European Commission

Land Sea Interactions in Maritime Spatial Planning

The inclusion of land-sea interactions (LSI) in the Maritime Spatial Planning (MSP) Directive recognises that effective maritime spatial planning cannot take place unless consideration is given to the interface between terrestrial and marine environments. In particular, Recital 15 states that MSP should aim to 'integrate the maritime dimension of some coastal users or activities and their impacts and ultimately allow an integrated and strategic vision.'

This brochure has been produced to give an understanding of how to address LSI in the development of marine spatial plans.

Fresh Thoughts Consulting
where policy meets science

ACTeon environment research & consultancy

ABP mer

milieu
Law & Policy Consulting

eco logic

BEF GROUP

1 About this brochure

The LSI of eight of the most typical marine development sectors are described below, along with the key messages and issues to be considered in the MSP process.

This list of sectors is not exhaustive, and their relative importance will vary according to the specificities of plan and its locality.

This brochure results from a European Commission study examining LSI in the planning process. Potentially significant LSI have been identified for each of the eight sectors on the basis of a desk study reviewing marine and coastal plans, projects and developments.

A Three broad categories of LSI have been identified: **environmental**, **socio-economic** and **technical**.

For each potentially significant LSI, the study has considered:

B **Sources of information** that can assist the consideration of the LSI.

C **Existing policies and guidance** that are relevant to the consideration of the LSI.

D **Assessment tools** that can be used to analyse the LSI.

E **Potential mitigation measures** that might be applied to minimise negative impacts or maximise positive impacts.

F **Stakeholders** that should be engaged in discussions around the LSI.

G **Options** for addressing the LSI through plan making.

Case examples have been used to illustrate good practice in addressing LSI issues at different stages in plan-making processes. These case examples have been drawn from a wide range of sources including marine plans, sectoral plans, terrestrial plans and individual projects.

For each of these topics the issues and information planners need to consider are set out in **matrices** based on the generic marine planning process: scoping, assessment, analysis, plan-development and review. Using information from the plan review the matrices use generic LSI created for illustrative purposes.

When addressing LSI planners need to consider:

- *Vertical, geographical and sectoral separation of decision making*
- *Role and engagement of private/commercial sectors*
- *Using the Ecosystem Based Approach*
- *Scale and availability of data*
- *Political context*
- *Expected climate change impacts.*

STEP 1: SCOPING	STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
INTERACTIONS	KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
ENVIRONMENTAL	B	C	D	E	F	G
SOCIO-ECONOMIC	A					
TECHNICAL						

The relationship between the MSP Directive and LSI

Understanding and accommodating LSI is critical to the successful delivery of MSP and cohesive management at the coast. The MSP Directive (2014/89/EU) specifically requires Member States to take account of LSI.

The Directive notes that should LSI not form part of the MSP process directly, Member States may use other formal or informal processes, such as integrated coastal management (ICM). Member States shall reflect the outcomes in their maritime spatial plans.

Member States should aim through MSP to promote coherence of maritime spatial plans with other relevant processes. Addressing LSI is one key to achieving this coherence.

The role of Integrated Coastal Management in delivering LSI

Management of the land-sea interface has been promoted at a European level through the process of ICM or Integrated Coastal Zone Management (ICZM). ICM is a process for the management of the coast using an integrated approach, regarding all aspects of the coastal zone, including geographical and political boundaries, in an attempt to achieve sustainability. The tools developed by ICM are important in the identification, assessment and management of LSI to ensure the economic, social and environmental sustainability of Europe's coastal regions. The ICM principles are:

1. Take a broad overall perspective
2. Take a long-term perspective
3. Use adaptive management
4. Retain local specificity
5. Work with natural processes and respect the carrying capacity of ecosystems
6. Involve all parties concerned in the management process
7. Gain support and involvement of relevant administrative bodies
8. Use a combination of instruments designed to facilitate coherence between sectoral policy objectives and coherence between planning and management, regional and local level.

Aquaculture LSI

Summary

Aquaculture development has the potential to give rise to a range of LSI including:

- Environmental LSI associated with landscape impacts, water quality changes (including from organic and inorganic waste emission), fish parasites (such as sea lice affecting wild fish populations), aquaculture gear loss and accidental escapes of farmed fish.
- Socio-economic benefits in terms of local income and employment by the aquaculture sector.
- Socio-economic LSI associated with impacts of water quality changes on coastal tourism and recreational boating, and benefits in terms of local income and employment impacts associated with water quality changes, poor sea lice management and accidental escapes of farmed fish.
- Technical LSI associated with provision of suitable landing and processing facilities and transport links.

The LSI for Aquaculture should be considered in conjunction with those discussed in the Fisheries.

Examples

1. ISSUES IDENTIFICATION

The Code of Practice for Scottish Finfish Aquaculture (UK) establishes high minimum standards of practice for finfish aquaculture producers and supports compliance with regulatory requirements. It covers all aspects of finfish aquaculture operations including specific guidance on hazard analysis and critical control points.

- *http://thecodeofgoodpractice.co.uk/chapters/*

In France, professionals from the aquaculture sector created a "Quality Charter - Aquaculture of our Regions" and developed a "Label Rouge" (e.g. for bar and turbot fish), guaranteeing a healthy fish diet, exemplary traceability and optimal freshness, thus preventing negative LSI (including negative impacts on the environment, other farms, native fish populations...). For instance, rigorous checks on sanitary conditions, water quality and installations are guaranteed and monitored. See:

- *http://www.poisson-aquaculture.fr/demarche-qualite/* Quality Charter.
- *http://www.aqualabel.fr/fr/* Label Rouge.

2. EVIDENCE COLLECTION

The Scottish Aquaculture Research Forum (SARF) commissioned research on the public perception of fish farming. The work concluded that increased development would not reduce tourist likelihood to return to the area suggesting aquaculture does not have a detrimental effect on visitor numbers. A similar study conducted in Catalonia also found no perceived negative impact. See:

- *https://tinyurl.com/y8gg6gw9* - Scotland 1 (2011).
- *https://tinyurl.com/ydxwvnoc* - Scotland 2 (2009).
- *https://tinyurl.com/y6ut8blu* - Catalonia (2014).

In France however, residents have opposed to extension of aquaculture infrastructure projects due to "visual and noise pollution". In South Brittany, there are conflicts between coastal hikers and aquaculture zones.

- *http://fcsh.unl.pt/geoinova/revistas/files/n11-10.pdf*

3. ASSESSMENT

The Aquabest project worked to improve spatial planning to create new sustainable aquaculture in the Baltic Sea region. The project produced spatial planning guidelines for aquaculture in the Baltic Sea Region. The project recommended that Geographic Information System (GIS) analysis be used to identify sites that are suitable with respect to environmental and economic sustainability.

Within the AquaSpace project (Ecosystem Approach to making Space for Sustainable Aquaculture), the French research institute IFREMER (Institut français de recherche pour l'exploitation de la mer) has developed the SISAQUA application (Spatial Information System for Aquaculture in Normandy). It is a prototype of a decision support system based on the use of GIS and Web technologies.

- *http://www.aquabestproject.eu/aquabest-project/work-packages/spatial-planning.aspx* Baltic Sea.
- *https://wwz.ifremer.fr/lern/Projets-de-recherche/SISAQUA-planification-spatiale* North Sea & Manche.

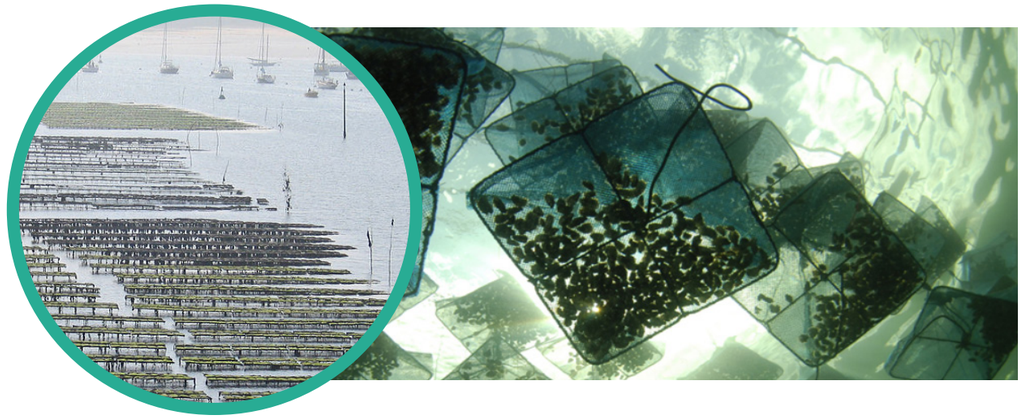
4. PLAN MAKING

The European Commission has produced a document to aid with applying the legal requirements of the Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD) in relation to aquaculture. This document is intended for use in the development of sustainable aquaculture so that it properly complies with all features of the WFD. See:

- *http://ec.europa.eu/environment/marine/pdf/SWD_2016_178.pdf*

In France, the 2010 Agriculture and Fisheries Modernization Act planned the elaboration of regional marine aquaculture development plans (SRDAM). Their purpose is to identify, in each region of the metropolitan coast, the existing sites and sites for further development of marine aquaculture, taking into account current and future activities and environmental issues.

- *http://www.dirm.mediterranee.developpement-durable.gouv.fr* Mediterranean coast.
- *http://www.dirm.sud-atlantique.developpement-durable.gouv.fr* South Atlantic coast.



5. IMPLEMENTATION

In France, Schemes for the Enhancement of the Sea (SMVM) for both maritime and coastal areas allocated land and sea areas to the aquaculture sector, for production and transformation processes, in conjunction with other uses. In the municipality of Villeneuve-lès-Maguelone in the Occitanie region a coastal erosion management plan was developed, to identify priority sectors at risk resulting in the "strategic retreat" or re-localization of aquaculture ponds, which were too close to the shore.

The COEXIST project has developed guidance on the integration of aquaculture, fisheries and other coastal activities based on six case studies. The Multi Criteria Analysis (MCA) tool developed by COEXIST was successfully used to support the development of a coastal plan for the Hardangerfjord region of Norway.

- *https://tinyurl.com/jlnka35* COEXIST project.
  www.smbt.fr/content/vocation-conchylicole French policy framework for integrated coastal zone management (ICZM) in Thau.
  http://vertigo.revues.org/2529 Analysis of the coastal erosion plan of the Villeneuve-lès-Maguelone municipality.

