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Committee of the Regions

**Developing Blue economy through
better methodology for assessment on
local and regional level**

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List of acronyms

AS	Alien Species
CA	Coastal Areas
CBC	Cross-Border Cooperation
CF	Cohesion Fund
CFP	Common Fisheries Policy
CLLD	Community-led Local Development
CR	Coastal Regions
DG	Directorate-General
DG MARE	Directorate-General for Maritime Affairs and Fisheries
DH	Diffuse Horizontal
DNI	Direct Normal Irradiance
EAFRD	European Agricultural Fund for Rural Development
EASIN	European Alien Species Information Network
EC	European Commission
ECMWF	European Centre for Medium-Range Weather Forecasts
EEA	European Environment Agency
EMFF	European Maritime and Fisheries Fund
EMODnet	European Marine Observation Network
EMSA	European Maritime Safety Agency
ERDF	European Regional Development Fund
ESF	European Social Fund
ESIF	European Structural and Investment Funds
ETC	European Territorial Cooperation
EU	European Union
EuroGOOS	European Global Ocean Observing System
EWEA	European Wind Energy Association
FAO	Food and Agriculture Organisation
FMED	French Marine Economic Data
FP7	7th Framework Programme
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GHI	Global Horizontal Irradiance
GIS	Geographical Information System

GMT	Greenwich Mean Time
GVA	Gross Value Added
HCMR	Hellenic Centre for Marine Research
H2020	Horizon 2020
IAs	Initial Assessments
ICT	Information and Communication Technologies
ICZM	Integrated Coastal Zone Management
INSEE	(French) National Institute of Statistics and Economic Studies
JRC	Joint Research Centre
LAG	Local Action Group
LAU	Local Administrative Unit
LEADER	Liaison Entre Actions de Développement de l'Économie Rurale
LFS	Labour Force Survey
LRAs	Local and Regional Authorities
M&R	Monitoring & Reporting
MS	Member State(s)
MSFD	Marine Strategy Framework Directive
NACE	Statistical classification of economic activities in the European
NGOs	Non-Governmental Organisations
NSIs	National Statistics Institutes
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Cooperation and Development
OTEC	Ocean Thermal Energy Conversion
PPS	Purchasing Power Standard
R&D	Research & Development
SBS	Structural Business Statistics
SO	Specific Objective
TEN-T	Trans-European Networks -Transport
TO	Technical Objective
TVET	Technical Vocational Education and Training
WB	World Bank

Executive Summary

Blue economy is an essential driver of development. Its importance has been broadly measured and acknowledged in economic, social, and environmental terms. However, its impact at the regional and local level has not been measured to its full extent so far, as a system of indicators based on reliable data measuring the precise effect of activities directly or indirectly relying on the sea, has yet to be developed.

Several attempts to estimate the size of blue economy have been made. Specifically, the following initiatives provide an overview of approaches measuring the size, nature and dynamics of blue economy at the European Union (EU) and Member State (MS) level: the DG MARE's initiative, still ongoing, which is using data reported by Member States (MS) to Eurostat; Eurostat's work on maritime policy indicators and on maritime economy statistics; the French marine economic data report; the Ecorys (2012) study on Blue Growth; and the European Maritime and Fisheries Fund (EMFF) study on the development of a consistent set of data on the maritime economy in Europe (under evaluation).

The review of these recent initiatives aimed at measuring blue economy's impact indicated a high complexity of the exercise, as well as the lack of adequate indicators at the sub-national level. As a consequence, the design of a systematic and comprehensive impact assessment methodology for blue economy at the regional and local level is deemed a particularly demanding task, requiring significantly high resources. More pragmatically, this study provides an outline of the key elements to be considered by local and regional authorities (LRAs) when defining the scope of an impact assessment methodology, and identifies a limited set of indicators deemed most appropriate for use in the impact exercise.

A blue economy impact exercise requires LRAs to clearly define the economic sectors/sub-sectors in focus, coherently with the general sectoral framework for maritime activities devised at the EU level, and in line with those priority sectors highlighted in the Smart Specialisation Strategy of the concerned region. Sectors in focus are expected to be selected from the following maritime domains: a) coastal tourism (including related urban development and infrastructure, as well as recreational activities and sports); b) food, health and ecosystem services (fisheries, aquaculture, cosmetics); c) energy (oil, gas, renewable energy) and raw materials (salt extraction, marine aggregates extraction); d) transport (including shipbuilding and maritime monitoring and surveillance); and e) environmental monitoring and protection of maritime areas.

Three tiers of indicators are proposed for blue economy territorial impact assessment: 1st tier indicators are the main indicators used to indicate the magnitude of blue economy's impact in terms of Gross Value Added (GVA) and employment. These indicators may support LRAs in selecting those strategic sectors driving local/regional development; 2nd tier indicators may complement 1st tier indicators in cases of limited data availability or if further evidence is deemed necessary for assessing the economic/social impact in terms of turnover, revenue, investment, number of enterprises, and average wages per person employed. These indicators may facilitate LRAs decision making on investment policies and incentives for enterprises, as well as on employment support; 3rd tier indicators may be used with data at NUTS1 level to provide an estimate of labour market quality characteristics in the maritime sectors concerned, or to provide a more complete picture of the size and significance of the maritime sectors within the labour market. They support decisions by LRAs on employment and other social issues, and include employment by sex and age, staff mobility and employment of non-EU citizens, proportion of workforce from other EU countries, and indirect employment. In general, proxies may also be used to substitute for indicators missing sufficient data.

There is a wide range of data sources providing quality, though fragmented, information on blue economy. Tools facilitating access to maritime data, in both raw and processed form, are currently being developed. For example, the EU funded platforms EMODnet and Copernicus, already make partly available data for public use, thus making it easier for non-expert users, including LRAs, to benefit from existing information on blue economy state and processes.

Several issues impede LRAs from taking full advantage of existing information to the benefit of blue economy in their territories, including: numerous, dispersed and poorly communicated sources of information, databases and data sets; lack of adequate data management capacity and resources within administrations; need for investments in web/mobile applications facilitating a wide use of derived information products; prevailing decision making processes lacking experience with smart technologies; fragmented marine monitoring, observation and data collection networks, with their operation serving a wide and often diverse spectrum of purposes; constantly changing maritime data availability; and gaps in broadly available data.

Funding for LRA investments benefiting blue economy, including in addressing the aforementioned obstacles is made available under the European Structural and Investment Funds (ESIF), the Horizon 2020 programme, or other relevant measures foreseen at the national level.

Part 1: Methodology to measure the impact of the blue economy on the local and regional level

1.1 Background and rationale

The global importance of economic activities depending on the sea has been largely measured and broadly acknowledged, not only in terms of Gross Value Added (GVA) and jobs, but also of ecosystem services, with the ocean providing “*the essential services of regulating Earth’s climate and generating roughly half of primary production of organic matter*” (Svensson and Pendleton eds., 2014). Likewise, at both European Union (EU) and Member State (MS) level, marine or blue economy (Box 1) is considered an essential economic driver which extends beyond operations at sea. In fact, approximately 40% of the EU population lives within 50 km from the sea, almost 40% of the EU Gross Domestic Product (GDP) and roughly 5.4 million jobs are generated in maritime regions¹, and the vast majority of the EU foreign trade is conducted at sea (about 75% in volume).

Box 1. Blue economy definition

There is no clear consensus among stakeholders on the definition of blue economy at the EU level. A relevant proposal by DG MARE (September 2015) includes in blue economy **any market activity taking place on the European territory that is intrinsically linked to the sea**. It covers: (1) primary sectors – transport (shipbuilding, shipping), energy (oil, gas, and renewable energy), food (fisheries, aquaculture) and coastal tourism; (2) secondary sectors (e.g. insurance) which provide goods and services to these primary sectors; and (3) smaller sectors such as marine aggregate extraction or communication cable laying. Under this definition, non-market activities such as education and research, as well as business and day trips in the category of coastal tourism are excluded. The proposal has triggered a discussion with regard to the inclusion of, among other activities, off-shore activities, coastal tourism day trips, and activities in inland waterways. According to the above DG MARE outline, blue economy encompasses several of the economic activities linked to Blue Growth, i.e. the maritime pillar of the Europe 2020 strategy, supporting sustainable growth in the marine and maritime sectors as a whole.

Source: EC, DG MARE (2015)

¹ Based on data from ECORYS (2012).

There are clear indications that blue economy is a decisive growth factor in a number of EU regions, notably in coastal regions², with ocean and marine areas being a major source of food, energy, minerals, cosmetics and medicines, as well as the backbone of entire industries such as transport, tourism and recreation. However, blue economy's impact at the regional and local level has not been measured to its full extent so far, as **a system of indicators based on reliable data measuring the precise effect of activities directly or indirectly relying on the sea, has yet to be developed.**

Estimating the size of blue economy is a complex exercise. Several attempts have been made in this respect globally, with so far **none being considered definitive.** Within Europe, the focus of the exercises is mostly on the EU and national level with little, if any, attention paid to the regional and local level. Furthermore, two initiatives (one by the Directorate-General for Maritime Affairs and Fisheries - DG MARE - and the other one by the European Maritime and Fisheries Fund - EMFF) which are expected to provide relevant information are either still under implementation or not being publicly evaluated.

1.2 Selected recent and on-going efforts to measure blue economy impact

This section reviews the methodologies adopted in a few most relevant efforts made to measure the size and significance of blue economy in the EU or in individual EU countries. The scope is to illustrate the methodology options available and the difficulties encountered in defining and collecting information on both the maritime³ sectors/activities and the territories concerned by these efforts. Main recent and on-going initiatives and reports reviewed include:

- DG MARE's initiative on assessing blue economy (still on-going). It aims at estimating the size and nature of the blue economy using data reported by MS to Eurostat. The method (including the list of indicators used) and results are being discussed within a group of European Commission (EC)

² Eurostat defines a **coastal region** at NUTS3 level as a statistical region having a sea border (i.e. a coastline) or more than half of its population within 50 km from the sea. Hamburg does not meet any of the two conditions but is considered a coastal region due to its strong maritime influence. Likewise, **coastal areas** are statistically defined as local administrative units (LAU2), typically municipalities, bordering the sea or having 50% of their surface within a distance of 10 km from the sea.

³ Although some references distinguish the term 'maritime' from the term 'marine' (e.g. when referring to marine and maritime research), international literature addressing blue economy (including articles and reports on the measurement of blue economy's impact) generally uses 'marine' and 'maritime' as interchangeable terms. In this report, the term maritime is used, apart from where references are made to studies using the 'marine' term, e.g. the French Marine Economic Data report.

and national experts, and compared with similar approaches taken at the MS level.

- Eurostat’s work on maritime policy indicators (Eurostat 2016a). It includes comparison between coastal and non-coastal regions according to Eurostat regions’ typology at NUTS3 level.
- Eurostat’s work on maritime economy statistics (Eurostat 2016b). It includes recent data on both the geographical and sectoral aspects of the maritime economy of the EU, combining data from a variety of sources such as structure of business, product, maritime transport and fishery statistics.
- French Marine Economic Data (FMED) report (Girard & Kalaydjian, 2014). It includes a selection of key indicators addressing relevant (maritime) French sectors and activities. The report assesses the selected sectors’ economic significance in terms of output, employment, share in national economy and global market (international competition), as well as input to non-market public services.
- Ecorys (2012) study on Blue Growth. It outlines scenarios and drivers for sustainable growth from the oceans, seas and coasts.

An indicator matrix has been used to facilitate the analysis of the data sources referred to in each of the above initiatives/reports. The matrix provides information on the definition of the data, the understanding of what the data/indicator is measuring (measurement), the territorial level of reference of the data/indicator, the relevance, and the availability of data (addressing also the issue of coverage)^{4,5}.

1.2.1 On-going initiative by DG MARE

The DG MARE’s approach to measuring the size and significance of blue economy focuses on the EU level⁶. Data are gathered per each MS from various sources, such as the Labour Force Survey (LFS), the Data Collection Framework (for collection and management of fisheries data, as uploaded in databases managed by the Joint Research Centre), and structural business

⁴ ‘Relevance’ herewith refers to the degree to which the indicator meets current and potential needs of the users, in this case the measurement of blue economy’s impact at the regional or local level.

⁵ Data ‘availability’ is intended as the potential to collect the data feeding the indicator at the appropriate geographical level, i.e. regional and/or local (considered ‘available’ if either level is covered). Available time series, geographical coverage and updating frequency are also taken into consideration.

⁶ This initiative is on-going and several adjustments to the methodology proposed so far are currently being discussed within the Experts Group.

statistics (SBS) (exhaustive data, in this case largely used for comparison and cross-check), as provided by MS to Eurostat (Table 1).

Table 1 Data sources per maritime sector

Maritime sectors addressed	Data sources
Crude petroleum and gas extraction; Renewables; Other	Annual detailed enterprise statistics for industry (NACE Rev. 2, B-E); European Wind Energy Association (EWEA); LFS.
Fishing and Aquaculture	Annual detailed enterprise statistics for industry (NACE Rev. 2, B-E); Data Collection Framework; LFS.
Shipbuilding; Shipping	Annual detailed enterprise statistics for industry (NACE Rev. 2, B-E); Annual detailed enterprise statistics for construction (NACE Rev. 2, F); Annual detailed enterprise statistics for services (NACE Rev. 2 H-N and S95); Eurostat Tourism Survey; SBS; LFS.
Tourism	Eurostat Tourism Survey; SBS; LFS.

Information is processed (aggregated) at the EU level. The analysis looks mainly into two aspects of blue economy: output (in monetary terms) and employment, while environmental effects are not considered. Various indicators are used to measure the size and dynamics of each blue economy sector, as well as its impact on the labour market (Table 2).

