon the initial responses from phase 1. The team are particularly interested in identifying both "pinch points" and "gaps" with respect to use of the marine resources of the Firth of Clyde. Hence, one aspect might include development of illustrative outline maps/charts highlighting locations of key resources. Any such maps would be regarded by the project team as indicative drafts only, and would not be incorporated into the LMSP text or associated GIS without full prior consultation with, and agreement from, the relevant sector representative(s).

2.4 What You Should Do Now

It should take roughly an hour to complete the interactions matrix and background details sheet. However, you may wish to consult more widely with colleagues within your (sub)sector before or during the process of completing the matrix.

The matrix is in the attached Excel workbook, which includes a detailed "Instructions" sheet to guide you through the process. Where there are interactions with other (sub)sectors, you are asked to provide further details in the form of text notes. These notes will inform some of the issues to be explored in greater depth should you wish to participate in the second phase of the consultation. You are also asked to complete a short questionnaire giving details of the organisation you represent and its role within the Firth of Clyde. If you have any queries please contact the project team on 0141 951 0869 / 0870.

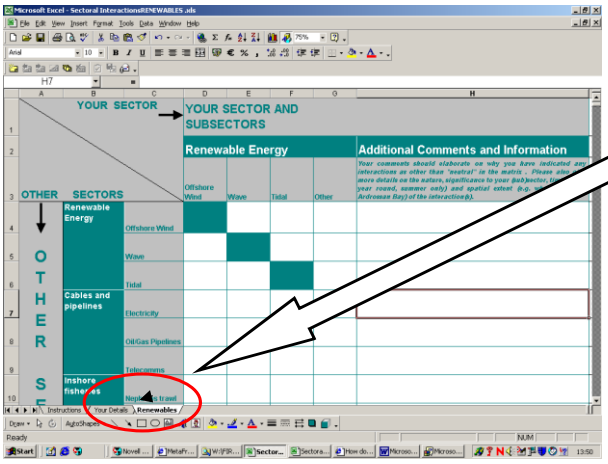
Once you have completed the background details sheet and matrix, please return the Excel file to the SSMEI Project team at SSMEI@ClydeForum.org. It would be very helpful if you could also indicate when returning the file whether you would be interested in meeting with a member of the project team to explore your responses further.

THANK YOU FOR YOUR PARTICIPATION

A Guide to Completing the SSMEI Clyde Pilot Sectoral Interactions Matrix

The sectoral interactions matrix is intended to provide a user-friendly format for the gathering and subsequent analysis of information on how various (sub)sectors and industries interact within the marine and coastal areas of the Firth of Clyde. Please follow this step-by-step guide to complete the Matrix for the (sub)sector(s) that you represent. You may find it helpful to print off these instructions for ease of reference - they will fit on two sides of A4.

If you need any further information, or assistance in completing the matrix, please contact Kate Thompson or John Donnelly by phone on 0141 951 0869 / 0870 or by e-mail at ssmei@clydeforum.org.uk



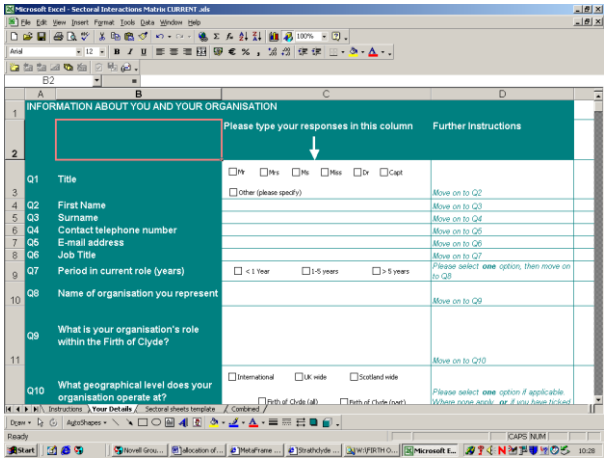
Overview

You are asked to input information in two worksheets:

Your Details

(Sector Name) - the name of the sector (e.g. Renewable Energy, Recreation and Tourism) within which the body that you represent falls. This sheet will be found immediately to the right of the *Your Details* sheet

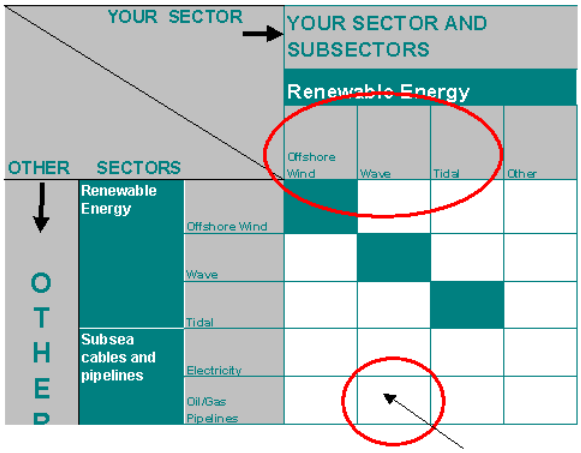
Please follow steps 1 to 3 below to complete these sheets.



STEP 1

Open the *Your Details* sheet. Answer the 14 questions, by clicking in check boxes where available, or by typing text into the spaces provided.

Once you have completed this sheet, please save the file, then open the (*Sector Name*) sheet.



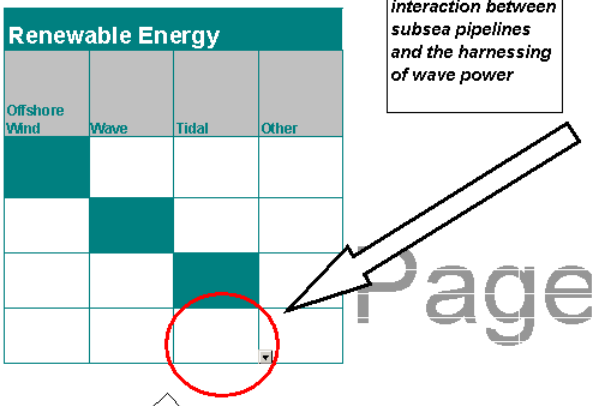
STEP 2a

Decide which subsector(s) you are able to represent (either alone or in consultation with others).

STEP 2b

Identify any additional subsectors/facets for your sector/industry not already listed in the sheet which you feel should be included and enter these in the heading for the column currently named "Other".

This cell represents interaction between subsea pipelines and the harnessing of wave power



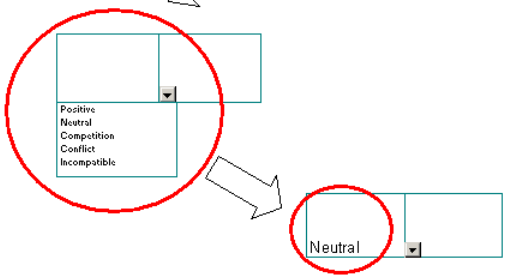
STEP 3

Work down the column(s) for each of your chosen subsectors. Each cell represents the interaction between the subsector named in the row and that in your chosen column, as shown in the example to the left.

Select each cell in turn to reveal the drop down menu button at the bottom right of the cell. There are 73 cells in each column - please ensure that you scroll down to the end of the document when completing the matrix..

Left click on the button to bring up the menu and then click again on **the option that best characterises the nature of the impact of the given subsector on your chosen subsector** - the cell will automatically fill with you selected option. If you wish to change your selection, simply highlight the cell, click *Delete* to remove the text and then pull up the cell menu again.

The table below gives full definitions of the menu options. Please familiarise yourself with these before starting to fill in the matrix.



Interaction	Description
Positive	Where the activity of the other (sub)sector has a positive influence on your (sub)sector.
Neutral	Where the activity of the other (sub)sector has no positive or negative influence on your (sub)sector.
Competition	Where there is sustainable competition for access to the same resources or area(s) between the other (sub)sector and your (sub)sector.
Conflict	Where conflict arises as a consequence of unmanaged competition between the other (sub)sector and your (sub)sector for access to the same resources or area(s).
Incompatible	Where there is a fundamental and unmanageable incompatibility between the activity of the other (sub)sector and your (sub)sector.

STEP 3 cont

Where you characterise an interaction as *Positive*, *Competition*, *Conflict* or *Incompatible* please provide further details in the "Additional Comments and Information" column. Your comments should indicate the basis for your choice (i.e. answer the question "Why?" did you characterise an interaction in this manner). Please also give more details on the nature, significance to your (sub)sector, timing (e.g. year round, summer only) and spatial extent (e.g. whole of Firth, Ardrossan Bay) of the interaction(s).

(Note: Your text may not all show within the box on the screen, but will be visible to the project team, so there is no need to adjust the box size).

INFORMATION ABOUT YOU AND YOUR ORGANISATION			
		Please type your responses in this column	Further Instructions
Q1	Title	☐ Mr ☐ Mrs ☐ Ms ☐ Miss ☐ Dr ☐ Capt ☐ Other (please specify)	*Move on to Q2*
Q2	First Name		*Move on to Q3*
Q3	Surname		*Move on to Q4*
Q4	Contact telephone number		*Move on to Q5*
Q5	E-mail address		*Move on to Q6*
Q6	Job Title		*Move on to Q7*
Q7	Period in current role (years)	☐ < 1 Year ☐ 1-5 years ☐ > 5 years	*Please select **one** option, then move on to Q8*
Q8	Name of organisation you represent		*Move on to Q9*
Q9	What is your organisation's role within the Firth of Clyde?		*Move on to Q10*
Q10	What geographical level does your organisation operate at?	☐ International ☐ UK wide ☐ Scotland wide ☐ Firth of Clyde (all) ☐ Firth of Clyde (part)	*Please select **one** option if applicable. Where none apply, **or** if you have ticked Firth of Clyde (part), please also provide written description of area covered.*
	Details of area covered		
Q11a	Type of organisation	*Please select **one or more of the following** options **OR** provide written description if none apply*	
		☐ Association or federation	*Please also answer Q11b*
		☐ NGO ☐ Sport club	*Please also answer Q11c*
		☐ Single Company ☐ Central Govn. Dept / Agency ☐ Local authority	*Move on to Q12*
	Other (please specify)		
Q11b	How many bodies (e.g. businesses or sports clubs) does your federation/association represent *within the Firth of Clyde area?*		*Please elaborate as you feel appropriate to provide understanding of scope of your interest. Move on to Q12*
Q11c	How many members do you have *within the Firth of Clyde area?*		*Please elaborate as you feel appropriate to provide understanding of scope of your interest. Move on to Q12*
Q12a	Are you consulting with others in your organisation to complete the interactions matrix?	☐ Yes ☐ No	*If "Yes" move to Q12b; if "No" move on to Q13*
Q12b	Please give further details		*Move on to Q13*
Q13	Are there other bodies within your sectoror industry whom you would suggest we should consult?		*Please provide as much information as possible, including relevant contact details*
Q14	Is your organisation a member of the Firth of Clyde Forum?	☐ Yes ☐ No	
	Thank you. You have now completed this part of the consultation. Please save the file and then move to the interactions matrix, as detailed in the Instructions sheet.		