STEP 1: SCOPING		STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
	INTERACTIONS	KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
ENVIRONMENTAL	**VISUAL IMPACT OF INFRASTRUCTURE** Aquaculture infrastructure - Presence of infrastructure in the water (e.g. pens, floats, feed barges (for finfish)) may lead to landscape and visual impacts with the perceived or real loss of amenity value of the seascape.	**Data:** current aquaculture farm locations of finfish, shellfish and/or seaweed farms; seascape/landscape sensitivity **Sources:** National and local datasets (e.g. National regulator; Previous EIA and SEA; landscape character assessment).	National or regional strategic locational guidance for fish/ shellfish/seaweed farm Guidance on seascape/ landscape assessment.	Landscape and visual impact assessments (LVIA).	Location and scale of above surface infrastructure.	National government and regulators Statutory nature conservation advisors Local authorities; fisheries associations (in relation to wild fish populations and commercial fisheries) Statutory maritime safety agency Regional tourism board Local recreational groups (e.g. boating); Environmental NGOs; Developers.	Spatial management policies taking account of landscape and seascape sensitivity.
	IMPACT ON WILD FISH Farmed stock can impact on wild fish populations, for example, through the spread of sealice or via escapees breeding with wild populations (leading to genetic impacts). This could affect individual species, populations or entire ecosystems. One example is the impacts on protected migratory fish features and a subsequent effect on recreational fisheries.	**Data:** Fish migration routes; local fish stocks; site specific sealice density/problem **Sources:** Primarily national and international datasets (e.g. research publications on impact of escapes/sea lice/practices of previous farm stocks; previous EIAs and SEAs; internal company reports).	National finfish aquaculture strategies Sectoral EIA guidance.	EIA	Net arrangements Anti-predator netting Lice treatments.	National government and regulators Local Authorities National/regional fisheries associations Recreational angling bodies Statutory nature conservation advisors Environmental NGOs.	Regulation of finfish farms (location, cage design, use of sea lice treatments).
	IMPACT ON WATER QUALITY Waste emissions from finfish farms (e.g. arising from use of chemotherapeutants) may lead to changes in water quality which could have wide ranging impacts on the marine environment and human uses, for example they could potentially affect the classification of any nearby bivalve harvesting area, which in turn could influence the purification (depuration) requirements for any shellfish farmed or wild harvested in the same classification area.	**Data:** Mandatory emissions monitoring (under national licensing system); national statutory water quality data; local shellfish and other stocks **Sources:** National/international datasets (e.g. research publications on impact of particular farmed stocks, regulator databases; internal company reporting; previous EIA and SEA).	National water environment/quality legislation (e.g. Water Environment (Controlled Activities, Scotland) Regulations 2011) Sectoral guidance on use of therapeutants.	Waste dispersion models (developed by national regulatory body, developer or researchers).	Location and scale of development of the fish farm (informed by modelling) Use of alternatives to chemotherapeutants e.g. use of cleaner fish for sea lice control.	National government and regulators Local authorities Local shellfish farmers or representative Statutory nature conservation advisors Environmental NGOs.	Regulation of use of chemotherapeutants.
SOCIO-ECONOMIC	**IMPACT ON RECREATIONALLY IMPORTANT FISH** Farmed stock - Sea lice and escapes can affect native populations of wild salmon potentially affecting recreational fisheries.	**Data:** Fish migration routes; Local fish stocks; site specific sealice density/problem **Sources:** Primarily national datasets (e.g. research publications on impact of escapes/sea lice; previous EIAs and SEAs; internal company reports; recreational fishery association reports), some European datasets on wild fish stocks.	National finfish aquaculture strategies; Sectoral EIA guidance.	EIA	Net arrangements; anti-predator netting; lice treatments.	National government and regulator Local authorities National/regional fisheries associations Recreational angling bodies Statutory nature conservation advisors Environmental NGOs.	Regulation of finfish farms (cage design, use of sea lice treatments).

STEP 1: SCOPING		STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
	INTERACTIONS	KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
SOCIO-ECONOMIC	**DISPLACEMENT OF FISHING ACTIVITY** Exclusion or displacement of fishing vessels from a sea area may lead to changes in fishing activity, with potential impacts on landings, fishermen's income, jobs and fishing communities.	**Data:** regional fishing fleet characteristics; fishing activity (areas and intensity), landings data (volume and value of landings); VMS data; AIS data **Sources:** Data sets at various international, national and local levels (e.g. previous consent applications; National fisheries regulator; National or Regional Fisheries Associations/ Committees) although European datasets on fish stocks; landings and employment statistics also available.	Strategic marine plan Sectoral marine plan Economic development strategies	Displacement modelling Socio-economic impact assessment Spatial analysis in GIS	Location and scale of fish farm development.	Local fisheries associations and representatives National government and regulators Local authorities Statutory nature conservation advisors.	Spatial management policies taking account of fisheries interests.
	EMPLOYMENT AND INCOME GENERATION The aquaculture sector provides socio-economic benefits in the form of employment and income regionally, including for remote coastal communities, and potentially nationally with respect to the downstream supply chain.	**Data:** Value of aquaculture production; employment statistics in production and supply chain sectors **Sources:** Primarily national datasets (e.g. Government, regulator and Industry Body statistics)	Strategic marine plan Sectoral marine plan Economic development strategies	Socio-economic impact assessment		Aquaculture producers Supply chain businesses (e.g. seafood processors, suppliers, transport companies etc.) National government.	Spatial management policies. Integration of marine plans with land use plans to support realisation of local economic and social benefits.
	INTEGRATED WATER MANAGEMENT Aquaculture, particularly shellfish aquaculture, depends on good quality of water for profitable production. Proximity to urbanized areas and polluting activities can compromise its existence. Therefore it relies on an integrated management between sea and coastal / inland activities, taking into account all interactions.	**Data:** Governance (dialogue instances between sectors, multisectorial procedures); Communication and awareness raising campaigns **Sources:** water quality datasets (e.g. National and Regional regulators, research publications).	National plans and coastal strategies	Policy analysis GIS	Integrated policy and management tools	National government and regulators Local authorities All users of the sea and coast Aquaculture industry representatives and producers Harbour/port authorities Local economic partnerships/development agencies Local recreational groups (e.g. boating).	Spatial management policies. Regulation and management of contaminant inputs to transitional and coastal waters to achieve water quality objectives.
TECHNICAL	**ACCESSIBILITY TO LANDSIDE INFRASTRUCTURE** Accessibility of aquaculture installation from ports/ harbours for husbandry of stock, harvesting etc. and of landside facilities for onward transportation of product into the supply chain (i.e. transport connections, processing facilities)	**Data:** Farm production statistics; local harbour/port facilities; markets and supply chain companies; transport links **Sources:** National datasets (e.g. Developers/producers; aquaculture industry bodies; Development proposals; Current National road network; Local development strategies).	Terrestrial spatial planning	Spatial analysis in GIS	Location and scale of development	National government and regulators Local authorities Aquaculture industry representatives Harbour/port authorities Local economic partnerships/development agencies.	Spatial management policies. Integration of marine plans with land use plans to support the achievement of local economic and social benefits.

Desalination LSI

Summary

Desalination development has the potential to give rise to a range of LSI including:

- Environmental LSI include coastal impacts associated with offshore brine disposal, impacts from coastal infrastructure and impacts from water flows (in & out). Infrastructures can disrupt hydrographic conditions.
- Socio-economic LSI include the impact of offshore energy projects on local incomes and employment, impacts on drought resistance and contamination levels of water supply.
- Technical LSI includes achieving efficient connectivity of offshore and onshore infrastructure (mains water supply).

Examples

1. ISSUES IDENTIFICATION

The United Nations Environmental Programme (UNEP) has produced a guidance manual for completion of an Environmental Impact Assessment (EIA) for desalination projects following technical advice from world experts within five working groups (Technology, Health, Sanitary and Microbiology, Monitoring, and Environmental Impacts).

This publication intends to assist project designers, regulators and decision makers to anticipate and address all relevant public health, socio-economic and environmental concerns that may arise when undertaking a desalination project, for obtaining maximum beneficial use of the desalinated water in terms of quality, safety and environmental protection. See:

- *https://tinyurl.com/y7ydezdd*

2. EVIDENCE COLLECTION

A Baseline Marine Monitoring Programme has been established to monitor the potentially significant effects of a proposed desalination plant in Victoria, Australia. The baseline information will inform the longer term impact monitoring of the operation of the marine intake and outlet for the desalination project. See:

- *https://www.aquasure.com.au/uploads/files/CESP%20Att%20I.4%20-%20Monitoring%20Program.pdf*

3. ASSESSMENT

Thames Water (which operates the first and only large-scale desalination plant in the UK) produced a feasibility study into provision of more plants around London. This guidance allows assessment to be made for the suitability of an area to the potential development of a desalination plant. The report looks at the technical and socio-economic LSI issues that need to be assessed. See:

- *https://tinyurl.com/y7d5z9n4*

4. PLAN MAKING

Alicante II Desalination Plant: Report on Efficiency, Spain. Before beginning the work, the Mancomunidad (state body) looked at various options regarding the location of the plant and the method of collecting sea water, brine disposal and delivering the desalinated water. These preliminary studies made it possible to rule out options that were more costly or more damaging to the environment and to make the best possible use of the existing infrastructure, with significant savings in the cost of the works. See:

- *http://ec.europa.eu/regional_policy/en/projects/best-practices/ALL/1613/download*

5. IMPLEMENTATION

In Cyprus the successful implementation of modelling studies, allowed potential negative environmental LSI to be prevented. The careful design of the discharge pipeline to a length and point in the sea where modelling studies suggest sufficient dispersion and subsequent monitoring of the impact of brine discharge on the marine environment are very important in minimizing environmental impacts on the marine environment. See:

- *https://www.ecologic.eu/sites/files/project/2013/task_2_report_march_2009.pdf*

	STEP 1: SCOPING	STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
	INTERACTIONS	KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
ENVIRONMENTAL	**PIPELINES** The process of installing intake and discharge pipelines leads to changes in coastal processes and potential impacts at the coastline e.g. beach erosion. Plants also contribute to the wastewater discharges that affect coastal water quality and coastal habitats mostly due to the highly saline brine that is emitted into the sea. Discharged water may be increased in temperature, contain residual chemicals from the pre-treatment process, heavy metals from corrosion or intermittently used cleaning agents. The effluent from desalination plants is a multi-component waste, with multiple effects on water, sediment and marine organisms. Elevated water temperatures may cause "thermal pollution" at the discharge site.	**Data:** Beach profiles, bathymetric surveys, sediment budgets, water quality data, seabed habitat maps near the pipelines **Sources:** Development proposals, previous EIAs and SEAs, WFD monitoring data.	National/sectoral marine plan National shoreline management/adaptation plans River basin management plans Natura 2000 management plans Programme of measures under the MSFD EIA Directive.	Beach trend analysis Seabed mobility Numerical and ecological modelling Water quality monitoring.	Location (informed by modelling) Strict intake velocity and strict discharge thresholds for desalination plant Adequate design of outfalls with diffusers, or the pre-dilution with additional wastewater have the potential to minimise most adverse environmental effects from elevated salinity and temperature Technical requirements related to intake.	Developers Government and regulators Local Authorities Statutory nature conservation advisors Drinking water companies NGOs for environmental protection Tourism representatives.	Spatial management policies Alternative supply options, water reuse or water saving measures Regulation of environmental impacts, water pricing policy including environmental and resource costs.
ENVIRONMENTAL	**IMPACT DURING CONSTRUCTION** Landside infrastructure - construction of desalination plant and associated infrastructure may lead to landscape, biodiversity (wildlife) and visual impacts with the perceived or real loss of amenity value of the landscape. In turn, this may lead to socio-economic impacts through reduced visitor numbers and visitor spend in the local community. Reduced water quality in coastal waters might also have an impact on recreational activities	**Data:** seascape/landscape sensitivity, tourism statistics (visitor numbers and expenditure at the coast); leisure and recreational statistics **Sources:** National government statistics, tourism agency statistics, development proposals.	Advice on seascape/ landscape assessment Sectoral marine plan Terrestrial spatial planning EIA Directive.	Landscape and visual impact assessments (LVIA) Biodiversity monitoring.	Location and scale of development (informed from LVIA) Architectural requirements.	Developers National Government and regulators National/regional Tourism Agencies Local Economic Partnerships/ Development Agencies Statutory Nature Conservation Advisors.	Spatial management policies Alternative supply options Water reuse or water saving measures Regulation of environmental impacts.
SOCIO-ECONOMIC	**SAFE WATER GENERATION** Desalination sector provides socio-economic benefits in the form of a drought resistant, reliable water supply, free of contaminants. It also provides employment and income locally and regionally associated with downstream supply chains and may sustain key sectors providing social benefits (e.g. agriculture).	**Data:** Value of resource production, employment statistics in production and supply chain sectors **Sources:** Government, regulator and industry body statistics.	National /strategic marine plan Sectoral marine plan Economic development strategies Droughts management plan EIA Directive.	Socio-economic impact assessment.	*n/a*	Water utility companies Local authorities National government Water dependent sectors.	Integration of marine plans with land use plans to deliver local/ regional benefits.
TECHNICAL	**ACCESSIBILITY TO LANDSIDE INFRASTRUCTURE** Efficiency of connection between desalination plant and mains water supply. Those related to the distance between the desalination plant and the water mains connection location (in turn related to land availability for the plant near the region of demand) and ability to construct the necessary infrastructure on that land.	**Data:** Current mains water network, planned/potential future network extensions/additions **Sources:** Water regulators/bodies, development proposals.	Terrestrial spatial planning Best Available Techniques EIA Directive EU Drinking Water Directive.	Network modelling Energy demand assessments for pumping.	Choice of location Strategic co-ordination of plant to national water infrastructure to minimise cumulative impacts Spatial management policies.	Developers National government and regulators, Environmental NGOs.	Application of mandatory cost recovery policies in combination with water pricing to ensure a minimisation of costs.