Table 2 Matrix of DG MARE indicators

Indicator	Measurement	Level	Relevance	Availability
GVA / Revenue / Turnover / Investment per maritime sector	Size and dynamic of blue economy by sector. Time series are an indicator of growth.	1	Y	P
Number of persons employed per maritime sector and as a proportion of total employment	As above.	1	Y	Y
Indirect employment per maritime sector	Jobs created in activities supplying goods and services to primary maritime activities.	1	Y	N

Indicator	Measurement	Level	Relevance	Availability
Employment age and sex distribution per maritime sector	Impact on (social aspects of) the labour market (age, gender).	1	Y	N
Staff mobility and employment of non-EU citizens per maritime sector	Impact on the labour market: internationalisation of the workforce.	1	Y	N
Proportion of workforce from other EU countries in blue activities per maritime sector	As above.	1	Y	N
Average wages per person employed, by maritime sector	Impact on the labour market.	1	Y	Y
Notes: 1 = NUTS1, 2 = NUTS2, 3 = NUTS3, Y = Yes, N = No, P = Partial				

Specifically, the analysis uses a combination of added value, revenue, investment and turnover to measure the **size and growth** of maritime sectors across MS and at the EU level. Blending these four indicators allows the selection of the ones most suitable for each maritime sector. The methodological approach used to derive aggregates at the EU level is not sufficiently explained but, in any case, these indicators cannot be used to measure the local or regional impact of blue economy due to the limited data availability at sub-national level.

As regards **employment**, a large number of indicators are used to assess both quantitative and qualitative aspects of blue economy's labour market. These include the number of persons employed per maritime sector and as a proportion of total employment, indirect employment, and average wages. Data disaggregation is also done by age, gender, and mobility characteristics of the workforce. These indicators are fed with data per maritime sector. For some of these sectors the information is also available at NUTS2 level through Eurostat's structural business statistics. However, the following maritime domains are not covered by SBS: 'coastal tourism'⁷, part of 'food health and ecosystem services' (notably, agriculture and fisheries), and part of 'environmental monitoring and protection of maritime areas'. Other information sources (i.e. the Data Collection Framework for agriculture and fisheries, Eurostat Tourism Survey, and the LFS) do not include publicly available data on employment at sub-national level. Indirect employment (secondary jobs generated by primary maritime activities, i.e. employment created in activities supplying goods and

⁷ 'Coastal tourism' corresponds to about half of the total employment of blue economy as considered by DG MARE.

services to primary maritime activities) is estimated with the use of a proxy indicator, based on the amount that each primary activity spends on goods and services, and the ‘turnover to persons employed by secondary activities for the provision of these goods and services’ ratio. The formula used to estimate secondary jobs assumes that any supply of goods and services to primary maritime activities (indirect activity) involves companies from the same country. Provided that most indirect activity is within the EU and that the turnover to persons employed ratios are similar among countries examined, this assumption is not expected to significantly affect estimation of blue economy’s impact at the EU level. However, the application of such a formula at the regional level (assuming that regional ‘goods and services market data’ are available) is likely to distort results, especially in cases of high dispersion of suppliers of goods and services to several regions and/or of disparities in regional turnover to persons employed ratios. Hence, it would not be appropriate for estimating blue economy’s impact at the regional or local level.

In terms of gathered information, data on age and gender labour characteristics sourced from Eurostat’s LFS show male predominance in specific maritime sectors and activities like energy (oil and gas), transport (ship building) and marine fishing. At the same time, a relatively high proportion of female and younger workers in selected service industries, notably tourism and fish processing, is noted. Relevant data at NUTS2 or NUTS3 level are not available, but in some cases national averages give a clear indication of the maritime sector characteristics, with adequate potential for use in estimating quality aspects of blue economy’s impact on regions, as well as in interpreting relevant impact assessments for policy use. In addition, the DG MARE analysis indicates a strong international character of the blue economy workforce, with a significant number of employees in almost all sectors coming from other than the industries’ own countries. The proportion of foreign employees is split to half between those originating from other EU countries and those from outside the EU. This global nature of human resources is particularly stressed in both the tourism and the fish processing industries. Findings at EU and MS level give a clear picture of employment’s multi-national origin in maritime sectors and activities, and are expected to also shape regional and local blue economies.

1.2.2 Eurostat’s maritime policy indicators

Eurostat’s work on maritime policy indicators - recently (May 2016) updated with new data - focuses on the EU level, with information processed (aggregates from NUTS3 level), analysed and presented in two distinctive data sets, i.e. coastal and non-coastal regions. The analysis is meant to facilitate a comparison of the demographic and socio-economic situation in the two aforementioned types of EU regions (Eurostat 2016a). It aims at being informative with regard to

the EU integrated maritime policy target of sustainable use of oceans and seas; an enhanced EU knowledge and innovation potential in maritime affairs; a sustainable growth in coastal regions; and a strengthened EU maritime leadership, including through raised attention to maritime issues across Europe.

A **geographic rather than a sector approach** is taken by Eurostat, grouping together 446 EU coastal regions located in 23 MS, covering the EU’s five sea basins (Baltic Sea, North Sea, Mediterranean Sea, Black Sea, and North East Atlantic Ocean) and its outermost regions. Information comes from Eurostat data sources on demography, tourism, labour market and economic accounts, with data sets specifically addressing coastal regions (demography, labour market and economic accounts), or coastal areas (tourism). The typology is based on NUTS3 units (LAU2 with regard to tourism statistics), however Eurostat does not publicly release data at NUTS2 or NUTS3 level through these sets. The analysis examines changes between reference years 2004 and 2014, depending on data availability in the different data sets.

On the basis of this approach, a set of core indicators on demography, labour market and economy (Table 3) is used to compare the demographic and socio-economic profiles of **coastal and non-coastal regions**, including population density, (un)employment, and purchasing power standards (PPS). These indicators measure aspects like the attractiveness of (non-)coastal regions as places to live in, the size of the labour market, and the available income per inhabitant (benchmarked with the EU average). The relevant maritime policy database developed by Eurostat includes additional indicators, covering measurements of tourism size, capacity and dynamics; the significance of the regional economy; and the age and gender structure of both the (non-)coastal population and the labour market.

Table 3 Matrix of Eurostat’s maritime policy indicators

Indicator	Measurement	Level	Relevance	Availability
Population density	Preference to living in (non-)coastal regions.	CR	P	Y
Crude rate of total population change	Trends in preference to living in (non-) coastal regions.	CR	P	Y
Total unemployment (people aged 15 years or over)	Labour market size in (non-)coastal regions.	CR	P	Y

Indicator	Measurement	Level	Relevance	Availability
Total employment (people aged 20-63 years)	As above.	CR	P	Y
PPP per inhabitant in percentage of the EU average	Regional output, in terms of resident financial capacity in (non-)coastal regions.	CR	P	Y
Additional indicators				
Nights spent at tourist accommodation establishments by coastal and non-coastal area	Tourism size and dynamic in (non-)coastal regions.	CA	P	Y
Number of establishments, bedrooms & bed-places by coastal & non-coastal area	Tourism capacity in (non-)coastal regions.	CA	P	Y
Economically active population by sex and age	Labour market characteristics in (non-) coastal regions.	CR	P	Y
(Un-)employment by sex and age (rates and absolute values)	Labour market size and characteristics in (non-)coastal regions.	CR	P	Y
Population by sex and age	Population characteristics in (non-)coastal regions.	CR	P	Y
GDP at current market prices	Size of economy in (non-)coastal regions.	CR	P	Y
GVA at basic prices	As above.	CR	P	Y
Notes: 1 = NUTS1, 2 = NUTS2, 3 = NUTS3, Y = Yes, N = No, P = Partly, CA/CR = Coastal Areas/Coastal Regions				

Eurostat analysis looks into the market economy of each region as a whole, without focusing on the maritime sectors. Therefore, measurements are not limited to the impact of blue economy (maritime activities) but include other activities as well. **This latter aspect limits the relevance of these indicators as tools to measure blue economy's impact at regional/local level**, although findings of the analysis remain useful in terms of capturing the potential effect that blue economy has on coastal regions affected by national or EU level processes (e.g. how the recent financial crisis affected coastal, compared to non-coastal areas); or those (coastal) areas where the blue economy may have a substantial impact (hotspots) due to the existence of infrastructure (e.g. ports) or

other aspects of significant magnitude increasing both the regional output and the labour market size.

1.2.3 Eurostat’s maritime economy statistics

Eurostat’s work on maritime economy statistics – also recently (July 2015) updated to include comparison with non-coastal regions – is based on data processed, analysed and presented mainly at country and EU level, with few exceptions where information is available at NUTS3 level. The analysis aims at measuring “economic, social and environmental issues related to coastal regions, sea basins and the maritime economic sectors” (Eurostat 2016b).

Statistical analysis and findings have both a geographic and a sector focus. They refer to the geography of **coastal regions** within MS, with respect to demography, GDP disparities, employment, and business characteristics on the one hand; and on the other hand, with respect to selected activities linked with maritime sectors, namely tourism, transport, maritime manufacturing, fisheries, aquaculture, fish processing, extraction of crude petroleum and of natural gas, manufacture of refined petroleum products, and extraction of salt.

Information comes from Eurostat data sources on maritime policy, transport, tourism, SBS, short-term business statistics, and fisheries. Notwithstanding the predominantly country and EU level analysis and presentation of data, the typology is based on NUTS3 units (LAU2 with regard to tourism statistics). However, with some exceptions regarding tourism and SBS, Eurostat does not publicly release these data at NUTS2 or NUTS3 level.

Selected indicators measure a wide range of aspects, including geographic and population distribution, output and employment (total and per maritime sector in focus), concentration of tourism activity and capacity, business demography and movement of freight and passengers in EU seaports (Table 4). The analysis examines changes between reference years 2005 and 2014, depending on data availability in the different data sets.

Table 4 Matrix of Eurostat’s maritime economy statistics indicators

Indicator	Measurement	Level	Relevance	Availability
Size of coastal regions	Geographic importance of coastal regions.	1	N	Y
Share of coastal and non-coastal regions	As above.	1	N	Y

Indicator	Measurement	Level	Relevance	Availability
in relation to total area				
Population living in coastal regions	Preference to living in (non-) coastal regions.	1	P	Y
GDP per inhabitant (coastal / non-coastal regions)	Size of economy in (non-) coastal regions.	1	P	Y
GDP per inhabitant at current market prices	As above.	3	P	N
Variation in number of high-growth enterprises (≥ 10 % employment growth) (coastal/non-coastal regions)	Impact on business development (including trends).	3	P	Y
Employment rates of the population (coastal/non-coastal regions)	Labour market size in (non-) coastal regions.	1	P	Y
People employed in enterprises born in 2008 having survived to 2010, all activities (NACE Rev.2)	Impact on business development.	3	P	Y
Relative share of people employed by newly born enterprises in the accommodation & food services sector (NACE Rev. 2)	Impact on tourism business development.	3	P	Y
People employed in enterprises born in 2008 having survived to 2010 in the accommodation & food services sector (NACE Rev.2)	As above.	3	P	Y
GVA at basic prices in the coastal regions	Size of economy in (non-) coastal regions.	1	P	P
Number of bed-places in coastal areas	Tourism capacity in (non-) coastal regions.	CA	Y	Y
Nights spent at tourist accommodation establishments in coastal areas	Tourism size and dynamic in (non-)coastal areas.	CA	Y	Y
Share of nights spent at tourist accommodation establishments in coastal areas	As above.	CA	Y	Y
Number of employed persons in the accommodation & food services sectors (NACE Rev. 2), by coastal and landlocked countries (2008-2014)	As above.	CA	Y	Y

Indicator	Measurement	Level	Relevance	Availability
Gross weight handled in EU ports (2004-2013)	Transport sector size in coastal regions.	n/a	Y	N
Maritime transport of goods, by direction (2013)	As above.	1	Y	N
Maritime transport of passengers, by direction (2013)	As above.	1	Y	N
Maritime transport of passengers in EU ports (2007-2013)	As above.	n/a	Y	N
Annual growth rates in main maritime industry NACE Rev. 2 activities (2005-2014)	Dynamics of blue economy by sector.	EU	Y	N
Production in main maritime industry NACE Rev. 2 activities (2005-2014)	Size of blue economy by sector.	EU	Y	N
Production value of the maritime manufacturing sector by main NACE Rev. 2 activities (2005-2014)	Size of blue economy by main maritime activities.	EU	Y	N
Value added of the maritime manufacturing sector by main NACE Rev. 2 activities (2012)	As above.	1	Y	N
Number of enterprises in the maritime manufacturing sector by main NACE Rev. 2 activities (2012)	As above.	1	Y	Y
Processing and preserving of fish, crustaceans and molluscs (2005-2014)	Fish processing sector size.	EU	Y	N
Value added of processing and preserving of fish, crustaceans and molluscs (2012)	As above.	EU	Y	N
Catches in volume	Fishing sector size.	EU	Y	N
Aquaculture production in marine areas	Aquaculture sector size in coastal regions.	1	Y	N
Notes: 1 = NUTS1, 2 = NUTS2, 3 = NUTS3, Y = Yes, N = No, P = Partly, CA/CR = Coastal Areas/Coastal Regions				

In particular, the analysis looks into the size of coastal regions within each MS, the proportion of coastal and non-coastal regions, as well as the proportion of population living in coastal and non-coastal regions within each country, to assess the geography and demography of the European coastal regions. It also examines the market economy of each region, providing information on the

(non-)coastal regions GDP and GVA, employment, and business demography. As with the case of marine policy indicators, this information relates with geographic units (coastal regions/areas) as opposed to sectors (maritime), hence it has only a partial relevance to the assessment of blue economy's impact on the regional/local level.

Going beyond the scope of the maritime policy indicators analysis, Eurostat's work on maritime economy statistics makes an assessment of main activities (sections in the NACE Rev. 2 classification), based on their added value (GVA) to coastal regions. Three main groups of activities have been identified as having significant added value, namely: i) wholesale and retail trade, transport, accommodation and food service activities; ii) public administration, defence, education, human health and social work activities; and iii) industry (except construction). On the same basis (i.e. added value to coastal regions), the tourism and transport sectors were selected for further analysis, along with a number of specific activities (classes – 4th digit NACE code) that are directly linked with the coast and the sea (maritime activities).