OTHER SECTORS		YOUR SECTOR AND SUBSECTORS			
		Historic and Cultural Heritage Management			Additional Comments and Information
		Management of coastal monuments and archaeology	Management of marine monuments and archaeology	Other	Your comments should elaborate on why you have indicated any interactions as other than "neutral" in the matrix. Please also give more details on the nature, significance to your (sub)sector, timing (e.g. year round, summer only) and spatial extent (e.g. whole of Firth, Ardrossan Bay) of the interaction(s).
OTHER SECTORS AND SUBSECTORS	Renewable Energy				
	Offshore Wind				
	Wave				
	Tidal				
	Subsea cables and pipelines				
	Electricity				
	Oil/Gas Pipelines				
	Telecomms				
	Inshore fisheries				
	Nephrops trawl				
	Scallop dredge				
	Demersal trawl				
	Pelagic trawl				
	Longline				
	Creel				
	Dive				
	Processing				
	Aquaculture				
	Onshore finfish				
	Offshore finfish				
	Shellfish				
	Processing				
	Shipping and transport				
	Tankers				
	Bulk carriers				
	Container vessels				
	Coastal bulk cargo				
	Ferries				
	Cruise ships				
	Ports and harbours				
	Large ports				
	Medium Ports				
	Small Ports				
	Piers and Jetties				
	Dredging incl. dredge disposal				
	Maritime Safety				
	Lifeboat service				
	HM Coastguard				
	Navigation aids				
	Recreation and Tourism				
	Cruisers				
	Small power boats				
	Jet skis				
	Yachts				
	Sailing dinghies				
	Sea kayaking				
	Marinas				
	Slipways				
	Moorings and anchorages				
	Boat building/repair				
	Recreational diving				
	Sea Angling				
	Bathing				
	Surfing / wind surfing/ kite surfing				
	Eco-tourism				
	Tourist accommodation / infra-structure				
	Naval Defence				
	Coastal infrastructure				
	Submarines				
	Surface vessels				
	Restricted areas				
	Exercise areas				
	Munitions dumps				
	Radar				
	Natural Heritage Management				
	Management of intertidal environment/ communities				
	Management of seabed environment/ communities				
	Management for breeding and wintering birds				
	Management for other mobile/migratory species				
	Landscape and Seascape Management				
	Landscape management				
	Seascape management				
	Environmental Quality Management (to meet requirements of Directives such as Water Framework, Bathing Waters and Shellfish Waters)				
	Bacterial quality				
	Biological quality				
	Chemical quality				
	Physical quality				
	Historic / cultural heritage management				
	Management of coastal monuments and archaeology				
	Management of marine monuments and archaeology				
	Coastal Development				
	Coastal power stations				
	Residential				
	Industrial				
	Coastal Defences				
	Waste management				
	Sewage disposal				
	Rubbish disposal				

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APPENDIX 4 DESCRIPTIONS OF PERCEIVED INTERACTIONS BY SECTOR

This appendix consists of stand-alone accounts of the perceived nature of interactions with other sectors for the each of the six main sectors for which forward sectoral plans will be prepared, namely:

A4.1 inshore fisheries
A4.2 mariculture
A4.3 shipping and transport
A4.4 recreation and tourism
A4.5 management of environment and heritage
A4.6 renewable energy

A4.1 INSHORE FISHERIES

A4.1.1 Overview of Sector

Inshore fisheries in the Clyde historically used pelagic drift nets to catch herring. Following the collapse of local herring stocks in the 1970s and 1980s there was a temporary shift to bottom trawling for demersal whitefish such as hake, cod, haddock, whiting and saithe, as well as a growth of the fishery for Nephrops prawns (also known as langoustine or scampi) which began in the 1950s (Barne *et al*, 1997; Bailey *et al*, 1986). The whitefish fishery largely collapsed in the 1990s and both trawl and creel fisheries in the Firth now primarily target Nephrops (Watson and Bryson, 2003). Scallops, including queen scallops, are also taken, mainly by dredging vessels from other parts of Scotland, but with some commercial SCUBA diving.

The main landing ports are Campbeltown (including Carradale and Tarbert) in Kintyre and Ayr/Troon, which together hold c. 350, registered fishing vessels. Of these, 100-125 regularly fish in the Firth of Clyde, providing employment for 300-400 men. Some Northern Ireland registered vessels also fish within the Firth of Clyde. In 2005, c.100 vessels in the Clyde-registered fleet gained 50+% of catch value from Nephrops. Of these vessels, 23 were creelers, mostly less than 10m length, and the rest were trawlers, two thirds over 10m in length (Curtis and Anton, 2006; Scottish Sea Fisheries Statistics, 2005[1]). Only vessels of under 70ft are permitted to fish within the Firth. Fishing takes place on grounds throughout the Firth, with the exception of Holy Loch and five other restricted MoD areas, where all fishing is prohibited. In addition, the Gare Loch is subject to an Inshore Fishery Order, which prohibits all trawl and dredge fisheries to protect spawning and nursery grounds of demersal species and there are annually reviewed closures to whitefish trawl in the Outer Firth to protect cod spawning grounds. As of 1986, there has been a ban on mobile gear fishing at weekends (imposed under the Inshore Fishing (Scotland) Act 1984) and there is also a voluntary agreement restricting trawl fisheries in shallow waters in Upper Loch Fyne (D. Donnan, SNH pers. comm.).

A4.1.2 Key Interactions between Inshore Fisheries and Other Sectors

A4.1.2.1 Intrasectoral

Within the Firth of Clyde, and especially parts of the sea lochs, there are negative interactions between trawl and static gear (creel) fisheries. As highlighted by previous studies (Watson and Bryson, 2003; Curtis and Anton, 2006), these arise from competition for access to fishing grounds, concerns over sustainability of fished stocks, principally Nephrops, and conflicts over damage to fishing gear.

Trawl fishermen characterise interactions with static gear and dive fisheries as competitive and managed through local agreements and restrictions (section 4.1.1). However, creel and dive fishermen claim that local restrictions are not universally adhered to and perceive the ban on weekend trawl fishing as forcing creelers to work antisocial hours over weekends in order to minimise the risk of damage to gear by trawlers during weekdays.

A4.1.2.2 Mariculture

Both trawl and creel or dive fishermen perceive mariculture developments as incompatible with their sectors. For mobile gear fisheries the main issue is restricted access to fishing grounds, while the creel and dive sectors cite damage to habitats and species in the vicinity of salmon cages as a concern. Existing consultation processes with respect to licensing of mariculture developments are seen as inadequate.

A4.1.2.3 Shipping and Transport

The trawl fisheries and commercial shipping sectors perceive competition for access to marine space between fishing vessels and commercial shipping as being adequately managed within the

[1] http://www.scotland.gov.uk/Publications/2006/09/19141352/0

Clyde, through a combination of international mechanisms (e.g. International Regulations for Prevention of Collision at Sea, IRPCS), local agreements (e.g. with respect to shipping channels north of the Cumbraes) and local byelaws. Static gear fisheries operate closer inshore and do not interact with most shipping, although ferry routes effectively close some potential fishing areas to creel fisheries and there are seasonal issues in some locations with respect to tourist vessels.

The presence of small ports, piers and jetties is viewed as positive by the fisheries sector, although concerns were expressed about the need for ongoing investment in maintaining such facilities and about potential "gentrification" of some ports to attract leisure craft. Dredging activities for maintenance of ports or shipping channels are potentially conflicting with trawl fisheries' interests (through exclusion of fishing vessels from dredge disposal sites or damage to fish spawning or nursery grounds). However, interactions within the Firth of Clyde were perceived by trawl fisheries as adequately managed and not conflicting with fishing grounds or key resources

A4.1.2.4 Recreation and Tourism

The fishing sector perceived most interactions with leisure craft as competition, managed through international rules governing collision avoidance at sea (IRPCS), although some concerns were raised about lack of awareness of rules among some leisure craft skippers. Similarly, given current levels of commercial fishing activity within the most popular sailing areas, the leisure boating sector perceived interactions with commercial fishing interests as neutral. However, trawl fishermen identified the presence of moorings and anchorages as being incompatible with their activities. Wash from power vessels was identified by creelers as posing an unmanaged safety risk, while the leisure sector identified unmarked creel buoys as a navigation hazard and, in particular, as conflicting with small power craft.

Recreational divers identified mobile gear fisheries, especially scallop dredgers, as conflicting or even incompatible with their interests through damage to seabed habitats and species. Sea anglers perceived trawl fisheries as depleting fish stocks, in particular through capture of non-target species by Nephrops trawls.

The presence of slipways and boat repair facilities was perceived as beneficial to inshore fisheries and concern was expressed about a reduction in numbers of slipways. Ecotourism was perceived as offering opportunities for diversification.

A4.1.2.5 Management of Environment and Natural and Historic Heritage

Current management for natural heritage interests in the Firth of Clyde, principally through designation of coastal or intertidal SSSIs and SPAs, is not perceived as interacting with trawl fisheries interests. However, the mobile gear sector expressed concern about potential impacts of future management of marine biodiversity interests e.g. through marine extensions to SPAs. Similar reservations were expressed with respect to future management of underwater archaeology; essentially any form of exclusion zone is perceived as potentially damaging to mobile gear fisheries. Creel fishermen also expressed some concerns about potential impacts of future management to safeguard seabed habitats if these were not adequately consulted on, but identified protected wreck sites as potentially beneficial through serving as marine refuges.

Conversely, environment and heritage management sectors perceived the current general absence of controls on trawl and dredge fisheries within the Firth as conflicting with the safeguard of seabed morphology, habitats, associated species and archaeology and as competing with conservation of birds (through potential indirect impacts on food supply). Harvesting of shellfish in the intertidal zone was identified as damaging to intertidal habitats and, through disturbance impacts, associated birds. Creel and dive fisheries are perceived as much less damaging, although still potentially competing with some natural heritage interests on a more localised scale.

Management of water quality was viewed as positive by the fisheries sector (but see section 6.3.2).

A4.1.2.6 Renewable Energy

FRS identified a number of *potential* interactions between fisheries and the construction, operation or decommissioning of renewable energy devices and associated cabling. These included imposition of restrictions on fisheries access (with potential knock-on effects for other areas) and potential damage to fished stocks, including smothering, changes to suspended sediment loads in the water column, loss of substratum, marine noise, decrease in wave exposure, decrease in water flow, and creation of barriers to movement for migratory species. Trawl fisheries identified interactions with renewables as competition while creelers characterised these as neutral.