Fisheries LSI

Summary

Commercial fisheries have the potential to give rise to a range of LSI including:

- The significance of individual LSI is dependent on the type of fishing (e.g. species targeted, gears used), intensity and location of the fishery. Potential environmental impacts can be effectively mitigated through management measures (e.g. spatial or temporal restrictions, technical (gear) controls, quotas). While fisheries management measures tend to be controlled through the Common Fisheries Policy or national fisheries management measures, planning processes at the coast, both marine planning and terrestrial planning can help to address potential interactions with other marine activities and to support the realisation of local socio-economic benefits
- Environmental LSIs include impacts on all kind of species, from mobile species (e.g. by-catch of birds, turtles or cetaceans) to seabed habitats near the coast. These could include vulnerable species and essential habitats
- Socio-economic LSIs include impacts on recreational angling/ecotourism and competition for space with other sectors – aquaculture, offshore energy, mining
- Socio-economic benefits associated with local income and employment
- Socio-economic benefits to tourism from local coastal fisheries
- Technical LSIs include the provision of landing and processing facilities and transport links

The LSIs for Fisheries should be considered in conjunction with those discussed in the Aquaculture brochure.

Examples

1. ISSUES IDENTIFICATION

Green growth within European fisheries (EU). The fisheries areas network (FARNET) has developed guides on how to incorporate Green Growth into the fisheries industries; this identifies multiple environmental and socio-economic LSIs. The importance of stakeholder involvement in order to act upon the issues is highlighted and intended for implementation via Fisheries Local Action Groups (FLAGs).

- *https://tinyurl.com/qcqaj94*

2. EVIDENCE COLLECTION

The Scottish Government has initiated a project, funded by the European Maritime Fisheries Fund (EMFF) to improve the quality of data relating to inshore fisheries around Scotland. The information will support decision making in fisheries management and in Marine Spatial Planning (MSP).

- *http://www.masts.ac.uk/research/emff-sifids-project/*

3. ASSESSMENT

COEXIST Fishers, Best Practice on Better Integration (EU). The COEXIST project ran from 2010/2013 funded by the European Commission. It produced several documents on how sectors can better integrate and investigated best practices on better integration across the EU. These Best Practice Guidelines was produced for the fisheries sector within the coastal zone. It produced ways to assess the needs of each sector and the relationship with others. It also includes several specific case studies as to how these sectors can interact successfully.

- *https://tinyurl.com/jlnka35*

4. PLAN MAKING

Côte d'Azur Local Development Strategy (LDS), France. The fisheries areas network (FARNET) has developed a guide on how to benefit the community by promoting fisheries and tourism interaction and collaboration. The importance of developing a MSP that incorporates positive interactions between these two sectors is shown. Following the guidance presented by FARNET the local government of Côte d'Azur in the Mediterranean produced a local development strategy that allowed tourism and fisheries to interact positively and produced benefits for both sectors.

- *https://tinyurl.com/y8hste9u*

5. IMPLEMENTATION

The Marine Management Organisation (MMO) and Inshore Fisheries and Conservation Authorities (IFCAs) have primary responsibility for ensuring that fishing activities in English marine Natura 2000 Sites do not compromise the achievement of site conservation objectives. The MMO, working with the IFCAs and statutory conservation bodies has undertaken a risk assessment to prioritise the development of management measures and established a clear framework for implementing fisheries management measures within relevant sites.

- *https://www.gov.uk/government/publications/revised-approach-to-the-management-of-commercial-fisheries-in-european-marine-sites-overarching-policy-and-delivery*

STEP 1: SCOPING		STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
	INTERACTIONS	KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
ENVIRONMENTAL	**IMPACT ON BIODIVERSITY** The capture of cetaceans, turtles and/or seabirds as by-catch in commercial fisheries. Near shore fisheries may cause damage to coastal seabed habitats. Such impacts may subsequently lead to impacts on the ecotourism sector (i.e. less visitors with subsequent economic losses to the local community).	**Data:** Information on by-catch Habitat data Ecotourism statistics (e.g. visitor numbers and expenditure at the coast) Leisure and recreational statistics **Sources:** Primarily any national datasets or scientific literature on by-catch (e.g. BirdLife International/ Environmental NGOs, Research publications, regional fisheries bodies, on-board observers) EMODNET habitat map Tourism data (e.g. national government statistics National or regional tourism agency statistics) although some data may be available at European level **Examples (European):** ICES Working group on by-catch of protected species: *tinyurl.com/y87gaqjh* Eurostat Tourism Statistics: *tinyurl.com/k8ghyan*	National regulations to reduce by-catch Management of Natura 2000 sites: e.g. see *tinyurl.com/38u7ndu*; ICES Special Request Advice (*tinyurl.com/ybakzlxf*)	Historic trend analysis of by-catch Population Viability Analysis Pressure assessment tools.	By-catch reduction measures (e.g. pingers, mesh size, net size, streamers on long lines) Spatial management measures to protect sensitive habitats.	National/regional fisheries regulators Statutory nature conservation advisors Environmental NGOs Local ecotourism companies and national governing body (where relevant) Environmental NGOs.	CFP measures National measures to support conservation.
SOCIO-ECONOMIC	**IMPACT ON STOCK SIZE** Within sector interaction - over-exploitation of target species that reduces the stock's biological productivity may lead to reductions in the volume of fisheries landings (through reduced stock productivity and/or changes in quotas) with potential impacts on fishermen's incomes, jobs and fishing communities.	**Data:** Fish stock assessments for quota species National/regional data for non-quota species Regional fleet characteristic Fishing activity (areas and intensity); VMS data; AIS data; landings data (volume and value of data) **Sources:** Primarily national datasets relating to stock status of target species (e.g. from regulators) although European datasets also available **Examples:** Eurostat (European): *tinyurl.com/y9xap9tl* ICES (Europe): *tinyurl.com/p5tb3lx* FAO Fishstat (Global): *tinyurl.com/yaqse6jw*	Quotas and TACs (under the Common Fisheries Policy) National/strategic marine plan.	Fisheries stock assessment models and tools.	Fisheries management measures (closures, restrictions, spatial measures, quota reductions etc.).	Fisheries regulators Fisheries bodies Environmental NGOs and bodies from the tourism sector.	Implementation of CFP policies and national measures. Consider requirement for additional measures.
	IMPACT ON RECREATIONAL FISHING STOCKS Over-exploitation of some target species that reduces the stock's biological productivity may lead to an impact on the recreational fisheries sector (i.e. less visiting fishermen if less fish to target), with subsequent economic losses to the local community.	**Data:** Fish stock assessments for quota species National/regional data for non-quota species Regional fleet characteristic Fishing activity (areas and intensity) VMS data AIS data Landings data (volume and value of data) **Sources:** Primarily national datasets relating to stock status of target species (e.g. from Regulators) although European datasets also available **Examples:** Eurostat (European): *tinyurl.com/y9xap9tl* ICES (Europe): *tinyurl.com/p5tb3lx* FAO Fishstat (Global): *tinyurl.com/yaqse6jw*	Quotas and TACs (under the CFP) National/ strategic marine plan Recreational fisheries policies.	Fisheries stock assessment models and tools.	Fisheries management measures (closures, restrictions, spatial measures, quota reductions etc.).	Fisheries regulators Fisheries bodies Recreational fishermen's bodies.	CFP measures. National allocation mechanisms.

STEP 1: SCOPING		STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
	INTERACTIONS	KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
SOCIO-ECONOMIC	**DISPLACEMENT OF OTHER SECTORS** Commercial fisheries and aquaculture. The existence of established commercial fishing grounds may exclude the development of new aquaculture farms or expansion of existing farms (i.e. via competition for marine space), subsequently constraining jobs and income opportunities for the local aquaculture industry.	**Data:** Regional fishing fleet characteristics Fishing activity (areas, intensity, gears used) VMS data AIS data Location of aquaculture production businesses **Sources:** National datasets relating to commercial fishing activity and location of aquaculture production businesses (e.g. national regulators, national or regional fisheries associations/committees).	National/strategic marine plan.	Spatial analysis in GIS Socio-economic impact assessment.	Spatial management measures for commercial fisheries.	Fisheries bodies Environmental regulators Local authorities Aquaculture organisations.	Spatial management policies.
	EMPLOYMENT AND INCOME GENERATION The commercial fisheries sector provides socio-economic benefits in the form of employment and income regionally, including for coastal communities, and potentially nationally with respect to the downstream supply chain.	**Data:** Value of landings Employment statistics in catch and supply chain sectors **Sources:** Primarily national datasets (e.g. government, regulator and industry body statistics) although some European scale datasets available **Example:** Eurostat employment statistics: *tinyurl.com/y9psrmny*	National /strategic marine plan Sectoral marine plans Economic development strategies.	Socio-economic impact assessment.	*n/a*	Local fishermen's association Industry bodies Supply chain businesses (e.g. seafood processors, suppliers, transport companies etc.) National government.	Integration of marine plans and land use plans to support supply chains and the delivery of local and regional social and economic benefits.
	IMPACT ON LOCAL CULTURE Commercial fisheries and tourism. Commercial fishing can contribute to a community's sense of identity and history, and therefore may confer social and cultural benefits as well as sustaining employment and incomes. Such coastal fishing communities may also attract tourism with subsequent economic benefits to the local economy.	**Data:** Tourism statistics (visitor numbers and expenditure) **Sources:** National datasets or information sources (e.g. regional or national tourism agency).	National /strategic marine plan Sectoral marine plans Economic development strategies.	Socio-economic impact assessment.	*n/a*	Local fishermen's associations Local authorities Local and regional tourism agencies Local economic partnerships	Integration of marine plans with land use plans to support local tourism benefits.
TECHNICAL	**ACCESSIBILITY TO LANDSIDE INFRASTRUCTURE** Provision of suitable port/harbour facilities for the commercial fishing fleet including landing facilities, storage, processing facilities and transport links/ distribution network	**Data:** Land use, land ownership, transport links, investment opportunity, supply chain **Sources:** National datasets or information sources.	Terrestrial spatial planning.	Supply chain mapping Strategic planning.	*n/a*	Local fishing association and industry bodies Harbour/port authorities Local authorities Land owners Local economic partnerships/ development agencies.	Integration of marine plans with land use plans to support the development of suitable infrastructure.

Cables & Pipelines LSI

Summary

Marine cables and pipelines have the potential to give rise to a range of land-sea interactions (LSI) including:

- Potentially harmful environmental LSI in the construction phase, such as the disturbance of seabed morphology when laying cables and pipelines, the re-suspension of sediment, possible pollution releases and noise from construction vessels. Effects of disturbance on marine, coastal and terrestrial habitats
- Potentially harmful environmental LSI during operation, including: disturbance of the seabed and coastal habitats, sediment instability and landfalls, increased turbidity, energy inputs (e.g. heat), pollution from leakages.
- Species can be affected physically and as consequence of increased turbidity
- Potentially harmful environmental LSI arising from terrestrial cable/pipeline landfalls and routes affecting landscapes and habitats
- Positive socio-economic benefits associated with local income and employment (especially in construction phase);
- Potentially negative socio-economic LSI if fishing activity is displaced, either in the construction or in the operation phase
- Technical LSI associated with efficiency of connection to national electricity/pipeline networks

The LSI for Cables & Pipelines should be considered in conjunction with those discussed in the Offshore Energy section.

Examples

1. ISSUES IDENTIFICATION

Lessons learnt for cable installation, UK. The UK's Offshore Wind Programme Board (OWPB) comprises representatives of industry, government and statutory nature conservation bodies. It has produced guidance on the process of offshore cable installation, including key issues that should be addressed.

- *https://tinyurl.com/ycpyn2c4*

2. EVIDENCE COLLECTION

INTERREG project Baltic InteGrid (Integrated Baltic Offshore Wind Power Grid Development, 2016 – February 2019) is gathering data to study the potential for a common, connected grid among Baltic Sea states and its possible impacts on the environment and on other maritime activities. The project will also review the role of Marine Spatial Planning (MSP).