For each of the above maritime activities, Eurostat's analysis examines the trends of economic figures over the period 2005-2014, facilitating comparison between coastal and non-coastal regions. **Focus is largely on the description of the activity's characteristics rather than on measuring blue economy's impact. Economic impact is partly measured in terms of value added.** With the exception of the tourism sector, where a positive effect of blue economy on employment growth is implied (EU coastal regions tend to have steadier employment growth rates than EU landlocked regions), the analysis does not indicate any blue economy's impact on the social (e.g. job creation, better job places, gender balance) or the environmental (e.g. natural resource use, pollution) conditions of the EU regions. Relevant impact on some economic aspects (e.g. income generation) is also overlooked.

1.2.4 French Marine Economic Data report (2013)

The French Marine Economic Data (FMED) report is elaborated and updated by Ifremer every two years since the first edition released in 1997. The report provides a relatively comprehensive approach as for the sectors addressed, assessing the economic significance of maritime activities in France in terms of both economic production and jobs. The analysis focuses mainly on the national level but it also takes into account the EU dimension and addresses regional aspects when data allow.

The report considers both the industrial and the non-commercial public sectors, yet excludes certain sectors which, although significant, suffer from poor data

availability such as bank services and salt production. More specifically, the 2013 FMED report covers the following sectors:

- Seafood industry: commercial fisheries, aquaculture, seafood trade, seaweed exploitation and processing, seafood processing.
- Marine sand and gravel extraction.
- Energy production: onshore power plants, marine renewables.
- Shipbuilding and repair: merchant and defence shipbuilding, marine equipment, ship repair, boat building.
- Marine and river civil engineering.
- Submarine cable manufacturing, laying and maintenance.
- Oil and gas offshore services.
- Coastal tourism.
- Maritime transport and inland navigation: seaport and river port services, maritime and river shipping services.
- Marine insurance.
- French Navy.
- Public intervention at sea and maritime affairs: signalling and rescue, safety at sea and security, seafarer training, social protection.
- Protection of coastal and marine environment.
- Marine science.

Information on the sectors is mainly provided by the National Institute of Statistics and Economic Studies (INSEE), with additional data collected through satellite accounts (e.g. for tourism, transport and the environment), industry associations and enterprises, Eurostat (indicators for international comparisons), and contributions from the French Navy General Staff, the French Maritime Affairs Directorate, the French Transport Ministry, and marine science research and other organisations. Data typology is based on the French classification of economic activities (NAF), which is in line with the NACE.

The **analysis of maritime activities is based on a small number of economic indicators by sector** (Table 5) such as turnover, value added, employment (in full time equivalents or, in case of no data, in number of jobs as at of end of the year), number of enterprises, and export rate. Additional indicators for the public sector include staff number and cost broken down by activities.

Table 5 Matrix of French Marine Economic Data report indicators

Indicator	Measurement	Level	Relevance	Availability
Number of enterprises	Size and dynamic of blue economy, by sector.	1	Y	Y
Turnover	Size and dynamic of blue economy, by sector. Time series are an indicator of growth.	1	Y	P
Value added	As above.	1	Y	P
Employment	Size and dynamic of blue economy employment by sector. Time series are an indicator of growth.	1	Y	Y
Export rate	Competitiveness of blue economy, by sector.	1	Y	N
Notes: 1 = NUTS1, 2 = NUTS2, 3 = NUTS3, Y = Yes, N = No, P = Partial				

Based on value added and employment, the report identifies coastal tourism as the most important maritime activity in the country, accounting for about half of the total value added and employment. Using the same criteria, among the main sectors are: shipbuilding; maritime and river transport; seafood industry; offshore oil and gas services (though employment in the sector is relatively low compared to added value); and the public sector. The report also makes reference to the following sectors as making a significant contribution to blue economy: submarine cables, maritime and river civil engineering, and marine aggregate extraction.

1.2.5 Ecorys study on Blue Growth scenarios and drivers for sustainable growth from the oceans, seas and coasts (2012)

The study produced by Ecorys on behalf of DG MARE (Ecorys, 2012) aimed at improving the understanding of the maritime sector towards the outlining of policy options supporting smart, sustainable and inclusive growth from the oceans, seas and coasts. In doing so, it developed a methodology to identify maritime functions⁸ and sub-functions which are most significant in terms of size, growth rate and future potential, i.e. it **elaborated on methodological steps to estimate the current size, recent growth and future potential of the maritime economy**. The results of the study have provided guidance to a series of subsequent studies examining the size and nature of the maritime economy in

⁸ As opposed to the approach considering maritime sectors, that, among other weaknesses, does not sufficiently cover new or emerging sub-functions.

coastal MS, including in Sea Basins (Ecorys 2014a, Ecorys 2014b, COGEA 2014, COGEA 2013).

More precisely, the study assessed recent growth and present size of maritime (sub-)functions in terms of value added and employment, and future potential in terms of innovativeness, competitiveness, job creation, policy relevance, spill-over effects, and sustainability. The assessment process had to address several challenges, notably in allocating statistical sectors (for which sufficient data exist) to maritime functions (as defined by the study). The following approaches were then considered:

- Use of NACE sectors. For a number of 4-digit (or more detailed) sectors/activities a clear distinction between maritime and non-maritime was made possible.
- Use of NUTS geographic level for some activities, notably tourism, as the geographic definition helped addressing sector allocation problems.
- Use of existing allocation of activities to maritime sectors as suggested by previous studies. The approach required some adaptations to match the maritime functions in focus.
- Use of input/output tables to determine the part of each sector that was to be attributed to maritime (sub-)functions.
- Use of own estimates, based on expert opinions (including through relevant literature), to complement the other approaches.

With regard to the indicators used for the identification of the largest sub-functions in terms of current economic importance, as well as of the fastest growing sub-functions over the last 5 years, the study used value added and employment, or proxies when data availability was limited. Commonly used proxy indicators for value added included turnover and production value. For employment, proxy indicators were often sector-specific. For example, in the passenger ferries sub-function, data gathered included the total number of passengers transported by large operators, staff numbers and fleet sizes; hence, a proxy was calculated as the number of passengers served on average per staff member (inevitably including office and other shore staff of the operator).

The criteria used to determine future outlook for sub-functions were defined as follows:

- **Innovativeness:** the relevance of Research & Development (R&D) and innovation into technology improvements or new applications for the sub-functions. Table 6 reports on relevant indicators used to measure innovation potential.
- **Competitiveness:** potential for the EU industry to compete with the global industry in the respective segments.
- **Employment creation:** new jobs, including attention to geography.
- **Policy relevance:** degree of contribution to EU policy objectives/relevance for EU-based policy initiatives.
- **Spill-over effects:** links and synergies with other sub-functions.
- **Sustainability:** environmental considerations.

Scores reflecting the three options of positive impact, stability, decline or negative impact, were attributed to each sub-function on the basis of expert evaluation.

Table 6 Matrix of innovation indicators proposed by the Ecorys study

Indicator	Measurement	Level	Relevance	Availability
Number of publications	Innovation potential	1	Y	N
Number of innovations (patents)	Innovation	1	Y	P
R&D spending	Innovation potential	1	Y	P
Notes: 1 = NUTS1, 2 = NUTS2, 3 = NUTS3, Y = Yes, N = No, P = Partial				

Overall, the study identified six (6) maritime functions (maritime transport and shipbuilding; food, nutrition, health and ecosystem services; energy and raw materials; leisure, working and living; coastal protection; and maritime monitoring and surveillance) and 27 sub-functions. Following the described identification process, three sets of seven maritime sub-functions each were highlighted, as presented in Table 7.

Table 7 Overview of top-ranked sub-functions in order of size/growth/scores

Top-7 sub-functions		
Current Size	Recent Growth	Future Potential (based on scores)
Coastal tourism	Offshore wind	Blue biotechnology
Deepsea shipping	Cruise tourism	Offshore wind
Shortsea shipping, including Roll on - Roll off	Securing fresh water supply (desalination)	Protection against flooding and erosion
Offshore oil and gas	Shortsea shipping & deepsea shipping	Ocean renewable energy (wave, tidal, ocean thermal energy conversion - OTEC, thermal, biofuels, etc.)
Yachting and marinas	Yachting and marinas	Traceability and security of goods supply chains
Passenger ferry services	Marine aquatic products	Environmental monitoring
Catching fish for human consumption	Protection against flooding and erosion	Marine minerals mining

1.3 Methodological approach

Given the complexity of the issue and the lack of adequate indicators at the sub-national level, designing a methodology for a systematic and comprehensive measurement of the impact of EU blue economy at the regional and local level is not deemed feasible within the context of this study.

Based on the experience from relevant EU, sea basin and national level initiatives, the proposed approach outlines key elements to be considered by LRAs when defining the scope of an impact assessment methodology for their territory and identifies a limited set of indicators deemed most appropriate for use in the impact exercise. This approach combines the practice of the recent studies reviewed in order to delineate the priority scope of maritime activities having a significant impact on European regions and municipalities. Also, it draws from the data analysis, the challenges and the limitations identified in such studies, with a view to outline a limited set of indicators measuring (part of) the impact of blue economy at the regional and local level.

1.3.1 Elements to be considered in the approach

In order to facilitate blue economy's impact assessment at the local and regional level, the following essentials should be worked out at the EU level:

► Clarity of definitions and approaches

There should be one common and all-encompassing definition of blue economy at the EU level, which should then be applied coherently across EU-based analyses by concerned Directorate-Generals and Eurostat. Being multi-sector, the territorial assessment of the impact of the blue-economy shall allow for a 'modular' approach, with **regions/sub-regions focussing their assessment exercises on the sectors/sub-sectors which are most relevant for them.**

The Ecorys study on Blue Growth (2012) and the subsequent studies on EU Sea Basins (Ecorys 2014a, Ecorys 2014b, COGEA 2014, COGEA 2013) provide a starting point for such an assessment process, although a more systematic stocktaking of the sectors/sub-sectors contributing to the maritime economy in an orderly manner may be necessary. Moreover, considering the different methodological approaches used at EU and MS level for the assessment of blue economy size and impact, and in order to facilitate drawing of comparable results across the EU at local and regional level, an effort should be made to promote the **use of a common methodology for maritime data management.** DG MARE's on-going initiative to measure blue economy is a positive step forward in this respect. However, there is a clear need to complement the output of this initiative with a set of **guidelines for LRAs**, describing a common approach for the use of maritime data and indicators.

► Standards to define the geographical scope

The only typology allowing the collection of data at a level which is significant for LRAs is the Eurostat's typology of coastal regions. Such typology is defined at NUTS3 level and hence it theoretically allows the aggregation of data at NUTS2 level. A common approach to aggregate data at NUTS2 level should be developed.

► Enhanced accessibility of data

In the light of the open data policy in general and of the re-use of public data and documents in particular pursued by the EC, Eurostat data related to the regional and sub-regional level are expected to be made more clearly, comprehensively and easily accessible on the web.

1.3.2 Outlining the methodology

► Step 1: focus of the impact assessment

Within the general framework given by the standard definition of ‘blue economy’ devised at the EU level, each LRA should spell out clearly the economic sectors/sub-sectors to be considered in its impact exercise. Ideally, such sectors/sub-sectors should be in line with those highlighted in the Smart Specialisation Strategy of the concerned region.

Building on what has been discussed under section 1.2 in terms of existing work and information, LRAs focus is likely to be on impact from selected maritime domains and activities, as follows:

- Coastal tourism (including related urban development and infrastructure, as well as recreational activities and sports).
- Food, health and ecosystem services (fisheries, aquaculture, cosmetics).
- Energy (oil, gas, renewable energy) and raw materials (salt extraction, marine aggregates extraction).
- Transport (incl. shipbuilding and maritime monitoring and surveillance).
- Environmental monitoring and protection of maritime areas.

► Step 2: Measurement of the impact

All the reviewed initiatives rely on the use of indicators to measure the impact on the economy. To this regard two circumstances need to be underlined:

- Current exercises have already highlighted how a proposal for additional/new data collection is not feasible within the current reporting requirements of MS.
- The disaggregated level of some of the data sets produced by Eurostat is not clear. Apparently, some of the data publicly available at NUTS2 level are also available at NUTS3 level, but these are not made public.

Within each sector/sub-sector relevant dimensions are to be highlighted according to the policy scope of the assessment (e.g. social, economic, or focussed on individual aspects such as employment). For each dimension, a limited number of indicators may be selected. Satellite information, collected *ad hoc* or focussing on a specific research aspect, may support impact analysis. Qualitative information may also be used towards the same scope.

Building on what has been discussed under section 1.2, **the indicators which are likely to be most useful in territorial impact assessment include:**

1st tier indicators: these are the main indicators used to indicate the magnitude of blue economy impact. They are considered a **starting point for LRAs to understand the economic and social impact of maritime sectors on their territories.** In practical terms, 1st tier indicators support LRAs in selecting strategic key sectors for local/regional development. They include:

- **Gross Value Added:** output in terms of GVA indicates the size of a sector, thus it may provide a picture of the impact of any (maritime) sector on the economy at the regional and local level. The indicator may be interpreted by LRAs on its own (to compare with other maritime sectors), or in relation with regional/local GDP (to assess the magnitude of the selected maritime sector within the regional/local economy). Time series may give LRAs an indication of growth patterns.
- **Employment:** expressed as the *‘number of people employed per maritime sector as a proportion of total employment’* (in full time equivalents or, in case of no data, in number of jobs as at the end of the year), it indicates the impact of a sector on the local/regional labour market. Time series may also indicate growth patterns, but any indication of jobs generated and sustained should be interpreted by LRAs with caution and complemented with additional information on e.g. wages earned, type of employment (full-time or part-time), number of enterprises, and origin of workforce.

2nd tier indicators: these are used in case of limited data availability of 1st tier indicators or if further evidence is deemed necessary. Other than addressing poor data availability, the use of 2nd tier indicators provides LRAs with information on some quality aspects of each maritime sector development process. In practical terms, LRAs may use these indicators to support decision making on investment policies and incentives for enterprises (e.g. selection of focus sectors on the basis of revenue and number of enterprises, selection of type of support on the basis of investment size in previous years), and on employment support (e.g. selection of type of support on the basis of employment and wage levels). They include:

- **Turnover** (can be used as a substitute to GVA).
- **Revenue** (can be used as a substitute to GVA).
- **Investment** (can be used as a substitute to GVA).
- **Number of enterprises** (can be used as a substitute to GVA).