A4.1.2.7 Other Interactions

Marine litter was identified as problematic both through clogging of gear and potential damage to fishing vessels. Sewage related waste and surface scum are an ongoing concern for creelers in some locations, although there has been a general improvement in recent years.

A4.1.3 Overview of Interactions

A4.1.3.1 Sectoral Perceptions

Many of the inshore fisheries sector's perceptions of interactions arise from a wider cultural perception of the rights of fishermen to fish common stocks wherever they wish, without impedance from other interests. Hence, there is concern, particularly among trawl fishermen, about any developments, such as marine energy capture devices, fish farms, leisure moorings, or creation of protected areas for natural or historic heritage interests, that might restrict access to fishing grounds. There are also ongoing conflicts within the sector between static and mobile gear fisheries.

Current mechanisms for management of potential collision risks between fishing and other, including naval, vessels are seen as effective. Continued affordable access for fishing boats to ports, harbours, jetties and slipways is identified as important to the industry.

A4.1.3.2 Perceptions of other sectors

Perceived conflicts with fisheries arise mainly from concern about damage to natural and historic heritage interests through trawling or dredging of the seabed and potential depletion of target or non-target stocks.

A4.1.4 Potential Role of the FoCMSP

The Scottish Executive's strategic framework for inshore fisheries (Scottish Executive, 2005e) included proposals for the establishment of a series of Inshore Fisheries Groups (IFGs), comprising fishermen and other local stakeholders, to cover Scottish waters out to the 6nm limit reserved to the Scottish fleet. IFGs will be tasked with developing local objectives and associated management plans and management measures for their area, in line with strategic national objectives and EU quotas.

The Clyde IFG is anticipated to be a key mechanism through which conflicts of interest within the fisheries sector and between fisheries and other interests will be addressed. The District Safety Committee and Clyde Port are also anticipated as continuing to play a central role with respect to resolution of potential conflicts over navigation rights among the various types of vessel using the Firth; such pressures are anticipated to increase given current trends in the marine leisure (section 5.4.1) and commercial shipping (section 5.3.1) sectors. With respect to the mariculture sector, there may also potentially be new opportunities for consultation arising from recent transfer of planning control for aquaculture to Local Authorities.

However, while the FoCMSP will not be the main mechanism for future fisheries management within the Firth of Clyde, it is anticipated as assisting the work of the IFG and other fora in a number of ways, including:

- identification and communication of key sectors' aspirations for coming 5-20 years across the Firth at a strategic level, together with constraints mapping (e.g. with respect to technical feasibility of development of offshore wind or tidal stream devices), will assist in the identification of potential future pinch points between fisheries and other interests

- development of policies concerning provision of shore based infrastructure, such as harbours and slipways, which recognise their strategic importance to the fisheries sector in context of rapid expansion of the marine leisure sector

- development of a seabed habitat map and mapping of occurrence of priority marine species and habitats will together assist in future resolution of conflicts between the inshore fisheries sector and those, including statutory agencies, NGOs and recreational divers, concerned with management and conservation of natural heritage interests.

A4.1.4.1 Limitations

The extent to which the FoCMSP can provide spatial information on geographic areas of potential conflicts between the fisheries sector and other interests will also be dependent upon the provision of spatial data on fisheries effort by the industry to the project team.

There is no capacity within the resources allocated to development of the FoCMSP to enable a strategic overview to be prepared with respect of marine historic heritage interests, along the lines of English Heritage "Seascapes" programme, which was first applied within the context of the Irish Sea MSP pilot (MSPP Consortium, 2005b).

There is limited scope for the FoCMSP to address issues arising from marine litter, other than identifying this as an issue and promoting systematic monitoring to assess scale of the problem in the Clyde and, if possible, to determine, probable origins of marine waste.

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A4.2 MARICULTURE

A4.2.1 Overview of Sector[1]

Mariculture, mainly of Atlantic salmon, is a significant industry in the Firth, and particularly in Loch Fyne (Cappell, 2005; Barne *et al*, 1997), where 17 sites are licensed to hold up to 9000 tonnes of fish. There are additional salmon farming sites in Lochs Long, Riddon and Striven, Kyles of Bute, Cumbrae and Arran. Most salmon farms are owned by major aquaculture companies. In 2003 there were 11 aquaculture businesses in the Firth of Clyde employing an estimated 110-150 FTE employees. There is a trend in the Scottish aquaculture industry towards fewer and larger, sites located further offshore.

Shellfish (mussels, native or pacific oysters, and scallops) are also farmed in the Firth, with five production sites in Loch Fyne, and one each in Lochs Striven and Riddon. Shellfish farming enterprises are typically relatively small-scale owner occupied businesses often run on a part-time basis.

A4.2.2 Key Interactions between Mariculture and Other Sectors

A4.2.2.1 Inshore fisheries

Interactions between mariculture and inshore fisheries are regarding by both sectors as being conflicting or incompatible. Fishermen regard mariculture developments as eroding traditional rights of access to fishing grounds throughout the Firth of Clyde and are unhappy about existing consultation processes with respect to licensing of mariculture developments. Shellfish growers generally expressed less concern than salmon farmers about interactions with fisheries, but perceive conflict with scallop dredging. There are also concerns among fishermen about potential impacts of salmon farming on water quality, seabed habitats and biodiversity.

Potential collision risks are addressed through regulations on marking of salmon cages and related structures. The implications of recent transfer of planning control for aquaculture to Local Authorities have yet to be evaluated in context of potential interactions with inshore fisheries interests.

A4.2.2.2 Shipping and Transport

The mariculture industry identified concerns about marine pollution, especially (fuel) oil pollution but also potential introduction of pathogens in ballast water, as a potentially conflicting interaction with commercial shipping interests. Dredging and dredge disposal operations for harbour or channel maintenance are also seen as conflicting with mariculture, because of impacts on sediment load and water quality. The commercial shipping industry is not generally impacted by near shore mariculture facilities with respect to navigation, but does see retention of refuge anchorages in sheltered bays as an area of potential conflict that may not always be addressed through the planning process. Issues may also arise from poor practice at fish farm sites e.g. if marker buoys impede shipping channels.

A4.2.2.3 Recreation and Tourism

There is competition between the mariculture sector and recreational boating interests for access to sheltered waters with easy shore access. Moorings or anchorages for leisure vessels cannot occupy the same space as mariculture sites, while access between the land and sea for a wide range of recreational interests may be restricted by development of onshore aquaculture facilities such as

[1] Information taken from Scottish Environment Protection Agency: on-line reports on Shellfish Growing Waters and SEPA Monitoring Sites: http://www.sepa.org.uk/pdf/data/shellfish/7.pdf http://www.sepa.org.uk/pdf/data/shellfish/8.pdf http://www.sepa.org.uk/pdf/data/shellfish/9.pdf http://www.sepa.org.uk/pdf/data/shellfish/10.pdf http://www.sepa.org.uk/pdf/data/shellfish/89.pdf

smolt units. The sector perceives potential conflicts with leisure craft, especially powerboats, arising from risk of collisions with cage structures or work vessels.

Discharge of faeces from leisure craft in vicinity of fish farms and, especially shellfish growing sites, is a further concern to the industry. Conversely, finfish farming is perceived by interests such as sea kayakers and recreational divers as potentially detracting from amenity or biodiversity values.

Potential synergies between leisure boating and mariculture exist with respect to access to specialist support facilities such as marine engine repair businesses.

A4.2.2.4 Management of Environment and Natural and Historic Heritage

The salmon farming sector perceives there to be managed competition with respect to management for most natural heritage interests, largely mediated through site designations and good practice guidelines. However, a current source of conflict lies in potential damage to cetaceans arising from use of acoustic seal scarers. The shellfish farming sector regards interactions with natural heritage management as conflicting. Conversely, natural heritage conservation interests view salmon farming as potentially more damaging than shellfish farming, but as being managed through statutory inputs to consents procedures and through application of voluntary mechanisms such as Area Management Agreements

Management of landscape and seascape is perceived by the salmon farming sector as based on somewhat subject criteria, and therefore conflicting, although shellfish farming interests see this interaction as competitive. Given their advisory, rather than regulatory role, SNH view such interactions as either competitive or conflicting depending on extent to which their advice is taken account of in granting consents and applying conditions to mariculture developments.

Water quality management is viewed as positive by the salmon farming sector and as competitive by SEPA, in its role as regulator of discharge consents in compliance with WFD requirements. Some regulatory confusion exists with respect to dumping of shells from processing facilities.

The transfer of control of mariculture developments to local authorities planning control is perceived by the historic heritage management sector as removing a potential loophole with respect to safeguard of unscheduled subtidal archaeology, and so interactions with mariculture are perceived as competitive. However, there may be practical issues to address with respect to capacity within local authorities to address underwater interests (C. Swanson, WoSAS, pers. comm.).

A4.2.2.5 Renewable energy

There are a complex set of potential interactions, as yet untested in Scotland given the marine renewable energy sector's early development stage, between mariculture and marine renewables. There is potential for positive synergies with salmon farming in terms of technologies development, logistics for structure maintenance, siting of microrenewable devices on aquaculture structures or creation of sheltered locations for large offshore fish farms. However, potential also exists for competition over space and there are concerns about potential impacts of marine renewables, particularly wind farms or tidal barrages, on features such as current flows, water quality (suspended sediment loading or substrate smothering) and fish health (through noise /vibration or electromagnetic stress).

A4.2.2.6 Other Interactions

Keep Scotland Beautiful (KSB) identified a potential for litter to be generated from mariculture sites; this interaction was categorised as competitive, although no specific management mechanism was identified. Salmon producers expressed concerns over potential impacts of acoustic pollution and vibrations from naval operations on fish health.

A4.2.3 Overview of Interactions

A4.2.3.1 Sectoral Perceptions

Both the marine finfish and shellfish farming industry representatives perceived relatively high levels of potential conflict with other sectors. These stemmed largely from three underlying concerns, namely: maintenance of high water quality, particularly at near shore sites with relatively low flushing rates; access to suitable locations, free of disturbance from other users, both at sea and on the coast; and, potential of noise and vibration from other activities to cause stress and ill-health in salmon.

The discharge of untreated sewage, oil, chemical pollutants, diseases or non-native species from vessels, potential interference with routine operations by leisure users of the water space and dredging works for whatever purpose were seen as potentially damaging to mariculture interests. With respect to access to suitable locations, particular conflicts were identified with trawl fisheries, while guidance on management for landscape and seascape was perceived as based on somewhat subjective criteria.

Potential synergies were identified with development of marine renewables and coastal power stations and also with growth of marine leisure facilities, where accompanied by improved availability of specialist services such as marine engine repair.