- *http://www.baltic-integrid.eu/*

The FAB project (France – Alderney – Britain) proposes to build an electrical interconnector between France and Great Britain via Alderney, a Channel Island. The FAB Project has been included as a *Project of Common Interest* by the European Union and receiving funding through the EU Connecting Europe Facility and in early 2018 was undergoing assessment and planning procedures.

Data was gathered to assess impacts onshore and in coastal and marine areas, including on: disturbance to sediment; benthic and intertidal ecology; fish and shellfish; marine birds and mammals; cultural heritage (including identified shipwrecks); commercial fisheries; and shipping and navigation. The proposed cable route was selected to minimise impacts and avoid, among others, mussel farms and identified shipwrecks.

- *http://www.fablink.net/*

3. ASSESSMENT

The OSPAR Commission has produced a document on the Best Environmental Practice in Cable laying and operation, it provides multiple mitigation examples to implement in order to reduce negative interactions with other sectors.

- *https://tinyurl.com/yayeaz3n*

The Nemo Link project, whose construction is expected to be completed in 2018, aims to link the electricity networks of Belgium and the United Kingdom, providing a fast response to changes in power generation and consumption: the project will support variations in onshore and offshore renewable energy in the two Member States. The Nemo Link has been included as a project under the EU Connecting Europe Facility.

Environmental assessments were carried out in Belgium, the UK and in France (as the cables pass through French waters). The environmental impact studies covered impacts onshore, in coastal zones and in marine areas, including an analysis of direct and cumulative effects of the project on soil, water, climate and atmospheric factors, sound, fauna, flora and biodiversity, landscape and cultural heritage, human activities and safety to shipping.

- *http://www.nemo-link.com/*

4. PLAN MAKING

Spatial Offshore Grid Plans were produced by German Federal Maritime and Hydrographic Agency in 2003. The aim was to ensure coordinated and consistent spatial planning of grid infrastructure and grid topology, particularly for the grid connections of offshore wind farms in the German EEZ of the North and Baltic Sea up to the 12 nautical mile limit of territorial waters.

- *http://www.bsh.de/en/Marine_uses/BFO/index.jsp*

5. IMPLEMENTATION

The Nord Stream gas pipeline is a 1,224 km pipeline from Russia via the Baltic Sea to Germany. During its planning, construction and operation, the use of MSP and the consideration of possible LSI have been important due to the high potential for interactions. Both environmental and social monitoring has been, and will continue to be undertaken, to minimise detrimental effects. Data will be shared with national authorities and the scientific community as a requirement of the licensing agreement.

- *https://www.nord-stream.com/environment/*
- *https://tinyurl.com/y9wxc7bx*

	STEP 1: SCOPING	STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
	INTERACTIONS	KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
ENVIRONMENTAL	**IMPACT ON COASTAL PROCESSES, HABITATS AND WATER QUALITY** The process of installing cables and cable-protection (e.g. rock armour) leading to changes in coastal processes and potential impacts at the coastline (e.g. beach erosion), as well as loss or degradation of habitats, temporary degradation of marine water quality. In addition, the operation of high-voltage electric cables could have impacts on marine fauna due to electromagnetic fields generated by the cables.	**Data:** Beach profiles bathymetric survey sediment budgets sediment thickness profiles **Sources:** Development proposals.	National/strategic marine plan Sectoral marine plan National shoreline management/ adaptation policy SEA EIA Natura 2000	Beach trend analysis Seabed mobility Modelling of sediment spreading Benthic/intertidal survey Numerical modelling.	Co-ordination of strategic export cable corridors to minimise cumulative impacts Cable insulation and burial to 1 m where possible Rock placement, mattressing.	Renewables developers and telecommunication companies Flood and coastal defence operators National government and regulators Landowners National electricity providers Statutory nature conservation bodies.	Spatial management policies to avoid sensitive locations Regulation of projects to avoid significant impacts.
	VISUAL IMPACT OF INFRASTRUCTURE Substation/overhead pylons - construction of infrastructure may lead to landscape and visual impacts with the perceived or real loss of amenity value of the landscape. In turn this may lead to socio-economic impacts through reduced visitor numbers and visitor spend in the local community	**Data:** Landscape sensitivity local/regional/national and international nature conservation designations Local/regional/national or international heritage designations Tourism statistics **Sources:** National statistics, tourism agency statistics, development proposals, research publications.	SEA EIA Natura 2000	Landscape and visual impact assessment.	Buried cables Screening (e.g. using vegetation) Strategic co-ordination of marine cable connection to terrestrial cable network to minimise cumulative impacts.	Renewables developers and telecommunication companies National government and regulators Landowners Statutory nature conservation bodies National/regional tourism agencies Local economic partnerships/development agencies.	Integration of marine plans with land use plans to optimise the marine/terrestrial route.
SOCIO-ECONOMIC	**DISPLACEMENT OF FISHING ACTIVITY** Export cable and landfall site and commercial fisheries - exclusion or displacement of fishing vessels from cable corridors or landfall site may lead to changes in fishing activity (this can be temporary or permanent depending on fishing gear used e.g. demersal trawls, netting or potting, and whether cable protection is deployed e.g. rock armour), This could have potential impacts on landings, fishermen's income, jobs and fishing communities.	**Data:** Regional fleet characteristics Fishing activity (areas, intensity and gear used), landings data (volume and value of landings) VMS data AIS data **Sources:** Development proposals, ICES, national fisheries regulator, national or regional fisheries associations/committees.	National /strategic marine plan Sectoral marine plan Economic development strategies Terrestrial spatial planning.	Displacement Tool Socio-economic impact assessment Trade off analysis.	Strategic co-ordination of export cable corridors to minimise exclusion/displacement impacts from multiple developments.	Renewables developers and telecommunication companies Local fisheries associations/committees and representative National government and regulators Statutory nature conservation advisors.	Spatial management policies to avoid sterilising important fishing areas.
	EMPLOYMENT AND INCOME GENERATION The marine cables sector provides socio-economic benefits in the form of employment and income regionally and nationally with respect to ancillary activities	**Data:** Employment statistics related to cable laying and related ancillary activities **Sources:** Government, regulator and industry body statistics.	National /strategic marine plan Sectoral marine plan Economic development strategies.	Socio-economic impact assessment.	*n/a*	Renewables developers and telecommunication companies. National government and regulators.	Integration of marine plans with land use plans to support delivery of social and economic benefits.
TECHNICAL	**ACCESSIBILITY TO LANDSIDE INFRASTRUCTURE** Efficiency of connection between landfall site and local/national cable and pipeline networks. This is related to the distance between the landfall site and the network connection location and the ability to construct necessary infrastructure (e.g. converter stations, pylons etc.).	**Data:** Current electricity transmission network Planned/potential future electricity transmission network extensions/additions Available capacity National asset databases for underground infrastructure **Sources:** National electricity network plans, national telecommunications companies, development proposals	National/strategic marine plan Sectoral plans Terrestrial spatial planning.	Network modelling.	Strategic co-ordination of marine cable connection to terrestrial cable network in order to minimise cumulative impacts.	Renewables developers and telecommunication companies National government and regulators Landowners Local economic partnerships/development agencies.	Integration of marine plans with terrestial plans and energy transmission network plans.

Mining & Minerals LSI

Summary

Sea bed mining and mineral extraction has the potential to give rise to a range of LSI including:

- Environmental LSI include impacts on habitats and species associated with: physical destruction of habitats, the hydrographic disturbances such as increased turbidity, increased pollution such as noise or toxic substances released from the remobilised sediments and impacts on the natural sediment balance along the coast
- Socio-economic LSI includes benefits to other sectors like tourism associated with beach recharge projects or the supply of material for construction. However, increased turbidity, noise and pollution will have negative impacts on tourism
- Technical LSI includes the provision of wharves and suitable transport links.

The LSI for Mining and Minerals should be considered in conjunction with those discussed in the Ports and Shipping section.

Examples

1. ISSUES IDENTIFICATION

The Marine Aggregate Regional Environmental Assessment (MAREA) is a voluntary initiative in the UK, endorsed by the British Marine Aggregate Producers Association (BMAPA), The Crown Estate and the Marine Management Organisation. The work aims to provide a strategic view of future marine aggregate extraction activities and their potential cumulative and in-combination effects to ensure that individual dredging permissions are suitably informed.

- *http://www.marine-aggregate-rea.info/*

2. EVIDENCE COLLECTION

The European Climate Adaptation Platform (CLIMATE ADAPT) has produced information on beach and shoreline nourishment. The use of dredged material to replenish eroded beaches or as a flood defence mechanism has multiple ecological and legislative implications, which this website mentions briefly.

- *https://tinyurl.com/y9njot6y*

3. ASSESSMENT

The British Marine Aggregate Producers Association (BMAPA) and The Crown Estate have produced good practice guidance on environmental assessment. It provides an overview of the marine aggregate industry for all stakeholders on the ways in which it works, and the planning, licensing, environmental assessment, monitoring, mitigation and management methods that are employed to protect the environment and other seabed interests and to ensure the sustainability of the industry.

- *http://www.bmapa.org/documents/BMAPA_TCE_Good_Practice_Guidance_04_2017.pdf*

4. PLAN MAKING

Hampshire Country Council's Minerals and Waste Plan (UK) identifies the strategic importance of marine aggregate wharves and rail depots in the south of England to meet the need for construction aggregate. This sectoral plan supports the extension and development of wharves and rail depots where appropriate to ensure that there is sufficient capacity for the importation of marine aggregate. This identifies the important technical LSI to create efficient connectivity between offshore and onshore activities.

- *http://www3.hants.gov.uk/mineralsandwaste/planning-policy-home.htm*
- *https://tinyurl.com/ybuhkh3d*

5. IMPLEMENTATION

The Marine Management Organisation is responsible for marine planning In English waters and is developing a number of regional marine plans to provide comprehensive coverage of English waters by 2021. The draft South Marine Plans include policies to support marine mineral extraction within the plan area and to promote co-existence with other marine activities wherever possible.