- **Average wages per person employed** (can be used as a substitute to employment).

3rd tier indicators: these may be used with data at NUTS1 level to provide an estimate of labour market quality characteristics in the maritime sectors concerned, or to provide a more complete picture of the size and significance of the maritime sectors within the labour market. In practical terms, LRAs may use these indicators to support decision making on employment (e.g. selection of target groups and fine-tuning of Technical Vocational Education and Training – TVET- programmes on the basis of employment levels by age and gender and/or the proportion of workforce from other EU or from non-EU countries) and on other social issues (e.g. selection of scope of gender equality schemes on the basis of employment distribution by sex, selection of incentives for youth employment on the basis of employment distribution by age). They include:

- **Employment by sex and age:** combined with information from 1st tier employment indicators, it may give LRAs an indication of expected trends in population with regard to male/female and young/elderly prevalence.
- **Staff mobility and employment of non-EU citizens:** may indicate to LRAs potential limitations in the expected blue economy's impact on specific sectors (e.g. high turnover of staff, limited year-round employment, high proportion of foreign employees likely to spend part of their income in other regions, etc.).
- **Proportion of workforce from other EU countries:** as above.
- **Indirect employment:** secondary jobs generated by primary maritime activities may give LRAs a more complete picture of the impact on the labour market at the territorial level in focus.

Proxies may also be used as a substitute for indicators missing sufficient data. Proxies should be decided on the basis of data availability, assuming they are sufficiently correlated to the 1st or 2nd tier indicators they intend to substitute. Examples of proxies include: annual number of ferry/cruise passengers transported (proxy for employment in short-sea shipping, transport sector); tonnage of waterborne transported cargo (proxy for turnover in freight transport, transport sector); and number of nights spent at tourist accommodation establishments (proxy for turnover in accommodation activities, coastal tourism sector).

1.3.3 Remarks on envisaged problems

Main issues of concern with regard to the implementation of the proposed approach refer to the following:

- The horizontal nature of the maritime sector implies complexity in the identification of the relevant sectors/sub-sectors within existing classifications. For example, it may not be possible to distinguish maritime-related activities within given NACE classes. Some believe that the analysis of the maritime sector needs a 4-digit detail in the NACE classification. If classes hide ‘maritime’ information, work on the approximation of the ‘weight’ of the maritime components within these classes is necessary. The use of Eurostat structural business statistics to measure the aggregate value added of all contributing sectors, i.e. those that include a maritime component, is an approach that has been extensively applied by past DG MARE studies, as well as by National Statistical Institutes (NSIs) involved in maritime monitoring initiatives (in the Netherlands, the UK, etc.). However, there are concerns in the application of the bottom-up approach in maritime data processing, due to the rather arbitrary definition of the proportion of maritime components within the selected sectors. More specifically, maritime sectors are considered as a set of sub-activities within multiple sectors, as opposed to a single sector activity, within the NACE classification, hence adding to the complexity of defining the maritime components within each sector. In addition, Eurostat considers a link between activities and the sea when marine resources, maritime areas or regions are used, or in case the activities take place in vicinity to these latter spatial units. However, no consideration is made in terms of how direct or strong this link is (the intensity of relationship is not examined).
- Lack of harmonised data at the desired geographical level. Eurostat is the main provider of harmonised data across the EU and the typology of coastal regions the best acknowledged geographical reference. Clarity on the available data disaggregated at NUTS3 level is considered essential to assess which indicators and information on maritime sectors may be relied upon. Likewise, the establishment of an EU methodology for maritime data processing would be a prerequisite for the provision of indicators based on consistent information that can be used across the EU, addressing existing problems of different timescales, data collection approaches, data availability, and data processing/analysis methods.
- Limited international past experience and references in the estimation of blue economy’s environmental impact. The scope of the majority of

national and EU level initiatives towards assessing the impact of maritime sectors and activities covers social and economic aspects (mainly output in monetary or physical units, and employment). Marine resources and other environmental aspects have not been broadly included in the scope of such exercises, yet.

- Existing efforts to measure the size and significance of blue economy at EU and national level have often resulted in largely different results. For example, figures resulting from the approach taken by the Netherlands NSI (not including coastal tourism) come up with an estimated GVA that is about two times higher than the figures presented in the Blue Growth study.
- Filtering out the effect of capital cities. Filtering or correcting statistics for capital cities, and/or even for cities which are major economic hotspots is a major challenge, with relevant international experience not pointing to any concrete approach to address the issue.
- Assessing benefits of the sea which are unquantifiable in purely monetary terms. Despite progress in internalising ecosystem services into the economic system, several environmental benefits of the sea remain an externality. Accounting for these benefits would require significant research efforts at EU and global level.
- Emerging maritime industries expand the scope of the maritime economy. New maritime activities require that an EU-wide consensus is reached as regards the classification and collection of economic data for these industries. Relevant difficulties refer to lack of data or problems in extracting data from national economic accounts

Part 2: Opportunities for LRAs to use available data sources for the development of blue economy at the local and regional level

2.1 Available sources of information and type of data on blue economy

Primary sources of EU marine and maritime data are numerous and scattered in a wide range of entities across Europe. These include the NSIs, delivering data on population, economic activities, employment, etc.; universities and research centres as sources of environmental data, financial and business information like the Amadeus database, etc.; sector- or country-level business associations, such as the International Association of Oil and Gas Producers and the Cruise Lines International Association offering data on, for example, added value of sector activities and employment; Non-Governmental Organisations (NGOs), collecting data on, for example, the quality of beaches; and thematic observatories, such as the Mediterranean Energy Observatory. In addition, several international agencies such as the Food and Agriculture Organisation (FAO), the Organisation for Economic Cooperation and Development (OECD), and the World Bank (WB), are involved in the compilation, analysis and/or dissemination of relevant data.

Eurostat is the major provider of both primary and secondary (processed) socio-economic and environmental data at the EU level. However, none of its domains in the database is specifically dedicated to blue economy. Eurostat statistics have a relevant geographical focus of interest for the scope of this study, as information may be referred to EU coastal regions or coastal areas.

Dedicated blue economy data are collected by MS in line with current obligations for the preparation of Initial Assessments (IAs) of marine waters, under the EU Marine Strategy Framework Directive (MSFD). Specifically, MS provide to Eurostat national socio-economic and environmental data related with the following three main aspects of marine waters: i) environmental state; ii) pressures, impacts and links with human activities; and iii) economic and social implications of the use of marine waters, including an analysis of the cost of their degradation.

In addition, with regard to maritime environmental information and, starting from 2013, also with regard to relevant information on human activities, the

European Marine Observation Network (EMODnet) brings together more than one hundred organisations with a view to collecting, processing and making publicly available maritime data, including data products and metadata (**Marine Knowledge 2020 initiative**). Structured into seven thematic groups (i.e. geology, bathymetry, physical habitats, physics, chemistry, biology, and human activity), EMODnet data are quality assured, standardised, harmonised across the EU, interoperable and free of restrictions on use. However, the database **will not be fully deployed before 2020**.

Several other standardized systems for managing the large and diverse available maritime data sets exist, including the SeaDataNet⁹ research infrastructure network, which gathers data collected by oceanographic fleets and automatic observation systems of 35 countries, the International Council for the Exploration of the Sea (ICES)¹⁰ data portal, the ESPON data navigator¹¹, the ADRIPLAN¹² data portal focusing on the Adriatic Sea, etc.

Maritime environmental information is also made available through Copernicus, an EU supported initiative providing, on a regular and systematic basis, reference information collected from satellite data, such as sea-surface topography, sea-surface temperature, ocean colour, and ocean currents. Data are frequently updated and their coverage is global.

Ad hoc sources of blue economy-related information are also numerous, but, with the exception of one-off studies, they are largely focused on specific topics, mainly environmental. These sources include a number of research, innovation or demonstration projects (e.g. funded under the EU 7th Framework Programme (FP7), Horizon 2020, LIFE, Interreg Programmes, etc.) such as PEGASO (www.pegasoproject.eu), focusing on ICZM indicators; DEVOTES (<http://www.devotes-project.eu/>), focusing on marine biodiversity and good environmental status assessment; BIAS (<https://biasproject.wordpress.com/>), focusing on underwater sound in the Baltic Sea; and SUBLIMO (<http://www.life-sublimo.fr/en/le-projet/>), focusing on marine biodiversity.

⁹ See: <http://www.seadatanet.org/>

¹⁰ See: <http://ices.dk/marine-data/data-portals/Pages/default.aspx>

¹¹ See: <http://datanavigator.espon.eu/index.php>

¹² See: <http://data.adriplan.eu/>

2.2 Potential use of data sources by LRAs for blue economy development

Available maritime data sources provide quality, though fragmented, information on blue economy. The deployment of tools facilitating access to maritime data, in both raw and processed form, such as the EU-funded platforms EMODnet and Copernicus (with some already partly available for public use), makes it easier for non-expert users, including LRAs, to benefit from existing information on the blue economy state and processes.

In the following sections, relevant opportunities for LRAs are identified and analysed for a set of five blue economy focus areas for development: i) coastal tourism (including related urban development and infrastructure, as well as recreational activities and sports); ii) food, health and ecosystem services (fisheries, aquaculture, cosmetics); iii) energy (oil, gas, renewable energy) and raw materials (salt extraction, marine aggregates extraction); iv) maritime transport activities (including shipbuilding and maritime monitoring and surveillance); and v) environmental monitoring and protection of maritime areas. Selected examples in each focus area are also highlighted.

2.2.1 Coastal tourism

Tourism development in coastal areas is linked to urban growth and changes in land cover and land use. In general, agricultural or natural land is being transformed into built-up area used for recreational or other purposes, including tourism-related infrastructure such as ports and roads to/from resorts or hotel complexes. Monitoring these changes may assist LRAs in steering tourism growth towards more sustainable forms.

Capturing changes in urban land use can be facilitated by existing information provided by Copernicus¹³. Specifically, LRAs may monitor the evolution of urban green areas based on satellite imagery information, thus take informed decisions on, for example, adapting spatial planning policies and/or regulating tourism development projects within the urban fabric. Moreover, they can use available data sets to support the development of derived information products. Examples of such products comprise sets of urban green indicators, including measures of ‘green necessity’, in terms of required action to increase public green supply, and maps of green roofs (by distinguishing between ‘ground’ and ‘elevated’ green areas) to be used as a tool for monitoring and control of relevant incentive plans or subsidies in the tourism sector (e.g. greening rooftops in coastal city resorts).

¹³ Copernicus Marine Environment Monitoring Service is available at www.marine.copernicus.eu

Satellite imagery data sets made available by Copernicus may be of use to LRAs for other urban planning applications such as the monitoring of soil sealing evolution, facilitating decision making on public space landscaping interventions as well as on the introduction of incentives for the use of natural materials in landscaping works in large private developments (mainly hotels and other tourism related projects); and the identification of illegal waste dumping (a major problem for coastal areas during the tourism season), allowing for appropriate measures to be taken. LRAs may also use data provided by Copernicus to assess bathing conditions in their beach areas, by complementing relevant *in situ* and laboratory measurements, including data made available by the European Environment Agency (EEA) in their annual ‘State of bathing waters’ report (EEA 2016), covering all EU28 MS (see also the description of baseline data provided by EMODnet, below). Relevant satellite information allows for frequent and relatively low-cost assessments of the quality of bathing waters, as it detects eutrophication levels and harmful algal blooms based on measurements of sea surface temperature, transparency or turbidity (cloudiness in the water), and ocean colour.

Other baseline information relevant to coastal tourism development may be accessed by LRAs through the EMODnet Human Activities portal¹⁴, providing data on, among other aspects:

- Lighthouses, distinguishing between those still standing and those that have been removed, relocated or destroyed¹⁵.
- Protected areas, distinguishing between those designated under Natura 2000 and nationally designated areas.
- The state of bathing waters¹⁶, according to five classes (excellent/good/sufficient/poor/other).

The database made available through the portal is regularly updated to include latest information from a large number of EU, national and local sources, with contributions also received by several LRAs. Indicatively, available information may be used by LRAs for benchmarking with other EU MS areas (e.g. state of bathing waters), or for establishing EU-wide networks for the promotion of tourism resources (e.g. lighthouses, protected natural areas). As mentioned, the database is still under construction and is expected to be finalised by September 2016.

¹⁴ Available at: <http://www.emodnet-humanactivities.eu/view-data.php>

¹⁵ When fully operational, the database is expected to include information allowing the assessment of the heritage value of each lighthouse (age, description of the edifice, pictures, etc.).

¹⁶ Based on the data set ‘Bathing Water Directive - Status of bathing water’ provided by the European Topic Centre on Water and made available by the EEA at <http://www.eea.europa.eu/data-and-maps/data/bathing-water-directive-status-of-bathing-water-8>. The currently available data set includes information on the 2015 bathing season, as well as some historical data since 1990.

2.2.2 Food, health and ecosystem services

Informed decision making on fisheries and ecosystem services, including on resources used in cosmetics and health products, depends on a wide range of data, addressing diverse factors like habitat conditions, population dynamics and their relationship with prey, climate variability, and fishing practices. Direct measurements of such data are not always possible or are too costly, hence marine ecosystem models are used to study the current status and make forecasts on habitat or fish stock conditions. LRAs can access relevant (frequently updated) information through the Copernicus service, which uses satellite data to measure geophysical parameters, including sea-surface temperature, ocean colour and ocean currents, and make estimates on plankton and micronekton concentrations, which in turn are used as proxy indicators for the **health assessment of various fish stocks** (Box 2).

Box 2. Copernicus Sentinel-3 mission

The quality of publicly available data on habitat and fish stock conditions is expected to improve in the near future, following the recent launching and operation of Copernicus Sentinel-3 mission (March 2016), which (once fully operational through the Copernicus services, i.e. before the end of 2016) will further support efforts by LRAs towards sustainable fishing by providing: improved accuracy of global sea-surface temperature measurements; improved accuracy of ocean colour maps showing concentrations of chlorophyll and suspended sediments; and improved accuracy of sea-surface height measurements.