A4.2.3.2 Perceptions of other sectors

A number of sectors, notably inshore fisheries, leisure boating and recreational divers identified potential competition with mariculture for access to marine space. Commercial shipping interests also saw access to sheltered bays as a potential source of competition while the renewable energy sector identified potential competition with respect to offshore wind and tidal barrage schemes. Some concerns were also raised by other interests about maintenance of good practice within the mariculture industry, for example removal of gear such as mooring cables when sites are no longer in operation.

Other concerns arose with respect to the impacts of salmon farming on water quality, biodiversity and amenity values. Regulators and statutory advisers generally perceive these as being managed through existing consents procedures for mariculture developments. However, a number of commercial and leisure interests perceive ongoing conflict with respect to impacts on biodiversity and amenity.

A4.2.4 Potential Role of FoCMSP

At a strategic level, fish farm developments in Scotland are informed by Locational Guidelines for the Authorisation of Marine Fish Farms in Scottish Waters. These are regularly updated by FRS and assign sealochs to three categories on basis of their predicted environmental sensitivity to additional fish farming capacity. The sea lochs of the Firth of Clyde are all currently (September 2007[1]) in category 3, which indicates that there is potential environmental capacity for expansion of the industry.

The implications of recent transfer of planning control for marine aquaculture to Local Authorities in Scotland have yet to be evaluated in context of potential interactions with other sectors. Navigational issues will continue to be addressed through the CPA Section 34 consents process, assisted by local initiatives such as mapping of anchorages by the Clyde Moorings Committee. Fish farms will also still be subject to the Environmental Impact Assessment (Fish Farming in Marine Waters) Regulations 1999 and will require discharge consents from SEPA under the consent to discharge under the Control of Pollution Act 1974. These discharge consents are informed by a range of hydrographic modelling tools.

[1] http://www.frs-scotland.gov.uk/FRS.Web/Uploads/Documents/logSept.pdf

As outlined above, mariculture developments are subject to a complex regulatory and consents procedures which address issues of potential conflict with other interests, specifically navigation, water quality, biodiversity conservation and safeguard of historic heritage on a site specific basis. In addition existing and proposed fora, including the Moorings Committee, Clyde IFG and, River Basin Management Planning Area Advisory Groups, may potentially assist in resolving generic conflicts of interest.

In this context, the principle potential contribution of the FoCMSP to the resolution of potential conflicts between the mariculture and other sectors lies in its provision and bringing together of strategic overviews of key aspects of the environment and usage of the Firth of Clyde as a whole, specifically:

- indicative seabed habitat map and map of occurrence of priority marine species
- poor weather refuge sites for shipping within the Firth
- leisure moorings and anchorages (as previously compiled by Clyde Moorings Committee)
- constraints mapping of technical potential for renewable energy developments

A further key aspect is the identification and communication of the aspirations of all key sectors for the coming 5-20 years across the Firth. This will be of particular relevance to interactions between mariculture and the expanding marine leisure sector. The development of forward sectoral plans for these two sectors within the Firth of Clyde will potentially enable the development, within the FoCMSP, of a strategic approach to meeting key resource requirements for both sectors while minimising potential conflicts. There may also be scope within the FoCMSP to develop policies to promote sustainable synergistic development of marine renewables and mariculture.

A4.2.4.1 Limitations of the FoCMSP

There is no provision of resources within the SSMEI Clyde Pilot to enable the preparation of a strategic assessment of landscape/seascape carrying capacity for mariculture developments across the Firth of Clyde. However, this aspect will be examined within the Sound of Mull Pilot (S. Benfield, pers. comm.)

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A4.3 SHIPPING AND TRANSPORT

A4.3.1 Overview of Sector

The Firth of Clyde is a hub for international shipping, with in excess of 10million tonnes of cargo passing through Clyde Port each year (Department for Transport, 2006a&b). Volumes have been increasing in recent years after a decline in the 1980s and 1990s. Facilities within Clyde Port are Hunterston (dry bulk handling, largely coal); Greenock Ocean Terminal (container port, transhipment of timber and timber products; ocean cruise ship destination); Ardrossan (RoRo); King George V and Rothesay Docks, Glasgow (bulk commodities scrap metal); and, the INEOS Finnart Oil Terminal, L. Long.

In 2005 Clyde Port ranked 11th among British ports for tonnage handled, which was around a quarter of that at the busiest ports, including London, and half of that for the Firth of Forth (Department for Transport, 2006a). Coal (mainly imports) made up 65% of total in 2005 while import/export of oil and oil products accounted for 22%. Overall, 75% of cargo handled was imports and 70% foreign traffic. There are longstanding proposals for the expansion of Hunterston to include a major container hub. Smaller ports include Ayr, which handles c.250,000 tonnes of cargo per annum, and local ship-based transport includes transhipment of timber currently being harvested from forestry plantations in Argyll to a processing facility near Troon.

Various vehicle and passenger ferries connect communities in the upper Firth and islands (Arran, Bute and the Cumbraes) but there are no direct cross-Firth links between Ayrshire and Kintyre. Apart from the cross-river Yoker-Renfrew ferry there are also no water-based transport links within the greater Glasgow conurbation.

Dredging activities in the Firth are confined to maintenance of shipping channels and port facilities; there is no commercial dredging for marine aggregates.

A4.3.2 Key Interactions between the Shipping and Transport Sector and Other Sectors

A4.3.2.1 Intrasectoral

There were mutually positive perceptions of interactions between ports and shipping. Competition for navigation access among commercial shipping of various types was regarded as being adequately managed within the Clyde through international agreements (e.g. International Regulations for Prevention of Collision at Sea, IRPCS) and local byelaws.

A4.3.2.2 Inshore Fisheries

The trawl fisheries and commercial shipping/ports sectors perceive competition for access to marine space between trawlers and commercial shipping as being adequately managed within the Clyde through a combination of international (e.g. IRPCS) and local regulations (e.g. ClydePort byelaws). However, increased levels of activity in either sector could potentially lead to conflict, particularly with respect to risk of damage to trawl gear. Static gear fisheries operate closer inshore and do not interact with most shipping, although ferry routes effectively close some potential fishing areas to creel fisheries and there are seasonal conflicts in some locations with respect to tourist vessels.

There is a mutually positive perception of interactions between fisheries and small or medium ports, although concerns were expressed by the fisheries sector about the need for ongoing investment in maintaining suitable port facilities for fishing vessels and about potential "gentrification" of some ports to attract leisure craft.

Dredging activities for maintenance of ports or shipping channels are potentially conflicting with trawl fisheries interests (through exclusion of fishing vessels from dredge disposal sites or damage to fish spawning or nursery grounds). However, interactions within the Firth of Clyde were perceived by trawl fisheries as adequately managed and not conflicting with fishing grounds or key resources.

A4.3.2.3 Mariculture

The commercial shipping industry is not generally impacted by near shore mariculture facilities with respect to navigation, but does see retention of refuge anchorages in sheltered bays as an area of potential conflict that may not always be addressed through the planning process. Issues may also arise from poor practice at fish farm sites e.g. if marker buoys impede shipping channels. The mariculture industry identified concerns about marine pollution, including (fuel) oil pollution and potential introduction of pathogens in ballast water, as a potentially conflicting interaction with commercial shipping interests. Dredging operations for harbour or channel maintenance are also of potential concern to the mariculture industry.

A4.3.2.4 Recreation and Tourism

Potentially conflicting interactions between recreational craft and shipping in the Firth of Clyde are generally perceived by both sectors as being well managed through international and local mechanisms and fora such as the District Safety Committee, particularly within areas under Clyde Port's jurisdiction (see section 6.2). However, some concerns were expressed about inexperienced recreational sailors being unaware of marine navigation and safety rules.

Jet skiing was perceived as conflicting with commercial shipping interests, implying absence of effective management mechanisms. Revised byelaws are being introduced at locations such as Ardrossan, where there are particular conflicts between jet skies and ferries. However, policing and enforcement are seen to be problematic, particularly in wake of a High Court ruling in England that determined that jet skies are not vessels under the terms of the Merchant Shipping Act.

Sea kayakers were perceived as conflicting with port operations, with concerns raised as to safety while kayakers regarded ports as conflicting with their interests as no access is permitted. However, kayakers felt that current shipping levels in the Firth were not generally problematic to their interests, so long as care is taken in areas such as those adjacent to ferry termini and when crossing main shipping channels. A number of recreational interests expressed concerns about ferry washes adjacent to jetties or slipways

Issues arising from pressure for leisure berthing space, either in existing smaller ports, or through the development of new facilities such as marinas or slipways, were perceived as competitive and addressed adequately through existing mechanisms.

Dredging operations are of concern to recreational divers, because of impacts on natural heritage interests and are viewed as competing by sea anglers.

A4.3.2.5 Management of Environment and Natural and Historic Heritage

The Chamber of Shipping perceives interactions with water quality management as competitive and managed through the provisions of MARPOL; however, enforcement of regulations is perceived as a potential issue by SEPA with respect to meeting WFD requirements. Shipping interests also identified conflicts, particularly within confined areas such as the Firth of Clyde, with management of natural heritage interests arising from perceived lack of consultation. Conversely, the natural heritage management sector viewed interactions with shipping as essentially competitive, but expressed particular concerns over the absence of local mechanisms to influence the routing of ships to avoid sensitive areas and over potential release of alien species from ballast water.

The ports sector perceived most interactions with natural heritage management as neutral or competitive (e.g. with respect to management options in event of an oil spill or with respect to landscape implications of new developments) but characterised the interaction of natural heritage management with dredging operations as creating a lot of bureaucracy and as being incompatible with respect to SPAs. From the natural heritage management sector's perspective, larger port developments were characterised as incompatible with protection of inter-tidal and coastal habitats. Dredging, associated with maintenance of ports and navigation channels, was classed as

conflicting with natural heritage management in the inter-tidal and sub-tidal zone and as competing with management of water quality. There are currently particular regulatory issues relating to dredging operations and to dredge spoil disposal management (which is covered by FEPA consents procedures) and compliance with WFD requirements. Safeguard of unscheduled historic heritage interests may also be in conflict with dredging operations, and dredging is also of concern to recreational divers and sea anglers.

Management of landscape and seascape interests is perceived as competing or conflicting with ports developments, depending on the nature of specialist advice given and the extent to which such advice informs consents.

A4.3.2.6 Renewable Energy

The Chamber of Shipping saw development of marine renewables as potentially conflicting with navigation. However, both ClydePort, and the renewables industry, typified the interaction with shipping interests as competitive, given the provisions of the CPA and the port authority's role in issuing works licences. Particular issues could arise with respect to structures being placed in sea between shipping channels and the coast in case of any incident such as a vessel losing power. The renewables sector identified possibilities for generation schemes to be incorporated into ports and larger ports were seen as necessary to berth construction or support vessels. Similarly, the Chamber of Shipping identified potential for increased business associated with activities such as cable laying.