- *https://tinyurl.com/y9o8lqgv*

	STEP 1: SCOPING	STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
	INTERACTIONS	KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
ENVIRONMENTAL	**IMPACT ON COASTAL PROCESSES** Coastal processes - Extraction of marine aggregate may affect physical process (bathymetry, wave and tidal streams) leading to changes in local coastal processes and potential impacts at the coastline e.g. beach erosion. Water quality might be impacted with consequent impacts to bathing zones.	**Data:** Beach profiles, bathymetric surveys, sediment budgets, habitat maps. **Sources:** Primarily national and regional datasets (e.g. development proposals, previous EIAs and SEAs, research and engineering projects), although some European scale datasets available **Example:** EMODNET bathymetry portal: *tinyurl.com/ybba8tag*	National/strategic marine plan Sectoral marine plan National shoreline management/ adaptation policy Rules and regulations established by International Seabed Authority (ISA).	Numerical modelling tools (hydrodynamic and sediment transport models) Morphological models Historical analysis Beach profile analysis Environmental impact assessment Guidance documents e.g.: *tinyurl.com/yd5vph84*	Spatial planning; limiting the spatial extent and depth of aggregate dredging, technical mitigation measures.	Marine aggregate companies Flood and coastal defence operators National government and regulators Local authorities Coastal landowners Environmental NGOs.	Spatial management policies to avoid sensitive locations Regulation of projects to avoid significant impacts.
SOCIO-ECONOMIC	**DISPLACEMENT OF OTHER SECTORS** Marine aggregate licence area and offshore energy - licenced areas for marine aggregate extraction will exclude the development of offshore energy in that marine area for the duration of the licence.	**Data:** Current licenced areas for marine aggregate extraction Areas in licence application stage Prospecting areas for marine aggregates (where suitable resource for extraction) **Sources:** National datasets (national administrations, development proposals National or regional geological surveys).	National /strategic marine plan Sectoral marine plans Economic development strategies (e.g. providing an indication of aggregate demand for terrestrial construction/ infrastructure projects).	Spatial analysis in GIS.	Spatial planning; limiting the spatial extent of aggregate dredging.	Marine aggregate companies Renewables developers Government and regulators.	Spatial management policies Temporal management policies.
	BENEFICIAL USE OF MATERIAL Tourism and recreation - increased availability of marine aggregate may support the tourism and recreation sector through the provision of material for beach recharge and coast protection. Flood Protection - increased availability of marine aggregate may support the development of flood defence structures.	**Data:** Beach profiles, bathymetric surveys, sediment budgets, habitat maps **Sources:** Primarily national datasets (e.g. from national administrations, development proposals) although some European scale data available **Example:** EMODNET bathymetry portal: *tinyurl.com/ybba8tag*	National /strategic marine plan Sectoral marine plan National shoreline management/ adaptation policy.	Beach trend analysis Seabed mobility Numerical modelling.	Beach recharge Sediment retention measures, shore normal and shore parallel groynes,	Marine aggregate companies Local Authorities Flood and coastal defence operators Government and regulators Statutory Nature Conservation Advisors Environmental NGOs.	Integration of marine plans with land use plans. Spatial management policies.
	EMPLOYMENT AND INCOME GENERATION The marine minerals and mining sector provides socio-economic benefits in the form of employment and income regionally and nationally, particularly through ancillary (e.g. exploration services, ship building) and secondary activities (e.g. construction).	**Data:** Economic value of marine minerals/ aggregates extracted Employment statistics in resource extraction sector and ancillary activities **Sources:** Primarily national datasets (e.g. from national administrations, industry body statistics) although some European scale data available **Example:** Eurostat employment statistics: *tinyurl.com/y9psrmny*	National /strategic marine plan Sectoral marine plan Economic development strategies.	Socio-economic impact assessment.	*n/a*	Marine aggregate companies Supply chain businesses Ancillary and secondary-related businesses National governments.	Economic development policies.
TECHNICAL	**ACCESSIBILITY TO LANDSIDE INFRASTRUCTURE** Requirement for suitable landside wharves near locations of aggregate demand and suitable transport links to areas of demand.	**Data:** Land use, land ownership, transport links **Sources:** National datasets (e.g. from local authority National transport agency Local development strategies)	National /strategic marine plan Sectoral marine plan Economic development strategies Terrestrial spatial plans Port master plans.	Strategic planning.	Spatial planning.	Marine aggregate companies Port and harbour authorities Terrestrial planners Government Local authority Local economic partnerships/ development agencies.	Integration of marine plans with land use plans. Spatial policies in terrestrial plans.

Ports and Shipping LSI

Summary

Ports and shipping have the potential to give rise to a range of LSI including:

- Environmental LSI include impacts on habitats and species associated with port development and channel dredging
- Environmental LSI include modification of hydrographic conditions, underwater noise, increased risk of collision (e.g. by mammals), increased risk of accidents, pollution marine litter and the introduction of non-indigenous species by vessels
- Environmental LSI include wider beneficial impacts including poor air quality, airborne noise and traffic
- Socio-economic LSIs include the impacts of port activity on income and employment and facilitation of ancillary and supply chain businesses
- Adverse socio-economic LSI include the displacement of other sectors including mineral extraction, offshore energy and others
- Technical LSI includes the achievement of efficient connectivity with terrestrial transport networks.

The LSI for Ports and Harbours relating to cruise ships should be considered in conjunction with those discussed in the Tourism and in the Minerals and Offshore Energy sections.

Examples

1. ISSUES IDENTIFICATION

Associated British Ports (ABP) consulted on a draft Master Plan for the Port of Southampton (UK) in 2016. To support consultation ABP prepared a Sustainability Appraisal and Appropriate Assessment to identify potential issues associated with future development options and associated mitigation measures.

- *http://www.southamptonvts.co.uk/port_information/commercial/southampton_master_plan/*

2. EVIDENCE COLLECTION

The BONUS research project SHEBA (Sustainable Shipping and Environment of the Baltic Sea region) provides an integrated and in-depth analysis of the ecological, economic and social impacts of shipping in the Baltic Sea, The project drafts and analyses policy options and thereby supports the development of related policies on EU, Baltic Sea region, national and local levels.

- *https://www.bonusportal.org/sheba*

3. ASSESSMENT

Floating liquefied natural gas (LNG) terminal, Livorno, Italy. The floating terminal reduced risks for port traffic and for tourism on nearby beaches, as well as visual impacts. The construction of the terminal and gas pipelines disrupted local habitats. The SEA and EIA required the proponents to restore damages and to provide compensation for nearby protected areas. Moreover, these decisions called on the proponents to carry out yearly monitoring of pollutants in the water, in sediment and in organisms, the characteristics of benthic communities and the passage of cetaceans and marine turtles.

- *http://www.va.minambiente.it/it-IT/Oggetti/Documentazione/809/1046*
- *https://www.oltoffshore.it/*

The European Environment Agency (EEA) produced a technical report in 2013 on the impact of shipping on air quality and climate forcing at a European scale. The modelled data suggested that shipping is contributing a significant level of emissions that need to be addressed.

- *https://tinyurl.com/y73ov7pe*

4. PLAN MAKING

Scottish Enterprise and Highlands and Islands Enterprise prepared a National Renewables Infrastructure Plan to support the development of manufacturing and operations and maintenance facilities for the offshore renewables sector in Scotland. A Strategic Environmental Assessment and Appropriate Assessment was prepared as part of the plan-making process to ensure that LSI relating to the environmental impact of port development were adequately considered during plan development.

- *http://www.hie.co.uk/growth-sectors/energy/n-rip.html*

5. IMPLEMENTATION

Beneficial use of dredging. The South and East Baltic coast are particularly vulnerable to erosion caused by natural and anthropogenic factors. Therefore many countries (Germany, Poland, Lithuania, Latvia and Estonia) have been undertaking coastal protection measures. Measures include also the use of sand dredged from entrance channels of harbours for beach nourishment. In that way, the impact from the port development is mitigated and coastal regression minimised. The Environmental Policy and Legislation on Dredged Material in the Baltic Sea Region document produced by SMOCS (Sustainable Management of Contaminated Sediments) has several beneficial uses of port material. Each country sets thresholds that eliminate the potential for contaminated substances to be disposed at sea or used in beneficial use projects. This is a requirement after the Helsinki Convention whereby all member countries must develop national criteria for dredged material to be disposed at sea. Download guidance:

- *https://www.researchgate.net/publication/301482517_Environmental_Policy_and_Legislation_on_Dredged_Material_in_the_Baltic_Sea_Region_wwwsmocseu*

	STEP 1: SCOPING	STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
	INTERACTIONS	KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
ENVIRONMENTAL	**IMPACT ON COASTAL PROCESSES** Port Infrastructure and coastal processes - maintenance or development (e.g. widening, deepening) of approach channels, turning circles, berths and/or landside infrastructure (e.g. piers, flood defences) has the potential to affect physical processes (sediment transport, wave and tidal streams), which may lead to changes in local coastal processes and impacts at the coastline.	**Data:** Water quality, beach profiles, bathymetric surveys, sediment budgets, habitat maps **Sources:** Primarily national and regional datasets (e.g. development proposals, previous EIAs and SEAs), although some European scale datasets are available **Example:** EMODNET bathymetry portal: *tinyurl.com/ybba8tag*	Natura 2000 WFD (*tinyurl.com/ybtfh78g*); National /strategic marine plan; Sectoral marine plan; National shoreline management policy	Beach trend analysis Seabed mobility Numerical modelling tools (hydrodynamic and sediment transport models, morphological models).	Project design (scale); improved coastal protection structures; sediment management.	Port authorities Flood and coastal defence operators National government and regulators Landowners All sectors potentially affected by a modification of the coastline (e.g. shellfish harvesting, tourism...).	Spatial management policies to avoid sensitive areas Regulation of projects to avoid significant impacts.
	IMPACT OF WASTE MANAGEMENT Port operations can cause a range of environmental impacts affecting water and air quality, noise, traffic and the disposal of solid waste.	**Data:** Emissions (e.g. NOx, SOx, CO2, micropollutants, marine litter, aquatic discharges, noise, solid waste), traffic **Sources:** National (e.g. development proposals), regional and European datasets ('Greenhouse gas emissions from transport(million tonnes CO2-equivalent)/International maritime transport' and 'Emissions of air pollutants from transport/ International shipping') **Example:** European Environment Indicators: *tinyurl.com/y7jyp3fh* Emissions Database for Global Atmospheric Research (EDGAR): *tinyurl.com/hyngkn3* Data bases such as: MarineDebris.info Underwater Noise Technical subgroup Report: *tinyurl.com/ya4wvy9g* Sheba project results for the Baltic sea: *tinyurl.com/y9nz98s8*	WFD MSFD Directive Ambient Air Quality Directive MARPOL Annex VI & associated NOx Technical Code.	Emission modelling (e.g. Ship Traffic Emission Assessment Model (STEAM3) for the emissions of NOx, CO2, SO2 and PM2.5), Scenario building Conflict maps.	Retrofitting trucks and ships with best available technologies, e.g. cleaning systems, including scrubber systems & on-board incineration for ships Regulation of port operation hours.	Port authorities and port employees Ship operators Residents (particularly those located in inner cities), Environmental NGOs Tourists Municipalities Environmental authorities Regional Sea committees.	Integration of marine plans with land use plans, waste management and air quality plans.

STEP 1: SCOPING		STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
INTERACTIONS		KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
ENVIRONMENTAL	**INVASIVE NON-NATIVE SPECIES** Shipping is an important distribution vector for potentially harmful invasive species and pathogens, Ports function as hubs for alien species entering new coastal and land-based ecosystems. Invasive species may travel on ship hulls (fouling), in ballast water and in the freight itself (e.g. via wood packaging, etc.).	**Data:** Presence of non-native species (e.g. within a region, port, harbour etc.); impact on native species/ biodiversity **Source:** National and European datasets of the distribution and impacts of non-native species **Example:** EC Joint Research Centre European Alien Species Information Network (EASIN): *tinyurl.com/ycauaz4j* Delivering Alien Invasive Species Inventories for Europe (DAISIE): *tinyurl.com/ycls28yv*	International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM convention) MSFD (descriptor 2), Regulation (EU) No 1143/2014 on the prevention and management of the introduction and spread of invasive alien species) EMSA guidance documents.	Molecular sampling and DNA sequencing GIS based analysis to identify areas of high risk.	Disinfection/filtration of ballast water Ballast water exchange on high sea, etc. Anti fouling measures.	Shipping industry Environmental authorities EMSA.	Ballast water management plans Port Biosecurity Plans.
ENVIRONMENTAL	**IMPACT ON AIR QUALITY** Port operation and social wellbeing - emissions from shipping vessels and other port-related activities has the potential to affect air quality which in turn has the potential to affect human health in neighbouring communities.	**Data:** Vessel numbers and shipping intensity Vessel emissions Air quality monitoring data Human health impacts **Sources:** Sources: national (e.g. development proposals), regional and European datasets on emissions/air quality, research publications on human health impacts **Example:** Emissions Database for Global Atmospheric Research (EDGAR): *ztinyurl.com/hyngkn3* SHEBA project results for the Baltic sea: *tinyurl.com/y9nz98s8*	The EU Ambient Air Quality Directive and Daughter Directives Terrestrial Planning.	Vessel and port estate emission analysis.	Local air quality management strategies Use of electric vehicles on port estates Shore to ship power Use of LNG fuel by vessels.	Industry bodies Government and regulators Port authorities Health authorities.	Integration of marine plans with land use plans and air quality plans.
SOCIO-ECONOMIC	**DISPLACEMENT OF OTHER SECTORS** Shipping and minerals mining. Areas of high shipping traffic could potentially exclude marine aggregate extraction, which in turn could impact on the availability of marine aggregate for use in land-based developments.	**Data:** Marine aggregate extraction licence areas and prospecting areas (including areas of suitable resource), shipping density and transit lines (AIS data) **Sources:** National datasets (national administrations, development proposals, national or regional geological surveys).	National /strategic marine plan Sectoral marine plan Economic development strategies.	Spatial analysis in GIS Socio-economic impact assessment Trade Off analysis.	Vessel traffic management plans.	Industry body Marine aggregate extraction companies Government and regulators Port Authorities.	Spatial management policies to avoid sensitive areas. Regulation of projects to avoid significant impacts.