Source: Copernicus Brief, [Issue 34](#), September 2013 and ESA website (accessed on August 2016).

Moreover, LRAs can use Copernicus radar imagery information to detect illegal, unlicensed and unreported activities, and subsequently plan and take action towards stopping overexploitation of fish stocks and increasing sustainable catches, in favour of local food security and livelihoods. Combined radar and satellite information provided by Copernicus may assist LRAs in applying **science-based management of fisheries**, for example through facilitating decision making on harmful subsidies' elimination or on investments to restore overexploited or collapsed fish stocks.

Information on the location of fish farms, made available by the EMODnet Human Activities portal, combined with production estimates (requiring validation, for example through ground data measurements and/or interviews with local experts and stakeholders), may further support decision making by LRAs on the planning and management of fisheries and aquaculture activities. More precisely, the following indicators may be derived from the data made available through the portal:

- The ‘fish farm influence’ pressure, showing the influence area of fish farms. The indicator is calculated for each fish farm by applying a theoretical maximum distance at which the farm may produce pressure. For example, the application of the ‘fish farm influence’ pressure indicator in the Mediterranean Sea, implemented by the Interreg Med project MedIamer¹⁷, considered a distance of 20 km around each farm location as highly impacted, in line with estimates by HELCOM while assessing impacts of aquaculture in the North Sea (Andersen and Stock (eds.) *et al.*, 2013).
- The fish farm production by km of coast.
- The fish farm production per capita (main species).
- The alien species (AS) related to aquaculture activity, showing the total number of AS from aquaculture activities in a specific sea basin. The indicator may be fed by data from the European Alien Species Information Network (EASIN) species count, which is coordinated by JRC and aggregates data from a wide range of providers across MS.

The aforementioned indicators may be indicatively used by LRAs for the designation of fisheries and aquaculture setback zones, and for the planning of new and/or the expansion of existing aquaculture production areas.

Further to supporting efficient and sustainable fishing operations, LRAs can use satellite data provided by Copernicus to detect water pollution, thus protect other living marine resources (sea-weeds, bacteria, algae, etc.) often used in cosmetics and health products (also in food supplies and in environmental remediation). Copernicus Earth observation data sets on pollutants, phytoplankton, algae, water temperature, etc., may also assist LRAs in their efforts to attract aquaculture investments, by facilitating planning and management of relevant activities. Specifically, satellite-based products and services may facilitate the identification of areas suitable for installing fish farms, the optimisation of aquaculture cage relocation, and the delineation and tracking of potential risks to fish farming sites, including the issuance of warnings on water quality threats. Such threats may include unevenness of sea-surface temperatures and ocean colour; hazardous algal blooms; jellyfish invasions; and water body movements with varying temperatures or oxygen concentrations.

LRAs may also use the aforementioned data sets to monitor the environmental impact of fisheries and aquaculture activities. Specifically, satellite data can

¹⁷ See: http://www.medmaritimeprojects.eu/download/ProjectMediamer/Final_factsheets/AIo_Aquaculture_factsheet.pdf

indicate environmental changes in the areas surrounding aquaculture sites, by assessing the state of habitats, including measuring changes in, for example, sea grass beds and erosion or deposition on inter-tidal mud flats. Moreover, they can be fed into local models to estimate the spread of diseases and other contaminants from aquaculture facilities. Lastly, they can assist LRAs in detecting areas where the seabed habitat has been disturbed by bottom trawling, determining damage to sea-floor to both living and non-living components, and monitor changes in the level of disturbance over specific time periods.

2.2.3 Energy and raw materials

Maritime energy development potential is linked with the exploitation of both deep water hydrocarbons and renewable energy sources, including (offshore) wind, wave, tidal, biomass, thermal conversion, and salinity gradients. LRAs aiming at attracting maritime energy investments may use information provided by the Copernicus and EMODnet services to assess the potential of exploiting renewables within their administrative boundaries.

Specifically, the aforementioned services make publicly available information that facilitates the identification and the optimised selection of appropriate sites for offshore wind farms, with relevant datasets measuring wind speed, wind fields and wave size and frequency. Assessing these wind- and wave-related factors enables those LRAs involved in the identification and optimised selection of appropriate sites for offshore wind farms in defining areas where wind energy may be generated in a way that is cost-effective and with a low risk of damage.

The EMODnet, through the ‘Checkpoint’ concept, assesses the availability and appropriateness of the observation and modelling data sets related to wind energy, including those feeding into downstream applications such as wind farm siting. For example, the EMODnet Black Sea Checkpoint works towards addressing the ‘Wind farm siting’ challenge¹⁸ by: determining the suitability of sites for wind farm development in the Black Sea area, notably border areas between Bulgarian, Romanian, Turkish and Georgian waters, including making an assessment of the appropriateness of floating or fixed wind farms; and evaluating the fitness for use of upstream data, considering aspects such as air characteristics (e.g. wind strength), bathymetry and sea bed characteristics (e.g. seafloor geology), marine water characteristics, biota/biology characteristics, environmental impact, maritime traffic and other human activity spatial distribution (e.g. distance from electric grid and shipping lanes). Relevant data examined at the ‘Wind farm siting’ challenge include:

¹⁸ See: <http://emodnet-blacksea.eu/portfolio/wind-farm-siting/>

- Meteorological analysis at high resolution, mainly from past EU FP7 projects.
- Wave analysis based on observations and modelling work done in past EU FP7 projects.
- Shipping lines available from the European Maritime Safety Agency (EMSA).
- Bathymetry (numerical values and maps) available at the EMODnet Bathymetry portal¹⁹.
- Seafloor geology available at the EMODnet Geology portal²⁰.
- Benthic ecosystem structure available at the EMODnet Seabed Habitat portal²¹.
- Electric grid infrastructure from network operators and energy authorities (or other related public bodies).
- Bird migratory patterns, as described in available literature.

EMODnet also gathers data from EWEA, DG MARE (European Atlas of the Sea) and other sources to provide information on wind farms²² located across MS maritime areas (both on and offshore), making a distinction on the basis of their operational status (i.e. authorised, operational, planned, producing, and under construction). LRAs can use this information to draw the baseline in wind energy production in neighbouring regions and countries, with a view to promoting relevant investments in their area, e.g. by facilitating discussion in public consultations.

Satellite data made available by the Copernicus Atmosphere Monitoring Service can provide information useful for solar energy management. The service monitors conditions in the atmosphere, including those having an impact on the amount of solar radiation reaching the earth's surface. LRAs can use this information to facilitate planning and management of relevant investments, notably estimating the potential for solar energy generation and identifying suitable sites for solar energy production.

¹⁹ See: <http://www.emodnet-bathymetry.eu/>

²⁰ See: <http://www.emodnet.eu/geology>

²¹ See: <http://www.emodnet.eu/seabed-habitats>

²² See: http://www.thewindpower.net/windfarms_list_en.php

Moreover, LRAs can benefit from relevant derived information products already available in the market, such as the Renewable Energy Atlas²³, providing a digital representation of wind, solar and biomass resources. The atlas is a private sector initiative based on weather simulation models combining satellite data with local on-site measurements and information from public weather stations. It is made available through a web-based Geographic Information System (GIS). The Renewable Energy Atlas facilitates the identification of sites suitable for the exploitation of renewable energy sources, presenting information on:

- Solar energy, measuring aspects such as Global Horizontal Irradiance (GHI), Direct Normal Irradiance (DNI) and Diffuse Horizontal (DH) irradiances, with annual and monthly maps, monthly variation graphs, and solar reporting at each point of interest.
- Wind energy, measuring aspects like wind speed; power density and direction, with maps for several heights; wind roses; Weibull distribution graphs; and providing terrain maps with data on roughness, elevation and land use.
- Wave/Tide energy, measuring tidal currents, tide power and wave power.

With regard to maritime raw materials, data on dredging activities in European Seas are made available through the EMODnet Human Activities portal. Information on dredging sites has been harmonised across the EU and is based on data sets provided by several sources for the following countries: Belgium, Bulgaria, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, Norway, Poland, Portugal, Spain, Sweden, the Netherlands, and the United Kingdom. Available data refer to: the position (point or polygon) of the dredging site; the extraction area and year; the amount permitted to be extracted in volume (m³) and weight (t); the extracted amount in volume (m³) and weight (t); the extraction type (e.g. harbour dredging, estuary dredging, sea lane); the dredging purpose (e.g. maintenance dredging, capital dredging); and the end-use of the extracted material (e.g. beach nourishment, commercialisation, confined deposit, construction material, embankment, filling material, land deposit, reuse, sea disposal, and wetland restoration).

LRAs may use relevant information derived from the EMODnet portal to assess the state of the seabed environment and facilitate decision making on issuing new or extending existing planning permissions for dredging activities.

²³ See: <http://www.noveltis.com/en/products-services/renewable-energy-atlas/about-renewable-energy-atlas/>

Similarly, the HELCOM HOLAS project²⁴ has developed a dredging data set for the Baltic Sea, addressing relevant activities such as harbour maintenance, harbour capital, sea lanes, and sand, gravel, boulder and maerl (coralline red algae) extraction. Information refers to the period 2003-2007 and focuses on the quantity, quality and purpose of dredging. Collection of data by project partners was complemented by information gathered from large construction and dredging companies. The data set is used to describe the extent and spatial distribution of the sea bed disturbance caused by human activities and also contributes to an overall assessment of the Baltic Sea marine environment.

2.2.4 Maritime transport activities

The development of ship transport activities, including ports, faces numerous challenges in terms of efficiency and environmental problems, such as air pollution (mainly greenhouse gas emissions), waste, invasive alien species in ballast waters, and hull fouling. LRAs may use satellite data on ocean parameters, like sea currents and sea ice, available through Copernicus, to develop web and mobile applications providing information that optimises ship routing and significantly improves navigation safety (notably, in Arctic regions and other regions with extreme meteorological conditions). Likewise, they can monitor large maritime areas to detect oil spills or illegal waste disposal and take action towards mitigating impacts and allocating responsibilities to those concerned.

Relevant applications combining satellite data with *in situ* measurements (e.g. using deep-sea buoys, gauges or met-stations at ports) have been developed and are provided online by members of the European Global Ocean Observing System (EuroGOOS). The databases and data services provided (see Box 4 for a list of member organisations and their web links providing access to relevant data services) focus on specific maritime regions, which in most cases coincide with the geographical mandate of the national governmental agencies and research organisations involved in their development and operation.

²⁴ See: <http://maps.helcom.fi/website/mapservice/index.html>

Box 4. Access to EuroGOOS member organisations data services

EuroGOOS comprises the following 40 national governmental agencies and research organisations from 19 countries in Europe, providing maritime data services that can be accessed through the given web links:

Belgium: the Agency for Maritime and Coastal Services (MDK), Coastal Division; and the Royal Belgian Institute of Natural Sciences (RBINS), OD NATURE

Croatia: the Croatian Meteorological and Hydrological Service (DHMZ); and the Croatian Institute of Oceanography and Fisheries (IZOR)

Cyprus: the Oceanography Center, University of Cyprus (OC-UCY)

Denmark: the Danish Meteorological Institute (DMI); and the Defence Centre for Operational Oceanography (FCOO)

Estonia: Tallinn University of Technology, Marine Systems Institute (MSI)

Finland: the Finnish Meteorological Institute (FMI)

France: Ifremer; and Mercator Ocean

Germany: the Federal Maritime and Hydrographic Agency (BSH); and the Centre for Materials and Coastal Research (HZG)

Greece: the Hellenic Centre for Marine Research (HCMR)

Ireland: the Marine Institute (MI)

Italy: the Euro-Mediterranean Center on Climate Change (CMCC); the National Research Council of Italy (CNR); the Liguria Cluster of Marine Technology (DLTM); the National Institute of Geophysics and Volcanology (INGV); the Italian National Institute for Environmental Protection and Research (ISPRA); and the National Institute of Oceanography and Experimental Geophysics (OGS)

The Netherlands: Deltares; the Royal Netherlands Meteorological Institute (KNMI); and Rijkswaterstaat

Norway: the Institute of Marine Research (IMR); the Norwegian Meteorological Institute (MET Norway); and the Nansen Environmental and Remote Sensing Center (NERSC)

Poland: the Institute of Meteorology and Water Management (IMGW-PIB); the Institute of Oceanology, Polish Academy of Sciences (IO PAN); and the Maritime Institute in Gdansk (MIG)

Portugal: the Hydrographic Institute (IH); and the Portuguese Institute for the Ocean and Atmosphere (IPMA)

Slovenia: the Slovenian Environment Agency; and the National Institute of Biology (NIB)

Spain: the Spanish Institute of Oceanography (IEO); and Puertos del Estado

Sweden: the Swedish Meteorological and Hydrological Institute (SMHI)

United Kingdom: the Centre for Environment, Fisheries and Aquaculture Science (Cefas); the Natural Environment Research Council (NERC) / National Oceanography Centre (NOC); and the UK Met Office

Source: [EuroGoos website](#) (accessed on August 2016)

The Portus Marine Information system²⁵ is one such example that stands out for its user-friendly interface. Developed for and operated by the state-owned Spanish port system (*Puertos del Estado*), the web application focuses on the Eastern Atlantic Ocean and the Western Mediterranean Sea coastal areas. It is

²⁵ See: <http://www.puertos.es/en-us/oceanografia/Pages/portus.aspx>

integrated in a GIS, measuring physical ocean parameters in distinct time periods, as follows:

- 3-day forecast for three variables: waves, wind, and sea level.
- 5-day forecast for three variables: ocean currents, water temperature, and salinity.
- Real time data (Greenwich Mean Time - GMT) for nine variables: waves; seiche (oscillations registered in the harbour caused by tsunamis or other relevant phenomena, measured by 1-minute tide-gauges); water temperature; currents; sea level; port agitation; air pressure; air temperature; and salinity.
- Historical data for nine variables: waves; water temperature; currents; wind; sea level; port agitation; air pressure; air temperature; and salinity.

Together with Port Authorities, Spanish and neighbouring countries' LRAs may use this application to access data facilitating efficient planning and management of maritime infrastructure, and an increased safety and security in maritime transport, especially at or near ports.