A4.3.2.7 Other Interactions

Potential conflicts between routine movements of naval craft, especially submarines, and commercial shipping were perceived as being managed through existing mechanisms which ensure communication between the Queens Harbour Master and Clyde Port.

Absence of consultation with port authorities about coastal developments, particularly where these affect lighting (e.g. installation of flood lights at sports fields) was identified by Clyde Port as a potential conflict with respect to navigational safety of vessels approaching harbours.

Marine litter was identified as a problem because of potential damage to ships, dock infrastructure, navigation aids (such as buoys) and dredging equipment. Conversely, shipping was perceived by conservation and amenity interests as contributing to the marine litter problem.

A4.3.3 Overview of Interactions

A4.3.3.1 Sectoral Perceptions

The main concern for the shipping and transport sector is the safe navigation and passage of vessels (commercial, naval, pleasure and fishing) through the Firth.. The industry itself perceives that competition within the Firth of Clyde for navigation rights is generally adequately managed, through international agreements (e.g. IRPCS) and local measures, principally ClydePort byelaws and the Marine Safety Committee. However, particular issues arise with respect to jet skis.

However, some areas of conflict with respect to access marine space were identified by the sector, mainly with respect to mariculture, where it is perceived that existing consents mechanisms do not enable adequate consultation on the needs of the commercial shipping industry.

A4.3.3.2 Perceptions of other sectors

Overall the majority of potentially conflicting interactions with commercial shipping and ports interests were perceived as managed through various mechanisms. However, some areas of potential conflict were identified, particularly with respect to perceived threats of pollution from chemical (oil) spillage or the introduction of invasive species from ballast water. Safety issues were also identified with respect to wash from ferries affecting other users of slipways. More generally there is potential for complex interactions between issues such as availability of suitable

access points to water for interests such as sea kayakers and their exposure to potentially dangerous interactions with other users such as ferries or commercial shipping.

Dredging operations, including disposal of dredge spoil, associated with maintenance of navigation channels and ports are seen as a source of conflict with a number of interests, because of their impacts on water quality and/or natural heritage features. While the ports sector perceives current mechanisms for managing dredging impacts as being highly bureaucratic, environmental regulators and advisers identified a number of gaps in current provisions for regulation, e.g. with respect to WFD compliance and safeguard of unscheduled marine archaeology Possible future land reclamation for ports developments is also perceived as a major threat by natural heritage conservation interests.

The presence of smaller ports was seen as beneficial to interests such as fisheries and leisure craft, although there is potential for competition for access.

A4.3.4 Potential role of FoCMSP

Current levels of commercial shipping and other water traffic (fishing boats, naval vessels and leisure craft) within the Firth of Clyde mean that existing mechanisms, ranging from international agreements on maritime navigation (e.g. IRPCS) and safety (e.g. SOLAS) to local port byelaws, informed by the District Safety Committee, are generally perceived as adequately managing any potential conflicts over navigation rights. In this context, the development of forward sectoral plans and their integration within the FoCMSP will enable a longer-term strategic view to be taken of the potential for any new conflicts to arise in future (e.g. in the light of the expansion of the marine leisure sector or development of marine renewables). There is also potential for development of a strategic overview of desirable poor weather refuge sites for shipping within the Firth to inform future planning consents for mariculture developments.

The FoCMSP will also develop policies concerning provision of shore-based infrastructure, such as harbours and slipways, which recognise the potentially competing requirements of a range of users.

The development within the FoCMSP of an overview of the occurrence of species and habitats of priority interest for marine biodiversity conservation has considerable potential to assist regulators and statutory advisers in adopting a strategic approach to future resolution of potential conflicts between the ports sector and management of natural heritage interests e.g. with respect to dredging operations.

The development of a forward strategic plan for the renewable energies sector within Firth of Clyde and mapping of areas within Firth of Clyde that could technically be utilised for capture of marine, including wind, energy will enable potential points of conflict with shipping to be identified

The FoCMSP could potentially include demarcation of coastal zones within which terrestrial planners would be advised to consider the navigational implications of lighting of developments and to consult with the relevant port authority.

A4.3.4.1 Limitations of the FoCMSP

The identification of potential future pinch points with respect to navigation through the Firth of Clyde will be dependent upon the quality of data provided by various sectors on their intensity of usage across the Firth.

The FoCMSP *per se* has limited potential to address concerns among sectors such as mariculture and environmental and natural heritage management as to the adequacy of application of current, mainly internationally determined, regulations (e.g. MARPOL) governing issues such as oil spills and ballast water. However, a set of sustainability indicators will be developed in association with

the Plan and these could potentially include measures of the incidence and severity of shipping-related marine pollution incidents within the Firth of Clyde.

Similarly, there is limited scope for the FoCMSP to address issues arising from marine litter, other than identifying this as a problem and promoting systematic monitoring to assess scale of the problem in the Clyde and to determine, where possible, the probable origins of marine waste to inform future management.

There is no capacity within the resources allocated to development of the FoCMSP to enable a strategic overview to be prepared with respect of marine historic heritage interests, along the lines of English Heritage "Seascapes" programme, which was first applied within the context of the Irish Sea MSP pilot (MSPP Consortium, 2005b).

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A4.4 RECREATION AND TOURISM

A4.4.1 Overview of Sector

The Firth's proximity to the population centres of Glasgow and surrounding towns has long made it popular as a destination for day-trippers and holidaymakers. While the heyday of the Ayrshire coastal resorts are past, their sandy beaches remain the most frequently visited in Scotland and, in the western Firth, the Glaswegian tradition of day trips "doon the water" in a paddle steamer has been revived in recent years.

The Firth's sheltered waters and beautiful scenery have long made it a popular area for recreational sailing and motor cruising. There are c.5000 leisure craft (keel boats and motor cruiser) based in Firth of Clyde with almost 2,800 pontoon (marina) berths and c. 2,100 moorings. Recreational sailing activity was traditionally based around sailing clubs such as at Largs, Helensburgh and Royal Western (Greenock). However, the recent growth in leisure boating has been mainly associated with development of marinas (e.g. at Largs, Inverkip, Ardrossan, Holy Loch) which are attracting customers from outwith the immediate area; 30% of owners of vessels berthed in Firth are domiciled in England. The total value of marine leisure based industries in the Firth of Clyde, has been estimated at £80million p.a. and employs in the order of 1500 people (McKenzie Wilson Partnership, 2006) Scottish Enterprise consultants have identified leisure boating as a major opportunity for expansion within the Firth and have set a target to double marina capacity to over 5000 berths by 2015. Constraints include lack of qualified staff for ancillary industries such as boat repair.

Sea angling is also a long established leisure activity, although it has declined in recent decades (S. Bastiman, SFSA, pers. comm.). Other leisure activities, such as scuba diving, sea kayaking, jet skiing, and wind or kite surfing, are growing in popularity in the Firth and there are a number of wildlife watching or adventure boating businesses.

A4.4.2 Key Interactions between Recreation and Tourism and Other Sectors

A4.4.2.1 Intrasectoral

The presence of facilities such as marinas, slipways, moorings, anchorages, boat yards and tourist accommodation were generally seen as having a mutually beneficial relationship with marine leisure activities, particularly leisure boating. However, conflict may arise where development of a new facility, such as a marina, effectively removes previously accessible beach or slipway access used by groups such as kayakers. Several subsectors identified a shortage of accessible slipways, with adjacent car parking, as impeding pursuit of their activities.

Interactions between recreational vessels using the water were generally perceived as competitive in nature and adequately managed through mechanisms such as the District Safety Committee and co-ordination of dingy or yacht club racing schedules by the CYCA. However, particular issues were identified with respect to jet skis, which are perceived as causing considerable noise nuisance to other leisure interests and as potentially endangering dinghy sailors, sea kayakers, anglers, divers and bathers. Other small powerboats were identified as causing nuisance to moored or anchored craft in some locations and, if unfamiliar with protocols such as Flag Alpha, as posing a safety risk to divers and kayakers,.

Other potential safety issues were identified with respect to surf kayakers, wind/kite surfers and bathers using waters adjacent to beaches, but present levels of activity within the Firth were generally regarded as sustainable without regulation.

A4.4.2.2 Inshore Fisheries

In general, given current levels of commercial fishing activity within the most popular sailing areas, the leisure boating sector perceived interactions with commercial fishing interests as neutral. However, unmarked creel buoys are seen as a navigation hazard posing a particular problem for small power craft, which may be disabled if buoy ropes become entangled in propellers.

Conversely, wash from power vessels was identified by creelers as posing an unmanaged safety risk.

Trawl fishermen identified the presence of moorings and anchorages as being incompatible with their activities. In general, however, interactions between fishing interests and leisure craft were perceived by the fishing sector as competition, managed through international rules governing navigation and collision avoidance at sea (IRPCS). Some general, but minor, concerns were raised about lack of awareness of rules among some leisure craft skippers.

Recreational divers identified mobile gear fisheries, especially scallop dredgers, as conflicting or even incompatible with their interests through damage to seabed habitats and species. Sea anglers perceived trawl fisheries as conflicting with their sector through depletion of fish stocks and in particular, capture of non-target species by Nephrops boats.

Potential synergies between leisure boating and commercial fishing exist with respect to access to specialist support facilities such as marine engine repair businesses.

A4.4.2.3 Mariculture

There is competition between the mariculture sector and recreational boating interests for access to sheltered waters with easy shore access. Moorings or anchorages for leisure vessels cannot occupy the same space as mariculture sites and access between the land and sea for a wide range of recreational interests may be restricted by development of onshore facilities such as smolt units. The current trend towards larger fish farms situated further offshore is perceived by the leisure industry as potentially creating new conflicts with general navigation. Conversely, the mariculture sector perceives potential conflicts with leisure craft, especially powerboats, arising from disturbance or risk of collisions with cage structures or work vessels. Discharge of faeces from leisure craft in vicinity of fish farms and, especially shellfish growing sites, is a further concern.

Finfish farming is perceived as potentially detracting from amenity or biodiversity values by interests such as sea kayakers and recreational divers.

Potential synergies between leisure boating and mariculture exist with respect to access to specialist support facilities such as marine engine repair businesses.

A4.4.2.4 Shipping and Transport

Potentially conflicting interactions between recreational craft and shipping in the Firth of Clyde are generally perceived by both sectors as being well managed through international and local mechanisms, including the District Safety Committee, particularly within areas under Clyde Port's jurisdiction (see section 6.2). However, perceived conflicts arise from concerns among recreational users about ferry washes adjacent to jetties or slipways, while Clyde Port expressed concern about safety of sea kayakers in vicinity of commercial shipping. In this context, there may be potentially complex interactions between issues such as availability and locations of suitable access points to water for recreational users such as sea kayakers and their exposure to potentially dangerous interactions with larger vessels .