	STEP 1: SCOPING	STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
	INTERACTIONS	KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
SOCIO-ECONOMIC	**DISPLACEMENT OF OTHER SECTORS** Shipping and offshore energy/cables. Areas of high shipping traffic could potentially impact on the positioning of export cable corridors from offshore energy developments (as the laying of the cable, or any maintenance of the cable required, may temporarily disturb shipping vessel traffic) This in turn could influence the landfall site of the export cables and hence the efficiency of the connection with the onshore national grid infrastructure.	**Data:** Existing and planned renewable developments (including lease areas); shipping density and transit lines (AIS data) **Sources:** National datasets (e.g. regulators, industry bodies, sectoral marine plans; development proposals).	National/strategic marine plan Sectoral marine plan.	AIS data analysis Spatial analysis in GIS Socio-economic impact assessment.	Strategic co-ordination of offshore renewables to minimise conflicting marine area use demands.	Industry bodies (aggregates and shipping) Marine aggregate extraction companies Government and regulators Port authorities National maritime safety agency.	Spatial management policies to avoid sensitive areas. Regulation of projects to avoid significant impacts.
	EMPLOYMENT AND INCOME GENERATION The ports and shipping sectors provides socio-economic benefits in multiple forms, such as: increased employment; increased income both regionally and nationally; increased accessibility to local communities; improved supply routes for island communities.	**Data:** Economic value of ports and shipping sector to the economy; employment statistics **Sources:** Primarily national datasets (e.g. development proposals, socio-economic impact assessments, regulator and industry body statistics) plus some European scale datasets **Example:** European employment statistics: *tinyurl.com/y9psrmny*	National/strategic marine plan Sectoral marine plan Economic development strategies.	Socio-economic impact assessment.	*n/a*	Industry bodies Government and regulators Port authorities National maritime safety agencies planning & development agencies.	Integration of marine plans with terrestrial plans to support delivery of social and economic benefits.
TECHNICAL	**ACCESSIBILITY TO LANDSIDE INFRASTRUCTURE** Ports require good transport links (particularly road and rail) to facilitate intermodal distribution and access to a wider area. Efficiency of distribution network.	**Data:** Transport maps **Sources:** Primarily national datasets **Example:** Trans-European Transport Network.	National /strategic marine plan Economic development strategies Port master plans National Transport Plans.	Transport analysis.	Spatial planning.	Transport authorities Local authorities Port authorities.	Integration of marine plans with terrestrial plans.

Tourism & Coastal Recreation LSI

Summary

Tourism and coastal recreation are associated with a range of LSI. The sector depends on natural resources and their quality but also causes pressure on them. Emerging new sea uses and growing environmental standards require the tourism industry to adapt or find new solutions for LSI:

- Environmental LSI includes an intensive use of space and resources which may lead to poor water and environmental quality. Tourism and recreational activities can be a source of pollution, noise or species' disturbance. Building new marinas, piers or berths has an impact on marine and coastal habitats
- Socio-economic LSI include competition for coastal space with sectors such as aquaculture, offshore energy production and port development with potential positive impacts on income and job creation in coastal communities
- Technical LSI includes the setting up of efficient and new type of infrastructure to limit environmental pressure and provide suitable access at the coast.

The LSI for tourism relating to cruise ships should be considered in conjunction with those discussed in the Ports and Shipping brochure.

Examples

1. ISSUES IDENTIFICATION

As part of the INTERREG 2 Seas Programme, Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB) Partnership developed a tourism strategy. This strategy is based upon a comprehensive understanding of the current position and future opportunities and challenges being faced by the tourism sector. The Strategy included a 10-year vision supported by detailed objectives for developing the tourism offer.

- *https://tinyurl.com/ycxpz3b2*

2. EVIDENCE COLLECTION

The Scottish Government (UK) commissioned a study to fill data gaps on marine recreation and tourism activity in Scotland and to provide baseline information for marine planning. The study gathered information for 23 different recreation and tourism activities undertaken at sea or around the Scottish coastline using a web-based survey.

- *http://www.gov.scot/Topics/marine/seamanagement/national/RecandTourism*

3. ASSESSMENT

The Convention on Biological Diversity (CBD) Guidelines on Biodiversity and Tourism seek to promote sustainable tourism development including tourism at the coast. The Guidelines provide a practical tool to assist stakeholders to work together to plan and assess tourism development projects and to identify necessary mitigation measures.

- *https://www.cbd.int/doc/publications/tou-gdl-en.pdf*

5. PLAN MAKING

Latvia's National Maritime Spatial Plan includes a number of policies that support the sustainable development of marine recreation and tourism. It designates important areas for coastal and marine tourism and highlights the integration of these areas into local municipality development and spatial planning documents as well as in strategic planning of the tourism sector.

- *http://www.varam.gov.lv/eng/darbibas_veidi/maritime_spatial_planning/*

Tourism Carrying Capacity Assessment (CCA) has proved to be an efficient planning tool applicable both in less developed as well as highly developed tourism areas. The Mediterranean Action Plan (MAP) has prepared a guide on good practice in carrying out The CCA: its review of case study analysis of some CCA examples has shown that CCA can be useful either as an independent activity aimed at planning tourism activity, or as an input to ICM or similar planning processes.

- *http://www.pap-thecoastcentre.org/pdfs/Guide English.pdf*

6. IMPLEMENTATION

The Baltic was the first sea in the world to receive status as a special area for sewage and have this status enforced by the International Maritime Organisation. The Baltic Sea Sewage Policy, BALTICV, is set to come into effect in June 2021, passenger ships, including cruise ships, will be limited to discharging sewage into port reception facilities or alternatively at sea only after treatment with very advanced on-board sewage treatment plants able to reduce nutrient input into the sea. As the result the major ports around the Baltic Sea are establishing fixed sewage reception facilities that are connected to municipal treatment plants. This was implemented in the Port of Tallinn in 2016.

- *https://tinyurl.com/yby2kecb*

	STEP 1: SCOPING	STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
	INTERACTIONS	KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
ENVIRONMENTAL	**IMPACT OF WATER QUALITY** Poor water quality limits tourism and recreational activities. Water quality is affected by various land-based pressures, pollution from sewage outlets with inadequate treatment, diffuse pollution (e.g., agriculture). as well as coastal pollution from marine industries.	**Data:** Regular water monitoring data Monitoring of bathing water quality Data on point source polluters (locations, volumes discharged, etc.) **Sources:** Government, national and/or regional environment and health agencies State of the Environment reports (national or local) **Example:** EEA interactive maps and data Urban Waste Water Treatment maps (sewage outlets and compliance with requirements of the Directive).	River Basin Management Plans Programme of measures of marine strategy WFD MSFD Urban Waste Water Directive.	Spatial models of impacts of pollution sources on bathing water quality.	Pollution reduction measures (from urban waste water treatment plants, industrial plants as well as from diffuse pollution sources).	National Government Local authorities Environmental Authorities Waste water treatment companies/operators.	Regulation and management of contaminant inputs to transitional and coastal waters to achieve water quality objectives.
	WILDLIFE DISTURBANCE Tourism and recreation activities (including ecotourism) have the potential to damage and disturb wildlife at the coast.	**Data:** Abundance and spatial distribution of habitats Spatial distribution of birds and mammals Movements of species State of the biodiversity **Sources:** National and/or European data sets on marine species and habitats, literature reviews, guidelines **Example:** HELCOM Map and Data Service contains information on biodiversity, ecosystem components & human activity &pressure etc. *http://maps.helcom.fi/website/mapservice/index.html*	National biodiversity strategies & programmes Nature conservation and management plans Natura 2000	Species distribution models Spatial models of impacts of pollution sources on habitats and species (e.g. Marxan; InVEST).	Restrictions and limitations (e.g. Codes of Practice; information notices).	National Government Local authorities Environmental authorities Tourism companies Environmental NGOs.	Spatial management policies to avoid sensitive areas Management plans for Natura 2000 sites and other coastal and marine protected areas.
	WASTE MANAGEMENT Waste management is important aspect to be considered in developing tourism, in particularly cruise and boating tourism.	**Data:** Number and location of waste collection sites Number and location of separate waste sorting containers Location of waste treatment facilities Number of visitors Number of tourists Number and size of ships Number of passengers Capacities of port facilities **Sources:** Local municipal plans, waste management plans, port strategies and waste management plans.	Waste management policies and legislation Local municipal plans and regulations Regional Sea conventions and their recommendations EU directive on port reception facilities Port strategies and waste management plans.	Trends in waste generation, collection, reuse, recycling and disposal Trends in number of passengers Waste volumes Capacity of waste handling facilities assessment.	Available waste disposal infrastructure Awareness and educational activities to prevent littering Port rules and incentives on waste handling Cooperation between regional sea ports to have common approach to waste handling policies.	Local and national authorities Waste management associations Tourism organisations Port administrations Local community groups.	Integration of marine plans with land use plans, waste management plans and port waste management plans.

	STEP 1: SCOPING	STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
	INTERACTIONS	KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
SOCIO-ECONOMIC	**COMPETITION FOR COASTAL SPACE** In most coastal regions, tourism is an important local economic sector, so tourism activities often have priority over or equal call to other sectors when it comes to access to high-quality coastal and marine environments. Competition for marine space from recreational cruising routes, sailing and other water recreation may exclude development of new aquaculture farms or the expansion of existing farms with subsequent potential impacts on job/income opportunities for local communities. Furthermore, development of marinas may result in changes in water quality (via dredging for marina infrastructure and sewage discharges from recreational vessels) which may lead to deterioration in water quality.	**Data:** National and local: location of existing aquaculture installations and areas of aquaculture potential. European Level: COEXIST suitability maps, recreational activity levels and areas of use, and water quality **Sources:** Development proposals Industry or governing body databases/ publically available resources List of tools: COEXIST, Guidance of Better Integration of Aquaculture, Fisheries, and other Activities in the Coastal Zone - *http://msp-platform.eu/practices/guidance-better-integration-aquaculture-fisheries-and-other-activities-coastal-zone*. **Examples:** datasets for the UK (*https://data.gov.uk/dataset/aquaculture-guidance-on-the-location-of-marine-fish-farms*) and Malta (*https://www.europeandataportal. eu/data/en/dataset/f4403562-c0f4-46d0-83af-36e75507de27*). Areas of aquaculture potential at national level: for the UK (*https://data.gov.uk/dataset/mmo1040-current-aquaculture-potential*). COEXIST, Guidance of Better Integration of Aquaculture, Fisheries, and other Activities in the Coastal Zone - *http://msp-platform.eu/ practices/guidance-better-integration-aquaculture-fisheries-and-other-activities-coastal-zone*.	National aquaculture strategies Sectoral marine strategies National /strategic marine plan local terrestrial plans.	Spatial models of aquaculture potential Water quality models Spatial analysis in GIS Suitability maps for aquaculture Individual Stress Level Analysis (ISLA); Analysis of Conflict Scores; GRID (GeoReference Interactions Database)..	Marine planning with stakeholder engagement ICM FLAG strategy for fisheries-related tourism..	Tourism sector representatives Recreational activity governing bodies and associations Harbour authorities Aquaculture producers Environmental NGOs Statutory nature conservation agencies National Government and/or local authorities.	Spatial management policies Integration of marine plans with land use plans.
	IMPACT ON FISH STOCKS Recreational angling may potentially impact on fish stocks also targeted by commercial fishermen, which could lead to changes in commercial fishing activity (for example by reduced or zero quota for that species), and subsequent potential impacts on landings, fishermen's income, jobs and fishing communities. On the other hand, good recreational fishing spots also bring benefits to local communities, by bringing in visitors. These visitors create jobs in retail, entertainment and service industries which may not have otherwise existed.	**Data:** Recreational fishing intensity; VMS and AIS data where applicable, landings data, fish stock assessments **Sources:** National/regional angling associations/ bodies, ICES; personal angling logbooks, surveys on recreational fishing Examples: ICES. 2017. Report of the Working Group on Recreational Fisheries Surveys (WGRFS), 12–16 June 2017, Azores, Portugal. ICES CM 2017/EOSG:20. 113 pp.	Common Fisheries Policy; Quotas and TACs National data for non-quotas species Recreational fisheries policies.	Socio-economic impact assessment Bio-economic modelling of (e.g., FISHRENT model which simulates and optimises fishermen behaviour).	Quotas for commercial and recreational species for impacted fish stocks.	National/regional angling associations/bodies Recreational anglers Commercial fisheries industry bodies.	CFP measures National allocation mechanisms.