2.2.5 Environmental monitoring and protection of maritime areas

LRAs may benefit from the Copernicus Marine Monitoring Service²⁶ to regularly and systematically assess and monitor their maritime environment. Copernicus provides reference data about the state of European seas and oceans, with measurements of water temperature and salinity, ocean currents and several other ocean parameters, biological and chemical characteristics, including pollutants, algae, and phytoplankton. Relevant information can support LRAs' efforts towards enhanced protection and improved quality of bathing waters, including through an assessment of the eutrophication evolution in their coastal waters. At the same time, it can facilitate real-time monitoring of the environmental impact of selected maritime activities, e.g. ports, fish farms, and coastal tourism resorts. This information is complementary to relevant EEA data and the EEA mapping of the state of bathing waters (see also section 2.2.1) which provides an annual classification of bathing water quality in selected beaches.

Remote sensing data available from the Copernicus Marine Monitoring Service combined with bathymetry and sea-level information from EMODnet

²⁶ See: <http://marine.copernicus.eu/>

Bathymetry and Physics portals, as well as data from field surveys, may assist LRAs in monitoring changes in their coastal zones. LRAs may also benefit from relevant derived data products that use modelling to examine coastal protection parameters, such as annual sea level rise at the coast; average annual sea-temperature at surface, midwater and sea-bottom; and sediment mass balance at the coast.

The EMODnet sea basin checkpoints have carried out relevant challenges aiming at assessing “*the possibility of producing very specific spatial data layers and time history plots for selected climate and coastal variables*”.

Satellite data collected through ocean colour sensors (provided by Copernicus) can feed into local models to provide information on the location, extent and movement of phytoplakton or jelly fish, hence may assist LRAs in detecting and issuing warnings about algal blooms and increases in jelly fish populations, with both phenomena likely having a negative impact on human activities, notably on tourism and aquaculture (Box 5). Such warnings - if issued early enough - facilitate timely response by those concerned, and allow appropriate mitigation actions to be put in place.

Box 5. Impact of algal blooms on maritime activities

Algal blooms (i.e. the rapid multiplication of phytoplankton species which highly increase their concentration in the water) may have a devastating effect on maritime activities. They may deplete oxygen in the water or release toxins, thus resulting in the death of large numbers of fish, shellfish, marine mammals and seabirds. They may also cause serious illness in humans. The estimated annual costs from algal blooms in Greece, Italy and Spain exceeds EUR 300 million, considering losses in commercial and recreational fishing, decreases in tourism, and damages to ecosystems. Such high losses pose a threat to local economies and to the livelihoods of several coastal communities.

Source: Copernicus brief ([Issue 08 / Sep2013](#))

Similar services are made available to interested LRAs by the POSEIDON system²⁷ which is part of EuroGOOS and is developed and operated by HCMR. The system complements satellite data with *in situ* measurements (mainly using a network of observation buoys) to provide real-time and historical data, as well as 1 to 5-day forecasts (through both web and mobile technologies) on a number of weather and ocean parameters. POSEIDON may also support LRAs in the protection of maritime areas, with specific applications addressing emergency search operations at sea (e.g. providing estimates on object drifts) and oil-spill monitoring and forecasting (combining satellite-based oil spill detection with oil spill drift forecasts to provide the end-users with near real-time information).

²⁷ See: <http://poseidon.hcmr.gr/>

Likewise, the EMODnet Oil Platform Leak Bulletins²⁸, focusing on the entire surface of each of the EU Sea basins, provides users (including LRAs, at a cost) with information on the likely route of oil-slicks and the statistical probability for sensitive coastal habitats, species or tourism beaches to be affected by specific oil spills²⁹. Models are used to predict the oil spill trajectory, using datasets on a wide range of natural and human activity aspects, indicatively:

- Meteo-oceanographic forecast and analysis (e.g. winds, sea currents, waves and sea surface temperature) collected from relevant international (e.g. CMEMS) and regional providers, the European Centre for Medium-Range Weather Forecasts (ECMWF), and the national meteorological services.
- Seafloor geology available at the EMODnet Geology portal.
- Sea bed habitats available at the EMODnet Seabed Habitat portal.
- Human activities, including marine protected areas and coastal habitats, available at the EMODnet Human Activity portal.
- Oil platform position, date/time of leakage, type of oil, rate of leakage or total amount of oil leaked, with data provided by the EC or EMSA (oil spill satellite observations).

LRAs may use the simulation results from these models to plan preventive action for the avoidance of irreversible damages to protected natural areas and to tourism resources, mainly beaches. In case of oil-spill accidents, the bulletins may also assist in improved coordination and targeting of mitigation measures, with LRAs playing an important role in mobilising resources to protect their coasts from pollution.

²⁸ Arctic Sea: <http://www.emodnet-arctic.eu/oil-leak-platform>, Atlantic Sea: <http://www.emodnet-atlantic.eu/Challenges/Oil-Platform-leaks>, Baltic Sea: <http://emodnet-blacksea.eu/portfolio/oil-platform-leaks/>, Black Sea: <http://emodnet-blacksea.eu/portfolio/oil-platform-leaks/>, Mediterranean Sea: <http://www.emodnet-mediterranean.eu/portfolio/oil-platforms-leak/>, North Sea: <http://www.emodnet.eu/northsea/challenge/oil-platform-leaks>.

²⁹ Indicatively, according to the published terms of the service for the Baltic Sea, a first bulletin is issued within 24 hours from contractual request (based on working week days), and a second bulletin within 72 hours.

2.3 Addressing identified problems

There are several issues (mainly of practical nature) impeding LRAs from taking full advantage of existing information on the maritime state and processes, to the benefit of blue economy in their areas. These are outlined below, together with suggestions for possible solutions.

- **Numerous and dispersed sources of information, databases and data sets.** There is a very large number of international, regional and national scientific, research and other entities collecting, analysing and making publicly available maritime data³⁰. Most of these entities are well known to the academic world, however not to the majority of LRAs. What is more, the information they provide is fragmented, hence searching on the websites of these entities to access maritime data is a tedious task requiring sufficient resources and – in most cases – relevant expertise. To make this task even more complicated for LRAs, these entities (as a common practice) collaborate with each other in research and other projects, to come up with new maritime data sets which in some cases are only made available at the joint project’s website, i.e. a new web address other than those of the entities involved.

Gathering maritime information in a single (or from a limited number of) web portal(s) would facilitate access of relevant data by LRAs. EMODnet is a step forward towards this direction, bringing together more than 100 organisations assembling marine data, products and metadata, offering to public and private users (including LRAs) access to “*quality-assured, standardised and harmonised marine data which are interoperable and free of restrictions on use*” (EMODnet Central Portal). However, the full deployment of the EMODnet services is not expected before the end of 2020.

- **Poor information on available sources of data, databases and data sets.** Notwithstanding the large number of maritime data sources, there is a general lack of awareness about the maritime information that non-expert users may have access to. The majority of LRAs are poorly informed about the type and use of maritime data available, even by large data service providers like Copernicus and EMODnet. The latter should consider a more active promotion of their data services, with targeted approaches adjusted to the specific characteristics of major user groups, including LRAs. Some relevant actions have already been taken (e.g. the

³⁰ The SeaDataNet Pan-European Infrastructure for ocean and marine data management identifies more than 600 scientific data collecting laboratories from governmental organizations and private industry, in the countries bordering the European seas.

thematic briefs issued and disseminated by Copernicus), however, elaborating and implementing a **communication strategy** (potentially jointly by the main data service providers), is considered key towards addressing this problem.

- **Lack of adequate capacity and resources within administrations to manage available databases.** Several LRAs lack both expertise and tools required to identify appropriate blue economy related data and to process relevant information. They also lack adequate previous experience (if at all) in using satellite data and smart technologies to access and manage maritime data. This is becoming a major disadvantage as a large number of available data sets are based on the use of satellite imagery and other advanced technologies. In this context, local and regional administrations often fail to fully address the technical aspects required to handle the data they receive, hence depend on external support to appropriately manage relevant information resources. An **increased offer of derived information products** (as opposed to raw data sets) **by data service providers**, notably EMODnet, would raise the number of LRAs capable of exploiting maritime information towards maximising blue economy's impact on their areas. **Online training courses for non-expert users**, notably public servants in local and regional administrations, would be also beneficial in that respect (some courses are already available, such as the Copernicus online tutorials).
- **Need for investments in web and mobile applications facilitating wide use of derived information products.** LRAs need to make investments in smart technologies to promote uptake of maritime information in their areas (e.g. develop dedicated web pages or mobile applications with frequently updated information on aquaculture farms, on offshore energy potential, on tourism resources), with a view to supporting blue economy investments and development. Awareness on the size and technical requirements (including content development) of such investments is fairly limited, thus often resulting in reluctance by LRAs to invest in smart maritime data applications. A **clearer framework of downstream maritime data applications** would facilitate broader uptake of such technologies by LRAs.
- **Lack of adequate previous experience (if at all) in feeding the decision making process with information made available with the use of smart technologies.** Further to the aforementioned need for capacity building of local and regional administrations in maritime data management, **decision makers in local and regional councils also need support in understanding the added value of reliable, standardised**

and interoperable maritime information, in order to promote blue economy development.

- **Marine monitoring, observation and data collection networks are fragmented and their operation serves a wide and often diverse spectrum of purposes.** In their majority, such networks have been put in place for specific national purposes (e.g. to facilitate the implementation of national legislation in terms of monitoring the impact of activities in coastal or ocean areas) or for research purposes (e.g. to demonstrate a technological capability). As a result, on a sea-basin scale there is no comprehensive overview of data collection or monitoring gaps and duplications, while it remains unclear what the priorities should be for further data collection or assembly. **LRAs** should have a more **active involvement** in that process, **providing user feedback to the data service providers** and **expressing their needs** in terms of appropriate input data for the promotion of blue economy development in their areas.
- **Maritime data availability is constantly changing with advances made in data collection, harmonisation across the EU, and accessibility through smart applications.** LRAs lack the capacity to follow closely progress in this area, therefore need to commit resources for that purpose. Tools like the EMODnet portal need to become more friendly to non-expert users, notably as regards communication of available information products and their added value to the various users.
- **Gaps in broadly available data.** Considering the aforementioned weaknesses of data collection networks and given that the deployment of EMODnet services is still under way, reliable and harmonised data on several blue economy aspects are still missing, for example, fisheries activity on a time scale shorter than a whole year, biological distribution data (e.g. of birds and sea mammals), main sources of pollution across the coast, and the location of tourism beaches (other than those assessed for the quality of their waters). The role of LRAs in providing user feedback to the data service providers is considered vital to address existing gaps and accelerate the deployment of relevant services.

Part 3: Funding opportunities for LRA projects on blue economy development

LRA planning the implementation of projects fostering blue economy development, through the collection of new or the processing of already available data, may leverage resources by making use of funding opportunities under the European Structural and Investment Funds (ESIF), the Horizon 2020 (H2020) programme, or other relevant measures foreseen at the national level. An indicative, but non-exhaustive, list of such funding opportunities is provided below, structured in selected thematic and geographic areas of interest.

3.1 Cross-cutting areas of interest

Blue economy initiatives by LRAs may be funded through the Cohesion Fund (CF) and the European Regional Development Fund (ERDF), under the thematic objectives ‘*preserving and protecting the environment and promoting resource efficiency*’, and ‘*promoting climate change adaptation, risk prevention and management*’, with priority given to investments in: coastal urban environment improvements; low-carbon and intermodal transport systems; regeneration of port-city areas (revitalising port-cities), including the upgrade (decontamination and land use change) of brownfield sites; air pollution and noise reduction within ports and other coastal areas; marine biodiversity and soil protection and restoration; and the promotion of ecosystem services and green infrastructure.

The ERDF also provides funding opportunities for projects supporting blue economy development under the thematic objective ‘*enhancing access to and use and quality of ICT*’, with priority given to investments in the digital economy, including the development of ICT products and services, broadband deployment and the roll-out of high-speed networks (e.g. data-mining and analysis, creation of web or mobile applications analysing, disseminating and improving access to data on, for example, bathing water quality, tourism flows, movements of people and goods, and other maritime-related activities).

LRAs may seek support for a wide range of maritime investments through the European Agricultural Fund for Rural Development (EAFRD) under the ‘*LEADER cooperation activities*’ measure, focusing on the implementation of a community-led local development (CLLD) strategy. Fisheries, tourism and other maritime-related investments included in local development strategies developed by Local Action Groups (LAGs) may be funded under such a measure. Local communities not having implemented LEADER in the previous

programming period (2007-2013) may seek support for capacity building and small pilot projects not linked with a LAG development strategy.

Cross-cutting aspects of blue economy development investments may be funded through the European Social Fund (ESF) and the ERDF, under the following thematic objectives: *‘Promoting social inclusion, combating poverty and any discrimination’*, where relevant investments are foreseen in the context of CLLD strategies; and *‘Promoting sustainable and quality employment and supporting labour mobility’* where eligible actions may focus on the implementation of a territorial strategy for employment-generating growth in specific areas such as: the conversion of declining industrial regions into important transport nodes or into areas accessible by visitors; the development of natural and cultural resources into tourism assets, e.g. by providing for visitor accessibility and promoting the area’s attractions; or the implementation of local employment initiatives targeting youth or seniors, the promotion of self-employment, female entrepreneurship, and business creation.

The ESF may also fund blue economy development investments by LRAs under the thematic objective *‘Invest in education, training and vocational training for skills and lifelong learning’*, with potential maritime-related activities including education and vocational training to better match market requirements, and the development of apprenticeship schemes and recognised work-based education programmes.

Moreover, LRAs may seek institutional capacity support under the thematic objective *‘Enhancing institutional capacity of public authorities and stakeholders and efficient public administration’*, with funding coming from the ERDF, the ESF or the CF, and projects aiming at reforms, better regulation and good governance.

Cross-cutting actions such as studies, pilot and cooperation projects, public information-related activities, events, the exchange of best practices, and IT development may also be supported by measures under the European Maritime and Fisheries Fund (EMFF), in particular those promoting integrated governance (through, for example, networks and platforms linking LRAs with representatives of relevant sectors), cross-sector initiatives, and initiatives related to the protection of the marine environment, including Natura 2000 sites.