Dredging operations are of concern to recreational divers, because of impacts on natural heritage interests and are similarly viewed as competing by sea anglers.

Some concerns were expressed about inexperienced recreational sailors being unaware of marine navigation and safety rules. Jet skiing was perceived as conflicting with commercial shipping interests, implying absence of effective management mechanisms. Revised byelaws are being introduced at locations such as Ardrossan, where there are particular conflicts between jet skies and ferries. However, policing and enforcement are seen to be problematic, particularly in wake of a High Court ruling in England which determined that jet skis are not vessels under the terms of the Merchant Shipping Act.

There may be competition between commercial and leisure interests for berthing space in existing smaller ports; these interactions are perceived as being managed at a local level by port authorities e.g. through zoning, or through the development of new facilities such as marinas or slipways.

A4.4.2.5 Management of Environment and Natural and Historic Heritage

In general, leisure boating and other recreation interests perceive management for conservation of habitats and species as neutral or even advantageous, so long as such management does not place (arbitrary) restrictions on navigation or on access. Sea anglers would welcome creation of areas closed to commercial fishing.

However, potential conflicts were identified by the BMF with respect to impact of natural heritage management on the granting of consents, particularly with respect to dredging operations, for developments such as marinas and slipways. Conversely, natural heritage interests perceived such developments as conflicting or competing with protection of coastal, intertidal and seabed habitats and species principally as a consequence of land claim, dredging, inputs of sewage and other pollutants and potential disturbance of birds.

Management of landscape/seascape, historic heritage and water quality were also regarded across the sector as positive, for reasons of amenity and health. However, landscape/ seascape advisers perceived interactions with leisure related developments as being competing or conflicting, depending on extent to which specialist advice informs development decisions. Similarly, leisure boating and associated coastal and seabed infrastructure and support services raise concerns among water quality managers about potential impacts on water quality. Particular issues may arise where there is concentrated boating activity in the vicinity of designated bathing or shellfish growing waters, as sewage waste from leisure craft is discharged directly into the sea. Unmonitored seabed disturbance associated with moorings was perceived as conflicting with management for seabed archaeology while developments such as marinas may compete or conflict with historic heritage management.

A4.4.2.6 Renewable Energy

Tidal barrage schemes are perceived as incompatible with leisure boating and kayaking because of impedance of navigation. Other forms of marine renewables, such as wind, are perceived as potentially competing with larger leisure craft and as potentially conflicting with kayaking, depending upon impacts on navigation and aesthetics. Conversely, the renewables industry recognise that wind, tidal stream and tidal barrage technologies may compete with leisure boating interests over navigation but identify potential for microrenewables to be incorporated into marinas..

Recreational divers raise concerns about restrictions on access and potential impacts on marine wildlife while the renewables sector identify diving and sea angling as incompatible with tidal energy capture. However, both divers and sea anglers also suggest that marine wind farms might potentially act as artificial reefs, attractive to some forms of wildlife, and so be potentially beneficial to their interests. Wind and kite surfers see any reduction in wave energy reaching the shore as competing with their interests.

A4.4.2.7 Other Interactions

There is competition in some areas, notably Rhu Narrows and naval exercise areas for access to marine space between naval craft, including submarines, and leisure craft and concern about impact of wash from naval vessels at slipways and moorings. Kayakers may be especially at risk from collision or capsize. Shore facilities and associated exclusion zones limit access for recreational users and there is no consultation on their siting with respect to either impacts on access or aesthetics. Concerns over loss of access points were also raised by kayakers, divers and sea anglers with respect to all forms of coastal development.

Floating rubbish in the upper Firth is seen as a hazard to leisure craft and there are concerns among many leisure users, on grounds of both health and aesthetics, about continuing poor water quality, including presence of sewage-related waste, in some areas, including the Clyde estuary.

A4.4.3 Overview of Interactions

A4.4.3.1 Sectoral Perceptions

At present, the marine leisure sector is relatively little regulated and there is concern among participants across many different pursuits to maintain a culture of individual freedom to pursue activities without imposition of additional regulation. In this context, some marine leisure sectors, notably leisure boating, are using voluntary initiatives such as The Green Blue to address potential concerns among other sectors.

Given current levels of activity within the Firth of Clyde, there is general agreement that existing mechanisms, such as Clyde Port byelaws and the work of District Safety Committee, are sufficient to manage any potential conflicts among different interests within the sector as a whole, without the need for initiatives such as zonation of beaches. However, some interests, such as sea kayakers, are perhaps inadequately represented within current management fora within the Firth of Clyde.

Any impedance to navigation e.g. through creation of tidal power barrages was identified as a threat to leisure boating while marine litter and unmarked fishing gear floats have potential to damage leisure craft. Wash from other vessels, including ferries and naval craft, was identified as a potential safety and/or nuisance factor e.g. for kayakers, moored leisure vessels and for people on slipways.

Provision and maintenance of sufficient suitable access points, especially publicly accessible slipways/beaches with adjacent car parking, is a key concern for a number of sectors, including kayaking, scuba diving and kite surfing. Current consents procedures for operations such as dredging associated with marina development are perceived as very bureaucratic.

Recreational divers are concerned by activities such as dredging, salmon farming and trawling that may damage seabed habitats while sea anglers perceive trawl fishing, and associated discarding, as damaging to stocks of sport fish. Sea kayakers have particular concerns about impacts of renewable energy or mariculture developments on marine amenity and about poor water quality in the Clyde estuary.

A4.4.3.2 Perceptions of other sectors

Natural and historic heritage conservation interests expressed concern over impacts of dredging and land claim operations associated with construction of marinas and about seabed footprint of moorings if located in sensitive areas. The potential for leisure activities to cause disturbance to wildlife was a more general concern.

Leisure moorings and anchorages are seen as incompatible or conflicting with trawl fisheries and mariculture. However potential synergies were perceived between expansion of marine leisure sector, with associated opportunities for specialist businesses such as marine engine repair, and sectors such as inshore fisheries and mariculture. The marine renewables sector also identified possibilities for incorporation of microrenewables into marina developments.

Potential water quality impacts of leisure activities, e.g. through discharge of untreated sewage from leisure craft, are of concern to mariculture, especially shellfish growing, interests and to environmental regulators

Jet skies and small power boats were identified as posing safety risks and generating nuisance for a range of other interests including kayakers, divers, creelers and shipping.

A4.4.4 Potential role of FoCMSP

Current levels of marine based leisure activities within the Firth of Clyde are generally perceived as sustainable across key sectors, particularly with respect to navigation rights in marine areas, although some localised issues arise with respect to use of jet skis. Such issues are most appropriately addressed through fora such as the District Safety Committee, which might potentially be expanded to include interests, such as sea kayakers, not currently represented.

The FoCMSP will include strategic policies for sustainable management of the forecast ongoing expansion of the marine leisure sector, in particular leisure sailing and cruising, which take account of other interests. These will include consideration of provision of shore-based infrastructure, such as marinas, harbours, slipways and jetties to facilitate access between the sea and land for a range of leisure users.

These policies will be informed by a number of elements, including mapping of areas that could technically be utilised for capture of marine, including wind, energy to enable potential areas of conflict with leisure navigation to be identified. Similarly, the work of the Clyde Moorings Committee in mapping and classifying existing anchorages will be incorporated into GIS layers for the FoCMSP.

The development of an indicative seabed habitat map and of an overview of the occurrence of species and habitats of priority conservation concern have considerable potential to assist leisure interests, regulators and statutory advisers in avoidance or resolution of potential conflicts e.g. with respect to potential impacts of dredging operations or moorings on seabed habitats.

A4.4.4.1 Limitations of the FoCMSP

There is limited scope for the FoCMSP to address issues arising from marine litter, other than identifying this as a problem and promoting systematic monitoring to assess scale of the problem in the Clyde and to determine, where possible, the probable origins of marine waste to inform future management.

There is no capacity within the resources allocated to development of the FoCMSP to enable a strategic overview to be prepared with respect of marine historic heritage interests, along the lines of English Heritage "Seascapes" programme, which was first applied within the context of the Irish Sea MSP pilot (MSPP Consortium, 2005b).

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A4.5 MANAGEMENT OF ENVIRONMENT AND HERITAGE

A4.5.1 Overview of Sector

The Firth has for centuries acted as a deliberate or incidental repository for waste. Dredge spoils from navigation channel and harbour maintenance works within the estuary are deposited on the seabed at Cloch Point (south of Gourock) and there are a number of smaller licensed dredge spoil disposal sites adjacent to the Ayrshire coast (Barne *et al* 1997). From 1904 until 1998, when marine disposal was phased out under the 1991 Urban Waste Water Treatment Directive (91/271/EEC), sewage sludge from the Glasgow conurbation was dumped at the Garroch Head disposal site, off the southern tip of Bute (FRS, 2007). General standards of sewage treatment have been improving with implementation of the 1991 Directive. However, there are still numerous outfalls for discharge of storm runoff and effluent from sewage treatment works, especially in the inner Firth and estuary, and agricultural runoff is an increasingly significant source of pollutants . There are ten sites, seven of which are along the Ayrshire coast, designated under the Bathing Waters Directive and 15 designated Shellfish Growing Waters.

Marine and beach litter is a persistent problem in the Firth, with sites such as the head of Loch Long being particularly susceptible to accumulation of large volumes of seaborne rubbish (Barne *et al*, 1997). Some other beaches, adjacent to the estuary, accumulate exceptionally large amounts of sewage related litter (C. Duncan, MCS, pers. comm.).

There are no wholly marine areas within the Firth of Clyde given statutory protection for nature conservation purposes, but Ailsa Craig, much of the Inner Estuary and sections of the Black Cart have been designated as SPAs. The Firth contains numerous wrecks, a number of which are popular with recreational divers. None are subject to statutory designation for their historic significance, although two are protected under naval legislation (P. Robertson, Historic Scotland, pers. comm.) There are two designated National Scenic Areas, in North Arran and the Kyles of Bute, and numerous other non-statutory local landscape designations.

A4.5.2 Key Interactions between Management of Environment and Heritage and Other Sectors

A4.5.2.1 Intrasectoral

In general, interactions between the various subsectors (natural heritage, water quality, landscape and seascape, and historic and cultural heritage) were categorised as either neutral or mutually beneficial (e.g. protection of sunken wrecks from damage or disturbance may benefit biodiversity). However, there were some interactions identified as potentially competitive. These included possible damaging impacts on bird populations in intertidal areas arising from reduced nutrient inputs to the intertidal system as water quality rises, and, possible disturbance impacts on coastal habitats and wildlife from visitor pressure at historic sites. Potentially complex interactions were identified with respect to management for landscape/seascape interests and safeguard of biodiversity interests; depending on specifics these could range from positive to incompatible (e.g. if suggested relocation of wind turbines on visual grounds increased risk of bird strike).