STEP 1: SCOPING		STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
INTERACTIONS		KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
SOCIO-ECONOMIC	**DISPLACEMENT OF LANDFALL LOCATIONS** Coastal/beach areas with high levels of visitors and/or marine recreational activity could potentially influence the landfall site of the export cables for offshore renewable developments and hence the distance between the landfall site and grid connection (i.e. the efficiency of the connection with the onshore national grid infrastructure).	**Data:** Renewables lease areas, export cable routes; terrestrial grid network; tourism statistics **Sources:** Development proposals; national tourism agency statistics; national/regional/local government statistics; tourism data: Eurostat *http://ec.europa.eu/eurostat/statistics-explained/index.php/Tourism_statistics_at_regional_level*.	National/strategic marine plan Sectoral plans Terrestrial planning.	Network modelling Individual Stress Level Analysis (ISLA) Analysis of Conflict Scores GRID (GeoReference Interactions Database).	Strategic co-ordination of offshore renewable links to national grid infrastructure to minimise cumulative impacts.	Renewables developers National Government and regulators National/regional tourism agencies Local economic partnerships/development agencies Statutory nature conservation advisor.	Spatial management policies to avoid sensitive areas Regulation of projects to avoid significant impacts.
	EMPLOYMENT AND INCOME GENERATION The tourism and recreation sectors provides socio-economic benefits in the form of employment and income regionally, including for remote coastal communities. This comes from direct employment at the port, or secondary from increased tourism spend in/at local businesses.	**Data:** Tourism statistics (visitor numbers and expenditure); recreation statistics (activities, areas of activity and intensity); employment statistics (tourism industry including hospitality) **Sources:** Government, national and/or regional tourism agency statistics; national governing body participation statistics; employment statistics by category; Eurostat **Example:** tourism data: Eurostat *http://ec.europa.eu/eurostat/statistics-explained/index.php/Tourism_statistics_at_regional_level*.	National /strategic marine plan Sectoral marine plan Economic development strategies.	Socio-economic impact assessment.	*n/a*	National Government Local authorities Tourism providers (e.g. accommodation businesses) and/or industry representatives Heritage advisors/agencies Local enterprise partnerships	Integration of marine plans with land use plans to support delivery of social and economic benefits.
TECHNICAL	**ACCESSIBILITY TO BOATING LOCATIONS** Recreational boating - access to marinas, boat ramps, proper moorings are very important LSI for this tourism segment.	**Data:** Location and technical requirements of marinas and berths; available utilities and services; distance between marinas **Sources:** Local marinas and port administrations; national and regional surveys **Example (European):** Study on specific challenges for a sustainable development of coastal and maritime tourism in Europe, June 2016. Executive Agency for Small and Medium-sized Enterprise, *https://publications.europa.eu/en/publication-detail/-/publication/ab0bfa73-9ad1-11e6-868c-01aa75ed71a1*	Maritime tourism strategies Blue growth strategies Local spatial and land-use plans Criteria for Blue Flag Marinas.	GIS tools on density assessment, based on technical requirements.	Alternatives for locations, sitting, design of marinas, boat ramps Zoning of mooring areas depending of boat size.	Boating industry Local land-use planners Associations of marina developers Marina managers Local authorities.	Integration of marine plans with land use plans and harbour management plans.
	ACCESSIBILITY TO BEACHES LOCATIONS Beach access (roads and car parks); Lifeguard and safety services	**Data:** Local land-use and land cover maps; bathymetry tidal, wave and surf data **Sources:** Local municipality lifeguard and safety services; public health and/or environment agencies **Example (European):** EEA interactive maps and data on state of the bathing waters *http://www.eea.europa.eu/themes/water/interactive/bathing/state-of-bathing-waters* **Example (National):** Ireland's EPA bathing water quality information website External linkBeaches.ie	Bathing Water Directive Local building regulations Local land-use or spatial or master plans Criteria for Blue Flag Marinas.	GIS tools Landscape design tools.	Alternatives for locations, sitting, design of bathing areas.	Urban planners Architects Port and marina authorities Local authorities.	Policies in local land use plans.

Offshore Energy LSI

Summary

Offshore energy development has the potential to give rise to a range of LSI including:

- Environmental LSIs associated with offshore and/or landside infrastructure affecting coastal habitats and species, including with respect to collision risk of birds with offshore wind turbines
- Socio-economic LSIs associated with displacement of other sector activity from sea areas or physical obstruction of other sector activity during construction and operation of offshore energy developments. Other sectors affecting may include tourism, recreation, commercial fisheries and shipping
- Beneficial socio-economic LSIs associated with the provision of employment and income where the development of port/landside offshore energy supply chain businesses (e.g. manufacturing, construction and Operations and Maintenance facilities) are developed in proximity to the offshore developments to maximise local socio-economic benefits
- Technical LSIs associated with optimisation of marine and onshore cable routes to achieve an efficient grid connection.

The LSIs for Offshore Energy should be considered in conjunction with those discussed in the Cables brochure.

Examples

1. ISSUES IDENTIFICATION

The UK Government has undertaken an SEA for offshore energy development since 1999. The SEA process aims to help inform Ministerial decisions through consideration of the environmental implications of the outcome of proposed offshore energy plans and programmes. The UK Government has maintained an active SEA research programme, identifying information gaps and commissioning new research where appropriate.

- *https://www.gov.uk/guidance/offshore-energy-strategic-environmental-assessment-sea-an-overview-of-the-sea-process*

2. EVIDENCE COLLECTION

A Web-GIS platform was developed for Cyprus and the Aegean Sea in Greece to map the most relevant maritime uses (including offshore energy sectors) and to dynamically visualise conflicting interactions (of both maritime and land-based activities and uses) and derive density activity maps and/or conflicts maps. Data were made available via the project website to share results and engage stakeholders.

- *http://msp-platform.eu/practices/web-gis-platform-implementing-msp-greece-and-cyprus*

3. ASSESSMENT

Various studies have been undertaken to understand the risk of bird strike with offshore wind turbines which could provide useful background information for Marine Spatial Planning (MSP) assessments. Examples include:

- *https://www.bto.org/science/wetland-and-marine/soss*
  UK—Strategic Ornithological Support Services Programme
- *www.gov.scot/Topics/marine/science/MSInteractive*
  UK (Scotland) —Displacement models for foraging seabirds (Scotland)
- *www.bto.org*
  Review of flight heights and avoidance rates

4. PLAN MAKING

The State Development Plan for Schleswig - Holstein regulates the spatial objectives and principles for terrestrial and marine areas as far as the territorial sea border. The Plan for the territorial areas of the Baltic Seas includes a test field for wind energy turbines, core areas for tourism as well as nature and landscape reserves. Shipping is allowed to use the whole area without precise shipping lanes.

- *http://msp-platform.eu/practices/maritime-spatial-plan-territorial-sea-schleswig-holstein*

The Belgian Marine Spatial Plan, adopted in March 2014, is providing a structured approach to the laying out of cables and pipelines by establishing specific corridors from sea to land for offshore energy infrastructure. It also sets out clear areas for economic activities that potentially compete for space in land/sea areas, such as fisheries or dredging of sand and gravels.

- *https://www.health.belgium.be/en/environment/seas-oceans-and-antarctica/north-sea-and-oceans/marine-spatial-planning*

5. IMPLEMENTATION

Development of Green Port Hull (Humber Estuary, England) as a location for the manufacture, assembly and servicing facilities for offshore wind farms in the North Sea through the UK Government's Regional Growth Fund significant funding has been secured for skills & employment, business support, and research and development to ensure that local people and business gain maximum benefit from the renewable energy sector.

- *http://greenporthull.co.uk/*

	STEP 1: SCOPING	STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
	INTERACTIONS	KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
ENVIRONMENTAL	**IMPACT ON COASTAL PROCESSES** Presence of offshore structures affecting physical process (wave and tidal streams) leading to changes in local coastal processes and potential impacts at the coastline e.g. beach erosion	**Data:** Beach profiles, bathymetric surveys, sediment budgets **Sources:** Primarily national and regional datasets (e.g. development proposals; previous EIAs and SEAs), although some European scale datasets available **Example (European):** EMODNET bathymetry portal: *tinyurl.com/ybba8tag*	National/strategic marine plan Sectoral marine plan National shoreline management or coastal adaptation policy.	Numerical modelling tools (hydrodynamic and sediment transport models, morphological models) Historical analysis Beach profile analysis.	Spatial planning of offshore structures and cable/pipeline routes Co-ordination of strategic export cable/ pipeline corridors to minimise cumulative impacts.	Developers Flood and coastal defence operators Regulators and relevant advisors Landowners National electricity providers.	Spatial management policies to avoid sensitive areas Regulation of projects to avoid significant impacts.
	BIRD COLLISION RISK Presence of offshore structures (wind farms in particular) present a potential collision risk to birds - leading to potential population losses of those features from coastal or terrestrial designated sites	**Data:** Location of sensitive receptors (bird colonies, feeding areas), previous incidents (e.g. location, extent) **Sources:** European data sets, scientific literature **Example (European):** European Seabird at Sea Surveys: 1979-2000 at *tinyurl.com/y9bet9al*; 2000-present see: *tinyurl.com/jf64y5l*	Guidance on management of Natura 2000 sites: e.g. *tinyurl.com/38u7ndu*	Modelling collision risk - see case studies.	Spatial planning of offshore infrastructure, turbine height, array size and location (informed by collision risk data and modelling).	Developers Regulators and relevant advisors Environmental NGOs.	Spatial management policies to avoid sensitive areas Regulation of projects to avoid significant impacts.
	ACCIDENTAL INCIDENTS Any accidental oil spills present a pollution risk to marine organisms like birds and mammals - leading to potential population losses	**Data:** Location of sensitive receptors (bird colonies; feeding areas), previous incidents (e.g. location, extent) **Sources:** European datasets; Habitats Directive Article 17 reports; oil spill modelling reports; scientific literature **Example (European):** European Seabird at Sea Surveys: 1979-2000 at *tinyurl.com/y9bet9al*; 2000-present see: *tinyurl.com/jf64y5l*	Guidance on management of Natura 2000 sites: e.g. *tinyurl.com/38u7ndu*; guidance on spill prevention and clear-up.	Modelling oil spill - see case studies.	Spatial planning of offshore infrastructure Spill clean up preparedness and measures.	Developers Regulators and relevant advisors Environmental NGOs.	Spatial management policies to avoid sensitive areas Regulation of projects to avoid significant impacts.