In addition, LRAs can make use of the following calls under the H2020 programme:

- [Multi-use of the oceans marine space, offshore and near-shore: Enabling technologies](#), BG-03-2016 (04/10/2016-14/02/2017): the call provides an

opportunity for LRAs to contribute to the development of key enabling technologies (e.g. automation and remote monitoring) that support the use of multi-purpose facilities (platforms) combining several maritime activities in one place, such as renewable energy, aquaculture and maritime transport.

- [Cultural heritage of European coastal and maritime regions](#), CULT-COOP-07-2017 (04/10/2016-02/02/2017): LRAs may participate in multi-disciplinary research on coastal and maritime regions' cultural landscape, focusing on preservation, risk assessment and sustainable management.
- [Coastal-rural interactions: Enhancing synergies between land and sea-based activities](#), RUR-02-2017 (04/10/2016-14/02/2017): LRAs can identify and analyse interactions between land and sea, with a view to promoting innovative business models integrating land with sea-based production, to the benefit of the local economy, jobs and the environment.

3.2 Coastal Tourism

LRAs may seek funding for coastal tourism development (including pescaturism and maritime recreation and leisure) under the EMFF, with investments focusing on: adding value to local fishery products through food festivals, fishery fairs and the promotion of local catches within the local tourism network; the promotion and creative use of maritime history, culture and heritage; and the development of angling tourism activities in aquaculture farms.

LRAs' initiatives promoting tourism in coastal areas may also be supported by the ERDF under the thematic objective '*Promoting sustainable transport and removing bottlenecks in key network infrastructures*'. Specifically, the ERDF prioritises the enhancement of destinations' connectivity and the facilitation of tourism flows.

Moreover, LRAs' investments in coastal tourism development may be funded under Specific Objective (SO) 4.1 of the Interreg Europe programme, '*Improve the implementation of regional development policies and programmes, in particular Investment for Growth and Jobs and, where relevant, ETC programmes, in the field of the protection and development of natural and cultural heritage*'. Projects and actions related to sustainable management (preservation and exploitation) of the natural environment and of cultural heritage are eligible, especially when they add to regional attractiveness and support tourism development whilst valorising local ecosystems and cultural artefacts. Indicatively, examples of projects eligible for funding under SO 4.1

include the exchange of experiences among LRAs and nature managers on integrated coastal zone management (ICZM) practices following the new EU framework regulation on maritime spatial planning and ICZM.

National measures under LEADER may also provide funding to LRAs for coastal tourism related investments, including projects supporting angling tourism. In Ireland, for example, LEADER Axis 3 includes measures aiming at the promotion of *‘sustainable, regionally balanced, tourism potential of all rural areas through the provision of necessary infrastructure and the development of the countryside as a recreational resource for all’*, and the *‘protection of the local heritage’*, with eligible actions including: the promotion of angling club activities towards promoting angling as an ecotourism activity, with packages engaging local service providers, e.g. guesthouses, restaurants, and angling instructors; and small infrastructure projects, like fish passage enhancements, through e.g. the removal of barriers, the modification of weirs, and the construction of fish passes.

3.3 Food, health and ecosystem services

LRAs’ investments in fisheries, aquaculture and related activities may be supported through the EMFF under the following Union priorities, contributing to the Europe 2020 strategy and the implementation of the Common Fisheries Policy (CFP):

- a) *‘Promoting environmentally sustainable, resource-efficient, innovative, competitive and knowledge-based fisheries’*, with eligible investments aiming at reducing the impact of fisheries on the marine environment; balancing fishing capacity with available opportunities; enhancing the competitiveness and viability of fisheries enterprises and improving safety and working conditions; improving technological development, innovation and knowledge transfer; and developing professional skills, e.g. through training and lifelong learning.
- b) *‘Fostering environmentally sustainable, resource-efficient, innovative, competitive and knowledge-based aquaculture’*, with eligible investments focusing on technology development, innovation and knowledge transfer; ensuring viable aquaculture enterprises and safe working conditions; supporting the development of aquaculture that preserves the environment, promotes animal health and welfare and ensures public health and safety; and developing new professional skills.

- c) *‘Fostering the implementation of the CFP’*, with eligible investments aiming at fostering scientific knowledge, including through the collection and management of data; and supporting monitoring, control and enforcement, notably through increased institutional capacity and efficiency of public administration.
- d) *‘Increasing employment and territorial cohesion’*, with eligible investments that may target coastal or inland communities which depend on fishing or aquaculture and aim at supporting employability and labour mobility towards economic growth, social inclusion and job creation.
- e) e. *‘Fostering marketing and processing’*, with eligible investments focusing on market organisation of fishery and aquaculture products, and the development of the processing and marketing sectors.

In addition, LRAs may seek funding under the EARDF for the promotion of quality schemes for agricultural products and foodstuffs produced in coastal areas, with relevant measures focusing on increasing farmers’ participation in such schemes.

LRAs may also look into opportunities for funding in the following calls under the H2020 programme:

- [Interaction between people, oceans and seas: a strategic approach towards healthcare and well-being](#), BG-06-2017 (04/10/2016-14/02/2017): the call encourages an active involvement of LRAs in data collection, knowledge creation and actual implementation processes linking maritime sectors with human health, including the promotion of policymaking addressing both benefits and risks of exposure to marine and coastal ecosystems (e.g. improved ecosystem services provided by the marine environment, threats to public health, diseases caused by human activity interaction with marine-degraded environments).
- [Innovative sustainable solutions for improving the safety and dietary properties of seafood](#), BG-08-2017 (04/10/2016-14/02/2017): LRAs can contribute to the sustainability of the seafood production and processing industry, through e.g. actions supporting demonstration, piloting and large scale product validation towards consumer uptake and market replication.
- [Promoting and supporting the eco-intensification of aquaculture production systems: inland \(including fresh water\), coastal zone, and offshore](#), SFS-32-2017 (04/10/2016-14/02/2017): the call facilitates LRAs’ involvement in the development of new and cost-effective

commercial applications and innovative solutions supporting aquaculture production and ensuring sustainable offshore, coastal and inland development and growth, through e.g. actions implementing new/emerging technologies in aquaculture monitoring and management systems and actions focusing on sound economic reduction of operational costs.

- [Smart fisheries technologies for an efficient, compliant and environmentally friendly fishing sector](#), SFS-22-2017 (04/10/2016-14/02/2017): LRAs may explore opportunities to increase the use of innovative technologies (e.g. unmanned vehicles or drone-like devices) in fisheries-related activities, through e.g. actions focusing on the drone-based collection of relevant data or the monitoring of compliance with legislation, with a view to improving the sector's knowledge, monitoring, surveillance and resource efficiency.
- [Advancing basic biological knowledge and improving management tools for commercially important fish and other seafood species](#), SFS-21-2016-2017 (04/10/2016-14/02/2017): LRAs can contribute to improving fisheries management under the CFP, through e.g. actions strengthening the knowledge base and developing new tools for efficient fishing of stocks that are of interest to the EU, both inside and outside EU waters.
- [Towards a science-based regionalisation of the Common Fisheries Policy](#), SFS-20-2017 (04/10/2016-14/02/2017): the call facilitates the involvement of LRAs in multi-actor initiatives aiming at identifying and developing solutions for technical, administrative, social and economic impacts/problems related to CFP implementation, including highlighting strengths and weaknesses of the envisaged regionalisation process and structures, e.g. through actions examining ways for regional seas conventions and regional fisheries management structures to work better together.

National measures under LEADER (CLLD) may also provide funding to LRAs for bottom-up, integrated investments in fisheries and aquaculture, including projects supporting local partnerships and LAGs. In Greece, for example, LRAs participating in LAGs may seek funding from LEADER measure 19 '*Support for local development through LEADER CLLD*' and the OP for fisheries and the sea (priority 4 '*Increase in employment and territorial cohesion*'), to support investments in fisheries, aquaculture or other related activities, as foreseen in local development strategies.

3.4 Energy and raw materials

LRAs may seek financial support for their renewable energy investments through the CF and the ERDF, under the thematic objective ‘*supporting a shift towards a low-carbon economy in all sectors*’, with priority on projects addressing energy production and distribution from renewable sources.

Moreover, LRAs can make use of the following calls under the H2020 programme:

- [2nd Generation of design tools for ocean energy devices and arrays development and deployment](#), LCE -16- 2017 (11/05/2017-7/09/2017): the call provides an opportunity for LRAs to participate in the design and deployment of 2nd generation advanced tools improving technology performance, energy yield, survivability, environmental impact, reliability and cost-effectiveness of ocean energy arrays and devices, through e.g. the provision of input for the evaluation of relevant legal, institutional and political frameworks, and the development of an enabling environment for ocean energy.
- [Scaling up in the ocean energy sector to arrays](#), LCE-15-2016 (11/05/2016-08/09/2016): LRAs may contribute to the deployment of pilot technology projects on cost-effective ocean energy arrays, by participating in activities improving social acceptance of the developed technologies.

3.5 Maritime transport activities

The CF and the ERDF may provide funding to LRAs’ investments on maritime transport activities, under the thematic objective ‘*promoting sustainable transport and removing bottlenecks in key network infrastructures*’, with priority given to projects on the development and improvement of low-carbon maritime transport systems, port infrastructure (local and regional ports) and multimodal links, including inland and maritime waterways and intermodal connectors. Under the same thematic objective, the ERDF also prioritises investments promoting regional mobility, by connecting secondary and tertiary nodes to Trans-European Networks -Transport (TEN-T) infrastructure, while, under the thematic objective ‘*supporting the shift towards a low-carbon economy in all sectors*’ it supports investments on the development of low-carbon strategies for (among other contexts) maritime urban areas.

Moreover, the European Territorial Cooperation (ETC) programmes, under Interreg Europe SO 3.1 *‘Improve the implementation of regional development policies and programmes, in particular programmes for Investment for Growth and Jobs and, where relevant, ETC programmes, addressing the transition to a low-carbon economy notably in the framework of Smart Specialisation Strategies’* may fund LRAs’ investments in maritime transport, focusing on projects and actions in support of sustainable low-carbon transport and mobility (through, for example, cleaner transport modes and systems). Indicative examples of projects eligible for funding under SO 3.1 include the exchange of experience among LRAs on sustainable mobility measures to increase the use of low-carbon maritime transport options, or the exchange of practices on effective monitoring of emissions from maritime vessels.

LRAs may also consider the following calls under the H2020 programme:

- [The Port of the future](#), MG-7.3-2017 (20/09/2016-26/01/2017): the call provides an opportunity for LRAs to participate in research and innovation actions promoting: re-engineering of port operational processes, including improved integration of multi-modal operations among all actors (port authorities, shipping companies, security agencies, city authorities, etc.) and a shift to a circular economy with low environmental impact; integrated decision making on port operations; and smart urban development of Port Cities, with links to the surrounding industrial and urban environment, and efficient connections with the hinterland. LRAs may also engage in coordination and support actions addressing the port-city relation, with the outline of recommendations for city authorities towards the development of Smart Port Cities.
- [Innovations for energy efficiency and emission control in waterborne transport](#), MG-2.1-2017 (20/09/2016-26/01/2017): LRAs can contribute to a more energy efficient and less polluting waterborne transport, through a real-world demonstration of innovative pollution reduction and control technologies, including actions focusing on solutions for emission monitoring, and decision support systems.

3.6 Environmental monitoring and protection of maritime areas

Environmental monitoring and protection initiatives by LRAs may be funded through the ERDF, under the thematic priority *‘Preserving and protecting the environment and promoting resource efficiency’*, with relevant investments

focusing on the conservation, protection, promotion and development of natural heritage, and the protection and restoration of biodiversity. Likewise, LRAs may seek funding through the EMFF, with measures addressing Union priorities ‘*Promoting environmentally sustainable, resource-efficient, innovative, competitive and knowledge-based fisheries*’ and ‘*Promoting environmentally sustainable, resource-efficient, innovative, competitive and knowledge-based aquaculture*’, and aiming at protecting and restoring aquatic biodiversity and ecosystems.

LRAs’ investments in environmental monitoring and protection of maritime areas can also be funded under the Interreg Europe programme’s SO 4.2 “*Improve the implementation of regional development policies and programmes, in particular programmes for Investment for Growth and Jobs and, where relevant, ETC programmes, aimed at increasing resource-efficiency, green growth and eco-innovation and environmental performance management.*” In particular, projects in support of the transition to a resource-efficient economy and the improvement of environmental performance management are eligible for funding under SO 4.2, with indicative examples including the exchange of practices among LRAs on methods for the monitoring, management and improvement of water quality in coastal areas.

Moreover, LRAs can make use of the following calls under the H2020 programme:

- [Blue green innovation for clean coasts and seas](#), BG-07-2017 (04/10/2016-14/02/2017): LRAs may engage in actions developing and scaling up innovative participatory processes and measures for the cleaning up of coasts and oceans (including in regional seas or semi-closed sea basins such as the Mediterranean Sea), while transforming the collected waste into a resource stream in line with the concept of the circular economy.
- [The effect of climate change on Arctic permafrost and its socio-economic impact, with a focus on coastal areas](#), BG-11-2017 (04/10/2016-14/02/2017): the call facilitates LRAs’ participation in the assessment of the impact of permafrost thawing on Arctic coastal systems, notably on resource availability/accessibility, infrastructure stability, potential new economic activities, pollution and health, while also developing appropriate adaptation and mitigation responses.
- [Towards an integrated Mediterranean Sea Observing System](#), BG-12-2016 (27/10/2015-13/09/2016): LRAs can contribute to research and innovation activities with the aim of developing an integrated observing

system for the whole Mediterranean Sea building on existing facilities (remote sensing and *in situ*) and initiatives, and addressing both the open sea and the coastal zone (by optimizing existing systems, using new ocean observation technologies, identifying observational gaps, etc.), thus complementing established global observing systems such as Copernicus and GEOSS.