A4.5.2.2 Inshore Fisheries

The environment and heritage management sectors perceived the current general absence of controls on trawl and dredge fisheries within the Firth as conflicting with the safeguard of seabed morphology, habitats and associated species and with marine archaeology. Entanglement of non-target species (fish, birds, cetaceans etc) was also seen as conflicting with conservation interests, while indirect effects on food supply were identified as of concern with respect to birds. Harvesting of shellfish in the intertidal zone was identified as damaging to intertidal habitats and, through disturbance impacts, associated birds. Creel and dive fisheries are perceived as much less potentially damaging, although still potentially competing with some natural heritage interests on a more localised scale.

Inshore fisheries do not perceive current management for natural heritage interests in the Firth of Clyde, principally through designation of coastal or intertidal SSSIs and SPAs, as interacting with their interests. However, the mobile gear sector expressed concern about potential impacts of future management of marine biodiversity interests e.g. through marine extensions to SPAs. Similar reservations were expressed with respect to future management of underwater archaeology; essentially any form of exclusion zone is perceived as potentially damaging to mobile gear fisheries. Creel fishermen also expressed some concerns about potential impacts of future management to safeguard seabed habitats if these were not adequately consulted on, but identified protected wreck sites as potentially beneficial through serving as marine refuges

Management of water quality was viewed as positive by the sector (but see section 6.3.2).

A4.5.2.3 Mariculture

Natural heritage conservation interests view mariculture, particularly salmon farming as potentially damaging (because of issues such as development footprint, impacts on water quality, use of biocides, genetic or disease impacts on wild fish stocks and control of predators), but regard potential conflicts as being managed through statutory inputs to consents procedures and through application of voluntary mechanisms such as Area Management Agreements. The salmon farming sector also generally perceives there to be managed competition with respect to management for most natural heritage interests, largely mediated through site designations and good practice guidelines, although there is currently some conflict with respect to potential damage to cetaceans arising from use of acoustic seal scarers. The shellfish farming sector categorised interactions with natural heritage management as conflicting.

Given their advisory, rather than regulatory role, SNH view interactions between management of landscape and seascape and mariculture as either competitive or conflicting, depending on extent to which their advice is taken account of in granting consents and applying conditions to mariculture developments. Conversely, management of landscape and seascape is perceived by the salmon farming sector as based on somewhat subject criteria, and therefore conflicting, although shellfish farming interests see this interaction as competitive.

SEPA, in its role as regulator, sees potential conflicts with management of chemical, bacteriological or biological water quality as managed through existing consents procedures for finfish farms. However, some regulatory confusion exists with respect to dumping of shells from processing facilities and potential impacts on seabed morphology and biology. Conversely, the salmon farming industry typified most management for water quality as positive, although conflict may arise with respect to management of bacteriological quality and processing.

The transfer of mariculture developments to local authorities planning control is perceived by the historic heritage management sector as closing a potential loophole with respect to safeguard of unscheduled subtidal archaeology.

A4.5.2.4 Shipping and Transport

Potential conflicts with water quality and biodiversity management arising from risks of pollution from ships were regarded by all sectors as being managed (e.g. through the provisions of MARPOL), and hence competitive. However, concerns were raised by the natural heritage and environmental management sectors about the absence of local mechanisms to influence the routing of ships to avoid sensitive areas (e.g., hotspots for marine mammals) and over enforcement of existing regulations e.g. with respect to discharge of ballast water. Conversely, shipping interests identified conflicts, particularly within confined areas such as the Firth of Clyde, with management of natural heritage (biodiversity) interests, arising from perceived lack of consultation.

From the natural heritage management sector's perspective, port developments, and particularly associated land claim, were characterised, depending on their scale, as incompatible or conflicting with protection of inter-tidal and coastal habitats, and as conflicting or competing with management of birds. Management of seabed habitats and of mobile species was seen as

competing with all port developments. Dredging, associated with maintenance of ports and navigation channels, was classed as conflicting with natural heritage management in the inter-tidal and sub-tidal zone and as competing with management of water quality. Some particular concerns were raised over a current legislative lacuna whereby regulation of dredging operations under FEPA is not compliant with WFD requirements with respect to assessment and safeguard of morphological quality. Safeguard of unscheduled historic heritage interests in subtidal areas may also be in conflict with dredging operations. Conversely, the ports sector perceived most interactions with natural heritage management as neutral or competitive (e.g. with respect to management options in event of an oil spill or with respect to landscape implications of new developments). Management of dredging operations to safeguard natural heritage interests was perceived as highly bureaucratic, and while in general competitive, potentially incompatible in the case of SPAs.

Management of landscape and seascape interests is perceived as competing or conflicting with ports developments, depending on the nature of specialist advice given and the extent to which such advice informs consents. Shipping per se is not covered by mechanisms governing protection of landscapes or seascapes.

A4.5.2.5 Recreation and Tourism

In general, there are few perceived interactions between natural heritage management and leisure craft, other than with respect to disturbance issues (which are currently addressed primarily through the Marine Wildlife Watching Code); in this context small power craft and jet skis are seen as potentially conflicting with management for birds and other mobile species. Conversely, the leisure boating and other interests (such as diving) perceive management for conservation of habitats and species as neutral or even advantageous, so long as such management does not place (arbitrary) restrictions on navigation or on access. Sea anglers would welcome creation of areas closed to commercial fishing.

However, potential conflicts were identified by natural heritage managers with respect to associated infrastructure developments, such as marinas or slipways. These were perceived as conflicting or competing with protection of coastal, intertidal and seabed habitats and species principally as a consequence of land claim, dredging, inputs of sewage and other pollutants and potential disturbance of birds. Conversely, the BMF characterised such interactions as competing or conflicting, depending on specifics.

Landscape/seascape advisers perceived interactions with leisure related developments as being competing or conflicting, depending on extent to which specialist advice informs development decisions. Similarly, leisure boating may potentially compete with water quality management (e.g. where there is concentrated boating activity in the vicinity of designated bathing or shellfish growing waters), as sewage waste from leisure craft is discharged directly into the sea. Unmonitored seabed disturbance associated with moorings was perceived as conflicting with management for seabed archaeology while developments such as marinas may compete or conflict with historic heritage management. However, across the marine leisure sector, management of landscape/ seascape, historic heritage and water quality were regarded as positive, for reasons of amenity and health. However, there is concern to avoid additional regulation and the sector has developed a voluntary (Green Blue) initiative to promote positive behaviour with respect to safeguard of water quality and the environment.

A4.5.2.6 Renewable Energy

Tidal barrage schemes were perceived as incompatible with natural heritage management. Potential impacts of other types of developments were regarding as highly dependent upon specifics (e.g. location, project phase, types of devices deployed and their arrangement), but interactions were generally regarded as competitive and managed through licensing and consents procedures. However, particular concerns were expressed with respect to risk of bird strike in wind turbines and electromagnetic impacts of subsea cables on some fish species. The renewables industry perceived tidal barrage schemes as possibly conflicting with management of intertidal

habitats, but regarded most other potential interactions as either competitive, or, in the case of wave energy capture, neutral.

Similarly, landscape and seascape interests perceived interactions with deployment of renewables technologies as being either competitive or conflicting, depending upon the extent to which specialist advice informs decision making, while the industry identified possible competition with respect to wind or tidal turbines. The anchoring of devices to the seabed raises issues with respect to physical and ecological water quality; these are seen as managed through existing consents procedures. Interactions with coastal and seabed archaeology are perceived by both sectors as largely managed; however there is no statutory mechanism in place to manage potential conflicts with respect to unscheduled subtidal interests.

A4.5.2.7 Other Interactions

Naval restricted areas are seen as potentially beneficial to natural heritage and environmental management through exclusion of fishing and reduced disturbance from other activities. However, presence of munitions dumps is regarded as conflicting with management of seabed and coastal habitats and with chemical water quality management and as preventing access for survey or management of marine archaeology. The use of sonar is seen as conflicting with protection of cetaceans. All coastal developments are regarded as potentially competing with management of historic heritage, water quality and coastal and intertidal habitats and may also increase disturbance of birds in these habitats. Construction of hard coastal defences is seen as having particular potential to conflict with natural heritage management. Marine and beach litter is perceived as conflicting, or in the case of intertidal and coastal habitats, as being incompatible with, natural heritage management. Similarly, landscape and seascape interests perceive coastal developments as being either competitive or conflicting, depending upon the extent to which specialist advice informs decision making,

A4.5.3 Overview of Interactions

Management for safeguard of natural heritage interests, including attainment of physical and biological environmental quality standards under WFD, is a major source of potential conflict with a number of other interests within the Firth of Clyde. In the absence of site designations in the subtidal zone and their virtual absence, with the notable exception of the Inner Clyde SPA, in the intertidal zone, such potential conflicts arise principally in the context of consents procedures, and related processes such as EIA, associated with individual applications for developments. In this context, concerns among conservation agencies and NGOs and environmental regulators about potential damage to ecosystems, sensitive habitats and species, and landscapes/seascapes are mirrored by converse concerns from commercial interests such as ports operators and marine leisure interests over perceived barriers to development, with land claim or dredging operations being a particular focus of contention (UK CEED, 2000). There is a perception that some restrictions imposed for reasons of natural heritage conservation, environmental management or safeguard of landscape/seascape may be rather *ad hoc* in nature.

Another generic issue of concern to nature conservation interests, particularly with respect to breeding or wintering waders and wildfowl, is that of disturbance associated with commercial or residential developments and with pursuit of leisure activities, on or near the shore. Large mobile species such as cetaceans may also be directly disturbed by commercial or leisure vessels, especially powerboats or jet skies, or by sonar devices.

Interactions with mariculture developments are, however, generally perceived as competitive in nature and adequately managed through existing consents procedures and voluntary initiatives such as Area Management Agreements. The impact of the transfer of planning control for fish farms to Local Authorities in April 2007 has yet to be evaluated.

Anxieties among the mobile gear fishing sector about possible future restrictions on their activities for reasons of safeguard of natural heritage or marine archaeological interests mirror concerns among environmental protection and natural and historic heritage interests about the potential

impacts of such fisheries on seabed habitats, commercial species, other mobile species taken as bycatch, marine food chains and historic artefacts.

With respect to shipping, nature conservation interests expressed concerns about the adequacy and enforcement of international regulations intended to address pollution risk, including potential introduction of alien species in ballast water. Both shipping and nature conservation interests indicated that absence of locally based consultation on potential impacts of their activities was an issue within a confined area such as the Firth of Clyde.