STEP 1: SCOPING		STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
	INTERACTIONS	KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
ENVIRONMENTAL	**ONSHORE INFRASTRUCTURE CONSTRUCTION** Substation or pylons construction has the potential to impact on features of designated sites.	**Data:** Designated sites and features (habitats and species) **Sources:** European and National data sets (including Development proposals) **Example (European):** European Environment Agency - Natura 2000 Protected Areas: *tinyurl.com/yde9zeel* & *tinyurl.com/34hvoy2* EMODNET Seabed Habitats: *tinyurl.com/yarevgv6*	Guidance on management of protected areas like Natura 200 sites e.g. *tinyurl.com/38u7ndu*	Environmental Impact Assessment and Habitats Regulations Assessment (HRA) of the impacts of proposed development on Natura 2000 sites.	Compensation for loss of habitats Strategic co-ordination of offshore renewable links to national grid infrastructure to minimise cumulative impacts.	Developers Regulators and relevant advisors Landowners Environmental NGOs.	Spatial management policies to avoid sensitive areas Regulation of projects to avoid significant impacts.
	VISUAL IMPACT OF INFRASTRUCTURE: SEASCAPE The presence of offshore structures may lead to landscape and visual impacts with the perceived or real loss of amenity value of the seascape, potentially leading to reduced visitor numbers and visitor spend in the local community.	**Data:** Seascape/landscape sensitivity; tourism statistics (visitor numbers and expenditure at the coast); leisure and recreational statistics **Sources:** Primarily national datasets (e.g. national tourism statistics; national or regional landscape/ seascape sensitivity assessments; development proposals; research publications (e.g. studies of visitor attitudes to offshore renewables), although some European scale datasets available **Example (European):** Eurostat Tourism Statistics: *tinyurl.com/k8ghyan*	National advice on seascape/landscape assessment National/sectoral marine plan Terrestrial plans.	Landscape and visual impact assessments (LVIA)	Location and scale of development (informed from LVIA)	Developers Regulators and relevant advisors National or regional tourism agencies Local economic partnerships or development agencies.	Spatial management policies to avoid sensitive areas Regulation of projects to avoid significant impacts.
	VISUAL IMPACT OF INFRASTRUCTURE: LANDSCAPE Landside infrastructure such as substations/overhead pylons may lead to landscape and visual impacts with the perceived or real loss of amenity value of the landscape, potentially leading to reduced visitor numbers and visitor spend in the local community.	**Data:** Landscape sensitivity; local/regional/national and international nature conservation designations; local/regional/national or international heritage designations; tourism statistics **Sources:** Primarily national datasets (e.g. national tourism agency statistics; development proposals; research publications), although European datasets relating to protected areas, heritage and tourism available **Example (European):** European Environment Agency - Natura 2000 Protected Areas: *tinyurl.com/yde9zeel* & *tinyurl.com/34hvoy2* Eurostat Tourism Statistics: *tinyurl.com/k8ghyan* **Example (Global):** UNESCO World Heritage Convention Interactive map: *tinyurl.com/nddz7zl*	Terrestrial spatial plans.	Landscape and visual impact assessment.	Buried cables Screening (e.g. using vegetation) Strategic co-ordination of offshore renewable links to national grid infrastructure to minimise cumulative impacts.	Developers Regulators and relevant advisors Landowners National or regional tourism agencies Local economic partnerships or development agencies.	Spatial management policies to avoid sensitive areas Regulation of projects to avoid significant impacts.

	STEP 1: SCOPING	STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
	INTERACTIONS	KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
SOCIO-ECONOMIC	**IMPACT OF ACCIDENTAL INCIDENTS ON TOURISM** Any accidental oil spills resulting in reductions in the populations of seabird species may lead to impacts on the ecotourism sector (i.e. less visitors with subsequent less economic losses to the local community).	**Data:** Location of sensitive receptors (bird colonies; feeding areas); previous incidents (e.g. location, extent) **Sources:** European and National datasets; Oil spill modelling reports; scientific literature **Example (European):** European Seabird at Sea Surveys: 1979-2000 at *tinyurl.com/y9bet9al*; 2000-present see: *tinyurl.com/jf64y5l*	Guidance on management of Natura 2000 sites: e.g. *tinyurl.com/38u7ndu* Guidance on spill prevention and clear-up.	Oil spill models.	Location of infrastructure Spill clean up preparedness and measures.	Developers Regulators and relevant advisors Environmental NGOs Tourism Sector.	Spatial management policies to avoid sensitive areas Oil spill contingency plans.
	IMPACT OF ACCIDENTAL INCIDENTS ON FISHERIES Any accidental oil spills may prevent commercial fleets from fishing in the affected area, with potential impacts on landings, fishermen's income, jobs and fishing communities.	**Data:** Regional fleet characteristics; fishing activity (areas and intensity); VMS data; AIS data; landings data (volume and value of data) **Sources:** Primarily national datasets (e.g. from regulators, development proposals; fisheries associations; oil spill modelling reports) although European datasets also available **Example (European):** Eurostat fish catch statistics see: *tinyurl.com/y9xap9tl* ICES fish catch statistics see: *tinyurl.com/p5tb3lx* **Example (Global):** FAO Fishstat fish catch statistics see: *tinyurl.com/yaqse6jw*	National/sectoral marine plan.	Oil spill models.	Location of infrastructure Spill clean up preparedness and measures.	Developers Regulators and relevant advisors Fisheries associations and Industry representatives Environmental NGOs.	Spatial management policies to avoid sensitive areas Oil spill contingency plans.
	DISPLACEMENT OF FISHING ACTIVITY Exclusion or displacement of fishing vessels from the generation/extraction area or cable/pipeline export corridor may leading to changes in fishing activity, with potential impacts on landings, fishermen's income, jobs and fishing communities.	**Data:** Regional fleet characteristics; fishing activity (areas and intensity); VMS data; AIS data; landings data (volume and value of data) **Sources:** Primarily national datasets (e.g. from regulators, development proposals; fisheries associations) although European datasets also available **Example (European):** Eurostat fish catch statistics see: *tinyurl.com/y9xap9tl* ICES fish catch statistics see: *tinyurl.com/p5tb3lx* **Example (Global):** FAO Fishstat fish catch statistics see: *tinyurl.com/yaqse6jw*	National/sectoral marine plan Economic development strategies.	Displacement modelling Socio-economic impact assessment Trade off analysis Spatial analysis in GIS.	Strategic co-ordination to minimise exclusion/ displacement impacts from multiple developments.	Fisheries Associations and industry representatives Regulators and relevant advisors.	Spatial management policies to avoid sensitive areas Regulation of projects to avoid significant impacts.

	STEP 1: SCOPING	STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
	INTERACTIONS	KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
SOCIO-ECONOMIC	**DISPLACEMENT OF SHIPPING INDUSTRY** Offshore infrastructure may obstruct commercial shipping routes, leading to increased steaming distances and transit times resulting in increased fuel costs and reduced operational efficiency	**Data:** Shipping density and transit lines (AIS data); national port freight/passenger traffic **Sources:** Primarily national data sets (e.g. from regulators; national hydrographic office; national maritime safety agency; national/regional socio-economic impact assessments; development proposals) although some European data available **Example (European):** Eurostat Maritime ports freight and passenger statistics: *tinyurl.com/o39368k*	National/sectoral marine plan Sectoral marine plan Economic development strategies.	AIS analysis Socio-economic impact assessment Vessel emission analysis.	Infrastructure location informed by significant shipping routes and constrained areas for navigation (e.g. IMO traffic separation schemes).	Developers Fishing industry representatives Regulators and relevant advisors Port authorities National maritime safety agencies Local shipping/ferry companies.	Spatial management policies to avoid s ensitive areas.
	DISPLACEMENT OF RECREATIONAL ACTIVITIES Exclusion or displacement of recreational activities from generation/ extraction area, leading to changes in activity levels with potential impacts on income for local marinas, watersports centres/school and the community (accommodation providers, restaurants etc.)	**Data:** Participation statistics; marine locations and berth numbers; cruising routes; sailing routes; racing areas; watersport centre locations **Sources:** Primarily national or regional datasets (e.g. from recreational activity governing bodies; regulators and relevant advisors; development proposals; Socio-economic impact assessments; research publications).	National/sectoral marine plan Sectoral marine plan Economic development strategies Terrestrial spatial plans.	Socio-economic impact assessment.	Array size and location informed by data and stakeholder engagement.	Developers Regulators and relevant authorities National governing bodies for the recreational activities.	Spatial management policies to avoid sensitive areas.
	PLAN FOR EMPLOYMENT AND INCOME GENERATION Changes to port/landside infrastructure and service to enable provision of manufacture, construction and O&M facilities in close proximity to the offshore site to maximise socio-economic benefits to the local economy and communities (e.g. jobs, income).	**Data:** land use; land ownership; transport links; investment opportunity; staff availability; housing and services availability for workface **Sources:** national and regional plans and strategies (e.g. national renewables infrastructure plans; development proposals; local or regional development strategies).	National renewable infrastructure plans Terrestrial spatial plans.	Strategic planning.	Strategic co-ordination of offshore renewable links to national grid infrastructure to minimise cumulative impacts.	Developers Manufacturers Regulators and relevant advisors Local authorities Land owners Port authorities Local economic partnerships or development agencies.	Integration of marine plans with land use plans.

STEP 1: SCOPING		STEP 2: ASSESSMENT		STEP 3: ANALYSIS		STEP 4: PLAN MAKING	
INTERACTIONS		KEY DATA AND INFORMATION SOURCES	POLICY AND/OR LEGISLATION	POTENTIAL ANALYTICAL TOOLS	POTENTIAL MITIGATION MEASURES	STAKEHOLDERS	MANAGEMENT OPTIONS
SOCIO-ECONOMIC	**EMPLOYMENT AND INCOME GENERATION** The offshore energy sector provides socio-economic benefits in the form of employment and income regionally and nationally with respect to the downstream supply chain.	**Data:** Value of offshore energy to economy; employment statistics **Sources:** National and regional datasets (e.g. available from regulator and industry bodies), although some European datasets available **Example (European):** European Employment Statistics: *tinyurl.com/y9psrmny*	National/sectoral marine plan Sectoral marine plan Economic development strategies.	Socio-economic impact assessment GIS tools Transport analysis Network modelling.	*n/a*	Developers Relevant government departments Local Authorities Industry bodies.	Integration of marine plans with land use plans to support delivery of social and economic benefits.
TECHNICAL	**ACCESSIBILITY TO LANDSIDE INFRASTRUCTURE: OIL & GAS** The efficiency of connections between offshore wells and the landside refinery is related to the method of transporting the resource from offshore platform to the refinery (e.g. pipelines or via a floating production storage and offloading unit.	**Data:** Current and planned pipeline network, location of refineries; available capacity **Sources:** National datasets and reports e.g. development proposals; industry body; regulator and relevant advisors.	National/sectoral marine plan Sectoral marine plan Terrestrial spatial plans.	*n/a*	Strategic co-ordination of oil and gas downstream infrastructure requirements to minimise cumulative impacts.	Developers Regulators and relevant advisors Landowners Local economic partnerships or development agencies.	Integration of marine plans with land use plans.
	ACCESSIBILITY TO LANDSIDE INFRASTRUCTURE: ELECTRICITY The efficiency of connection between generation site and electricity grid is related to the distance between the landfall site and the grid connection location, region of energy demand and the ability to construct necessary infrastructure e.g. converter stations, pylons etc.)	**Data:** Current electricity transmission network; planned/potential future electricity transmission network extensions/additions; available capacity; energy transmission rates **Sources:** Primarily national datasets (e.g. national electricity network plans, development proposals), although some European datasets and information sources available **Example (European):** European subsea cables association: *tinyurl.com/y8jmd7s6* **Example (Global):** TeleGeography submarine cable map: *tinyurl.com/ydy3mtrw*	National/sectoral marine plan Sectoral marine plan Terrestrial spatial plans.	Network modelling.	Strategic co-ordination of offshore renewable links to national grid infrastructure to minimise cumulative impacts.	Developers Regulators and relevant advisors Landowners Local economic partnerships or development agencies.	Integration of marine plans with land use plans and energy transmission network plans.

Authors:

Brian Shipman
Heidi Roberts
Thomas Dworak
Tony Zamparutti
Ina Krüger
Kristīna Veidemane
Olga Mashkina
Camille Parrod
Erika Ceresil
Andrei Moarcas
Lise Oulès

Acronyms

- *AIS: Automatic Identification System (automatic vessel tracking system)*
- *CFP: Common Fisheries Policy*
- *EIA: Environmental Impact Assessment*
- *EMODnet: European Marine Observation and Data Network*
- *EMSA: European Maritime Safety Agency*
- *GIS: Geographical Information System*
- *ICES: International Council for the Exploration of the Sea*
- *NGO: Non-governmental Organisation*
- *SEA: Strategic Environmental Assessment*
- *TACs: Total Allowable Catches*
- *VMS: Vessel Monitoring Systems*
- *WFD: Water Framework Directivev*

The guidelines contained in this brochure have been produced under Contract no. 07.0201/2015/714041 with the European Union (DG Environment) and the opinions expressed are those of the contractor only and do not represent the EU's official position.