Management for bacterial and chemical water quality is generally less contentious, and generally viewed as competitive in nature, with many interests themselves identifying high water quality as important. As a corollary, groups such as kayakers, divers and fish farmers view sewage disposal as a conflicting activity. Leisure boating interests are resistant to further regulation and are working to address concerns surrounding pollutants, sewage waste and rubbish disposal from leisure craft through a voluntary initiative.

With respect to management of historic heritage, current statutory mechanisms for managing potential conflict do not apply to unscheduled sites below MLWM, other than with respect to aquaculture developments where local authorities now have planning control. Potential impacts on unscheduled archaeology (which includes the vast majority of wrecks) in the subtidal zone are covered only by a voluntary code of practice for seabed development (P. Robertson, HS).

A4.5.4 Potential role of FoCMSP

The preceding section indicates that an underlying factor contributing to perceived conflicts between natural heritage conservation and other interests is the absence of a strategic overview of local and national biodiversity conservation priorities within the subtidal areas of the Firth of Clyde. There are no equivalent designations to SSSIs within the subtidal zone to indicate where conservation priorities lie. The current operation of marine consents procedures might be seen as akin to planners in the terrestrial sphere lacking basic knowledge as to the habitats and species present at proposed development sites, and of the overall abundance and wider significance of such assets at local or national levels. It is therefore perhaps unsurprising that management for natural heritage interests is widely viewed, by both conservation bodies and prospective developers and other interests, including fisheries, as generating wide-ranging potential for conflict.

The SSMEI Clyde Pilot is attempting to address these difficulties by commissioning projects to produce an indicative seabed habitat map for the Firth and also to collate and map existing data on priority marine habitats and species across the Firth of Clyde. The outputs of these projects will be incorporated as GIS layers within the FoCMSP to provide a strategic overview, insofar as data limitations permit, of marine natural heritage interests within the Firth. This will assist relevant agencies in identifying marine biodiversity hotspots within the Firth of Clyde and so inform both the development of generic policies for the safeguard of priority conservation interests and the consents procedure with respect to specific developments.

A4.5.4.1 Limitations of the FoCMSP

There is limited scope for the FoCMSP to address issues arising from marine litter, other than identifying this as a problem and promoting systematic monitoring to assess scale of the problem in the Clyde and to determine, where possible, the probable origins of marine waste to inform future management. Similarly, potential disturbance impacts, while potentially damaging to natural heritage interests, are generally difficult to quantify or address at a strategic level. Their management may require specific actions (e.g. promotion of the Marine Wildlife Watching Code among trainee yacht skippers, rerouting of paths to reduce disturbance of birds feeding on the upper foreshore; seasonal closure of shingle beaches used as nesting sites by terns and plovers) to be taken at local levels, depending upon the precise issues However, the identification f hotspots for mobile species within the Firth may assist in the development of future management options

There is no capacity within the resources allocated to development of the FoCMSP to enable a strategic overview to be prepared with respect of marine historic heritage interests, along the lines of English Heritage "Seascapes" programme, which was first applied within the context of the Irish Sea MSP pilot (MSPP Consortium, 2005b).

There is no provision of resources within the SSMEI Clyde Pilot to enable the preparation of a strategic assessment of landscape/seascape carrying capacity for leisure-related developments across the Firth of Clyde. However, this aspect will be examined within the SSMEI Sound of Mull Pilot (S. Benfield, pers. comm.).

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A4.6 RENEWABLE ENERGY

A4.6.1 Overview of Sector

To date (November 2007) there has been no development of marine renewables within the Firth of Clyde. However, the Scottish Government has recently set new targets for generation of electricity from renewables in Scotland of 50% by 2020, with an interim target of 31% by 2011[1]. In this policy context, and given the potential, albeit relatively limited, for harnessing of tidal or wind power within the Firth of Clyde (DTI, 2004) this sector will be included in development of the FoCMSP.

A4.6.2 Key Interactions between Marine Renewables and Other Sectors

A4.6.2.1 Intrasectoral Interactions

Potential interactions between various types of marine renewables were identified as either neutral or potentially positive, with respect to infrastructure such as cabling.

A4.6.2.2 Inshore Fisheries

Both trawl fisheries and the renewables sector identified most interactions between them as competition, primarily because of potential restrictions on access to fishing grounds, although FRS also identify potential damage to fished stocks (from effects such as smothering, marine noise, decrease in wave exposure or current, and creation of barriers to movement for migratory species) as an issue. However, the renewables sector perceived potential interaction with Nephrops trawling as neutral, on the basis that renewable energy devices would not be deployed in areas with muddy bottom sediments. Potential issues were identified for scallop dredge fisheries with respect to cabling to connect energy capture devices to the shore. Creelers characterised interactions with renewables as neutral. However, the renewables sector identified interaction between tidal stream energy capture and creel fisheries as potentially conflicting.

A4.6.2.3 Mariculture

There are potentially complex interactions between these sectors, which are as yet untested in Scotland, given the current early development stage of offshore renewables. There is potential for positive synergies with salmon farming in terms of technologies development, logistics for structure maintenance, siting of microrenewable devices on mariculture structures or creation of sheltered locations for large offshore fish farms. However, there is potential also for competition over space and the mariculture industry has concerns about potential impacts of marine renewables, particularly wind farms or tidal barrages, on features such as current flows, water quality (suspended sediment loading or substrate smothering) and fish health (through noise /vibration or electromagnetic stress). Within the Firth of Clyde, there is probably limited spatial overlap between existing mariculture locations and any potential offshore wind farm sites. However, proposed barrages within sea lochs could interact with mariculture interests and the potential synergies between microrenewables and mariculture are largely unexplored.

A4.6.2.4 Shipping and Transport

The Chamber of Shipping saw development of marine renewables as potentially conflicting with navigation. However, both ClydePort, and the renewables industry, typified the interaction with shipping interests as competitive, given the provisions of the CPA and the port authority's role in issuing works licences. Particular issues could arise with respect to structures being placed in sea between shipping channels and the coast in case of any incident such as a vessel losing power. The renewables sector identified possibilities for wind or tidal barrage generation schemes to be incorporated into ports and larger ports were seen as necessary to berth construction or support vessels. Similarly, the Chamber of Shipping identified potential for increased business associated with activities such as cable laying.

[1] http://www.scotland.gov.uk/News/Releases/2007/11/27095600

A4.6.2.5 Recreation and Tourism

The renewables industry recognise that wind, tidal stream and tidal barrage technologies may compete with leisure craft over navigation, while sailors and kayakers perceive tidal barrages as incompatible with their interests. Other forms of marine renewables, such as wind, are generally perceived by the leisure sector as potentially competing with larger leisure craft, while kayakers are concerned not only about navigation but also aesthetics. The renewables sector identifies diving and sea angling as incompatible with tidal energy capture, while recreational divers raise general concerns about restrictions on access and potential impacts on marine wildlife. However, sea anglers suggest that marine wind farms might potentially act as artificial reefs, attractive to some forms of wildlife, and so be potentially beneficial to their interests. Wind and kite surfers see any reduction in wave energy reaching the shore as competing with their interests. There is potential for microrenewables to be incorporated into marinas

A4.6.2.6 Management of Environment and Natural and Historic Heritage

The renewables industry perceived tidal barrage schemes as possibly conflicting with management of intertidal habitats, but regarded most other potential interactions as either competitive, or, in the case of wave energy capture, neutral. Biodiversity conservation interests perceived tidal barrage schemes as incompatible with natural heritage management. Potential impacts of other types of developments were regarding as highly dependent upon specifics (e.g. location, project phase, types of devices deployed and their arrangement), but interactions were generally regarded as competitive and managed through licensing and consents procedures. However, particular concerns were expressed with respect to risk of bird strike in wind turbines and electromagnetic impacts of subsea cables on some fish species.

Landscape and seascape interests perceived interactions with deployment of renewables technologies as being either competitive or conflicting, depending upon the extent to which specialist advice informs decision making, while the industry identified possible competition with respect to wind or tidal turbines. Interactions with coastal and seabed archaeology are perceived by both sectors as largely managed; however there is no statutory mechanism in place to manage potential conflicts with respect to unscheduled subtidal interests.

The anchoring of devices to the seabed raises issues with respect to physical and ecological water quality; these are perceived as managed competition through existing consents procedures.

A4.6.2.7 Other Interactions

There is potential conflict between marine wind farms and naval radar and no potential for development within restricted areas; other potential interactions between renewables and naval vessel or activities were regarded by the industry as competitive. Coastal residential development was perceived as potentially competing with wind or tidal barrage developments because of potential objections to such schemes from coastal residents but opportunities were seen for potentially incorporating microgeneration schemes into costal defences.

A4.6.3 Overview of Interactions

A4.6.3.1 Sectoral Perceptions

The renewable energy sector is aware of potential conflicts of interest with other interests, particularly with respect to navigation or access (e.g. for sports divers) and impacts on natural heritage and landscape/seascape, but perceives such conflicts as being manageable through consultation and application of existing consents procedures. The sector also identifies potential for synergies with others either through incorporation of generation capacity into structures such as ports, marinas and fish farms or through sharing of technologies and facilities, such as work vessels for servicing offshore structures.

A4.6.3.2 Perceptions of other sectors

Several sources of concern were identified with respect to potential development of renewables. The first was potential restriction of navigation or access for fishing vessels, shipping, larger

leisure craft and divers. Renewables were also identified as having potentially damaging effects on natural heritage interests or fish stocks either directly through development footprints or through indirect effects such as alteration to current flows; in this context tidal barrages may conflict with management of intertidal habitats. Potential aesthetic impacts are of concern to landscape/seascape advisers and to interests such as sea kayakers concerned by "industrialisation" of the marine area, while sports relying on waves are concerned by any potential diminution in wave energy. Sea anglers identified creation of artificial structures with restricted access as potentially beneficial to some fish stocks

A4.6.4 Potential Role of the FoCMSP

The development of a forward strategic plan for the renewable energies sector within Firth of Clyde and mapping of areas within Firth of Clyde that could technically be utilised for capture of marine, including wind, energy will enable potential areas of conflict with other sectors over navigation and access to be identified.

The development of a seabed habitat map and mapping of occurrence of priority marine species and habitats will provide a strategic overview, insofar as data limitations permit, of marine natural heritage interests within the Firth. This, in conjunction with the SEA of marine renewables in Scotland (Scottish Executive, 2007), will also assist in development of policies for the safeguard of priority conservation interests in context of potential renewables developments.

A4.6.4.1 Limitations of the FoCMSP

There is no capacity within the resources allocated to development of the FoCMSP to enable a strategic overview to be prepared with respect of marine historic heritage interests, along the lines of English Heritage "Seascapes" programme, which was first applied within the context of the Irish Sea MSP pilot (MSPP Consortium, 2005b).

There is no provision of resources within the SSMEI Clyde Pilot to enable the preparation of a strategic assessment of landscape/seascape carrying capacity for marine renewables across the Firth of Clyde.

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