3.7 Specific geographic areas of interest

Maritime investments by LRAs focusing on specific geographic areas of interest may be financially supported under the European Territorial Cooperation (ETC) Programmes. An indicative, non-exhaustive, list of relevant funding opportunities is provided below:

- **Transnational Cooperation Programmes**

1. **Balkan Mediterranean** (AL, BG, CY, EL, MK)

LRAs' investments in environmental monitoring and protection of maritime areas and in coastal tourism can be funded under SO 2.1 of the Balkan Mediterranean programme (BalkanMed), '*Biodiversity: taking on the transnational challenge by promoting ecological connectivity and transnational ecosystems' integration*', with eligible actions addressing ecosystems restoration, blue and green development (including ICZM), and the promotion of natural and cultural heritage. Investments by LRAs in environmental monitoring and protection of maritime areas may also be supported under SO 2.2 of the BalkanMed '*Sustainable territories: fostering transnational cooperation for resource efficiency and climate change resilience*', with eligible actions aiming at enhancing management efficiency of resources (water, waste, soil, air and energy) and climate change resilience, through e.g. the joint elaboration by LRAs and other stakeholders of environment-friendly management plans for coastal/marine areas, the joint preparation of blue growth action plans and roadmaps, and the planning, design and implementation of pilot projects promoting innovative technologies.

2. **Interreg Mediterranean** (AL, BA, CY, EL, ES, FR, HR, IT, ME, MT, PT, SI, UK)

LRAs may seek funding for their investments in maritime transport activities, energy, and environmental monitoring and protection of maritime areas under the Interreg Mediterranean Programme (MED) SO 2.3 '*To increase capacity to*

use existing low carbon transport systems and multimodal connections among them, with eligible actions aiming at enhancing the use of and access to low-carbon systems (e.g. studies/analysis fostering connectivity plans using low carbon transport within and between islands and between mainland and islands) or at supporting public transport services for multimodal passengers (rail/maritime/cruise passengers). Coastal areas are also targeted, for the development of renewable energy solutions and for the protection of land, sea, and natural and cultural resources. Additionally, LRAs may seek funding for investments in coastal tourism under MED's SO 3.1 *'To enhance the development of a sustainable and responsible coastal and maritime tourism in the MED area'*, with eligible actions aiming at the development of a sustainable and responsible coastal and maritime tourism through cooperation and joint planning, e.g. the development of common management plans in coastal and maritime tourist destinations in order to prevent negative impacts on natural resources and cultural heritage, and the implementation of pilot activities for testing, evaluation and demonstration of models and plans for the management of coastal tourist destinations integrating the principles of (Integrated) Maritime Spatial Planning.

3. Interreg Adrion (AL, BA, EL, HR, IT, ME, RS, SI)

LRAs' investments in coastal tourism, in food, health and ecosystem services, and in environmental monitoring and protection of maritime areas, can be funded under the Interreg Adrion (ADRION) SO 2.2 *'Enhance the capacity in transnationally tackling environmental vulnerability, fragmentation and the safeguarding of ecosystem services in the Adriatic-Ionian area'*. Indicative eligible actions comprise the enhancement of networks for the development of transnational maritime protected areas and habitats and their integration in the tourism product of the ADRION area, and the development of transnational networks for increasing marine knowledge to ensure the implementation of the Marine Strategy Framework Directive, including management and mapping of threats to coastal and marine biodiversity, and deep sea resources monitoring and surveillance. LRAs' investments in maritime transport activities can be funded under ADRION SO 3.1 *'Enhance capacity for integrated transport and mobility services and multimodality in the Adriatic-Ionian area'*, with eligible actions indicatively focusing on the promotion of clean sea shipping in the Adriatic Sea basin, in line with EUSAIR (aiming at the reduction of air pollutants from shipping vessels), and the development of joint approaches and instruments in the field of maritime transport, such as a modern ship reporting system in the Adriatic Sea (Common Adriatic-Ionian Vessel Traffic Monitoring and Information System ADRIREP), the development of port infrastructures, and the deployment of an Intelligent Transport System.

4. Northern Periphery and Arctic (FI, FO, GL, IE, IS, NO, SE, SJ, UK)

LRAs' investments in coastal tourism and environmental monitoring and protection of maritime areas can be funded under the Interreg Northern Periphery and Arctic programme (NPA) SO 4 '*Increased capacity of remote and sparsely populated communities for sustainable environmental management*', with eligible actions focusing on (among other topics) coastal management and ocean acidification. Indicative actions include the development and transfer of concept models for the protection, promotion and development of natural and cultural heritage, and the development and transfer of decision making tools and solutions (e.g. new types of environmental assessments), to help LRAs to deal with sustainable environmental management of coastal areas.

5. Baltic Sea Region (BY, DE, DK, EE, FI, LT, LV, NO, PL, SE, RU)

LRAs' investments in blue economy development may be funded under the Interreg Baltic Sea Region programme (BalticSea) SO 2.4 '*Resource-efficient blue growth: To advance sustainable and resource-efficient blue growth based on increased capacity of public authorities and practitioners within the blue economy sectors*'. Eligible actions may address sectors that rely on sea resources (fisheries, aquaculture, coastal tourism, blue bio-technology, wind and wave energy, etc.) to develop sustainable business opportunities, e.g. clustering innovative, sustainable applications of marine resource uses; improving linkages between water management monitoring and reporting (M&R) systems and maritime spatial planning; developing transnational strategies to use the cultural and natural heritage of the sea and coastal areas for sustainable business development, with pilot actions improving the resource efficiency of maritime tourism. Moreover, investments in maritime transport activities can be funded under BalticSea SO 3.3 '*Maritime safety: To increase maritime safety and security based on advanced capacity of maritime actors*' and SO 3.4 '*Environmentally friendly shipping: To enhance clean shipping based on increased capacity of maritime actors*'. Actions supported under SO 3.3 may focus on increasing the capacity of maritime actors to develop new, promote and/or introduce in practice solutions for safer sea navigation, e.g. enhancing integrated maritime surveillance; deploying dynamic risk assessment systems for vessels entering the Baltic Sea; and implementing advanced technologies for maritime safety and security. Actions eligible under SO 3.4 indicatively aim at building the capacity of maritime actors in order to increase environmentally friendly shipping, e.g. piloting and promoting improvements to port reception facilities for ship-generated waste, and implementing pilot projects on retrofitting existing ships with new technologies for improved environmental performance.

6. North Sea Region (BE, DE, DK, NL, NO, SE, UK)

LRAs' investments in energy can be funded under the Interreg North Sea Region programme (NSR) SO 2.2 '*Stimulate the adoption of new products, services and processes to reduce the environmental footprint of regions around the North Sea*', with eligible actions addressing the need to increase renewable energy generation and reduce overall energy use, e.g. through the identification of viable opportunities for installing additional renewables infrastructure, and the pilot installation of newer renewable technologies such as wave power and blue energy. Likewise, LRAs' investments in environmental monitoring and protection of maritime areas can be funded under NSR SO 3.2 '*Develop new methods for the long-term sustainable management of North Sea ecosystems*', with eligible actions addressing an improved use of natural and maritime areas, e.g. through the development and implementation of long-term strategies for sustainable management of the North Sea landscapes and the North Sea itself; the development and deployment of new methods and technologies for environmental monitoring and management, focusing on removing or mitigating major threats and pressures including the risk of accident, eutrophication, highly toxic pollutants; and the preservation of the breeding, spawning and feeding grounds of North Sea fish and animals. LRAs' investments in maritime transport activities can be funded under NSR SO 4.1 '*Develop demonstrations of innovative and/or improved transport and logistics solutions with potential to move large volumes of freight away from long-distance road transportation*' and SO 4.2 '*Stimulate the take-up and application of green transport solutions for regional freight and personal transport*', with relevant eligible actions indicatively focusing on the development of practical methods to promote the use of inland ports and similar infrastructure, of methods for reducing the time and administrative burdens of cross-border customs procedures for ships, of improved logistics services, of integrated ticketing and traffic information systems across various transport modes (including ships), etc.

7. Atlantic Area (ES, FR, IE, PT, UK)

LRAs' investments in energy can be funded under the Atlantic Area Programme SO 2.1 '*Fostering renewable energies and energy efficiency*', with eligible actions indicatively focusing on improving the institutional, technical and social framework to promote local renewable energy and the adoption of energy efficiency strategies, e.g. creating an Energy Vision for the target areas, including targets for the development of networks of clusters on (maritime) renewable energies in the Atlantic Area; or improving spatial management to enhance the use of offshore renewable energies. Likewise, Atlantic Area SO 2.2 '*Fostering green growth, eco-innovation and environmental efficiency*', addresses cross-cutting issues in blue economy, hence may support a broader

range of relevant LRAs' investments. Eligible actions may indicatively aim at enhancing linkages, working structures and interaction between relevant actors to promote eco-innovation and blue growth, e.g. promoting eco-innovation solutions related with maritime activities, including transport and renewable energy (clean port infrastructure, low emission renewable energy, etc.). Moreover, LRAs' investments in ecosystem services and in environmental monitoring and protection of maritime areas can be funded under Atlantic Area SO 4.1 '*Improving the protection of biodiversity and enhancing ecosystem services*', with eligible actions indicatively aiming at developing or improving joint environmental management systems and solutions to protect and preserve the Atlantic biodiversity and natural ecosystems, e.g. through the development of methods for quality monitoring and enhancement of the coastal and inland waters; and the harmonisation and coordination of environmental management strategies in the Atlantic to protect natural and deep-sea ecosystems. LRAs' investments in coastal tourism may be funded under the Atlantic Area SO 4.2 '*Enhancing natural and cultural assets to stimulate economic development*', with eligible actions aiming at preserving and valorising the rich cultural and natural heritage of the Atlantic Area, to enhance the attractiveness of the region to visitors and develop new local jobs and economic activity, e.g. through the development of nautical activities and marine leisure (e.g. the integrated development of a nautical sector promoting the growth of economic activities in coastal areas, job creation, social integration and coastal zone preservation), and the improvement of skills in the tourism sector to help coastal community representatives become ambassadors and champions for their areas.

8. Alpine Space Programme (AT, CH, DE, FR, IT, LI, SI)

LRAs' investments in maritime transport activities can be funded under the Interreg Alpine Space Programme (Alpine Space) SO 4e.2 '*Increase options for low carbon mobility and transport*', with eligible actions indicatively aiming at promoting low-carbon mobility and transport through the adoption of technological, financial and organisational solutions, e.g. the design and testing of operational, technological and funding models for low-carbon mobility and maritime transport; and the development of tools to better integrate/coordinate regional mobility and transport strategies and plans.

9. Central Europe (AT, CZ, DE, HR, HU, IT, PL, SI, SK)

LRAs' investments in maritime transport activities may be funded under the Interreg Central Europe programme SO 4.2 '*To improve coordination among freight transport stakeholders for increasing multimodal environmentally-friendly freight solutions*', with eligible actions indicatively aiming at increasing coordination among existing services and promoting multi-modal platforms to

optimize freight flows, e.g. through the development and implementation of coordinated strategies (including innovative financing and investment models) for strengthening the multimodality of environmentally-friendly maritime freight transport systems; and the development and testing of coordinated strategies and concepts for “greening” the last mile of freight transport (logistics planning).

10. North West Europe (BE, CH, DE, FR, IE, LU, NL, UK)

LRAs’ investments in maritime transport activities may be funded under the Interreg North West Europe programme (NWE) SO 4 ‘*To facilitate the implementation of transnational low-carbon solutions in transport systems to reduce GHG emissions in NWE*’, with eligible actions indicatively focusing on multimodal systems and more environmentally friendly transport for freights and passengers, e.g. through the development and improvement of multimodal transport (freight and passengers), focused on reducing GHG emissions; and the optimisation of transnational logistic chains and systems in transport corridors or transport systems to reduce GHG emissions.

11. Amazonia (BR, FR, SR)

LRAs’ investments in maritime transport activities can be funded under the Interreg Amazonia programme SO 2 ‘*Increasing the mobility of goods and people within the transnational cooperation area*’, with eligible actions indicatively addressing the development of green transnational transport, e.g. through the elaboration of studies on regional coastal navigation (freight and passenger); the exchange of experience related to port business (green port techniques, regulations, etc.); and the creation of a port business school for the training of port personnel.

12. Danube Transnational Programme (AT, BA, BG, CZ, DE, HR, HU, MD, ME, RO, RS, SK, SI, UA)

LRAs’ investments in maritime transport activities can be funded under the Interreg Danube Transnational Programme (DTP) SO 3.1 ‘*Support environmentally-friendly and safe transport systems and balanced accessibility of urban and rural areas*’, with eligible actions indicatively focusing on the development of common orientations, frameworks and strategies, the development and practical implementation of transnational tools and services, and the preparation of transnational investments (including small-scale pilot activities), e.g. through the development of multimodal terminals at the Danube river ports and dry ports, connecting inland waterways with rail and road transport; and the development of more effective information sharing systems,

feeding into integrated approaches to limit impacts of transport systems on the Danube ecosystem.

13. [SUDOE/South West Europe](#) (AD, ES, FR, PT, UK)

LRAs' investments in environmental monitoring and protection of maritime areas can be funded under the Interreg South West Europe programme (SUDOE) SO 6d.1 '*Reinforcing the cooperation of the SUDOE stakeholders of the natural sites through the development and the use of joint methods*', with eligible actions indicatively aiming at strengthening the effectiveness of ecosystem management and conservation strategies and methodologies, e.g. through the conditioning of pilot projects or the carrying out of ecological engineering tasks designed to establish a network of ecological continuity, including urban and peri-urban areas.

14. [Caribbean](#) (AD, ES, FR, PT, UK)

LRAs' investments in blue economy may be funded through the Interreg Caribbean programme, under the following three thematic objectives (TOs): TO4 '*Low-carbon economy*'; TO5 '*Climate change and risk prevention*'; and 'TO6 '*Environment and resource efficiency*', with eligible actions indicatively focusing on improving knowledge of natural hazards, setting up of crisis management tools (e.g. shared risk management systems, shared observation tools), improving the management of vulnerable or protected areas, undertaking joint efforts to develop sustainable tourism in the Caribbean, and developing renewable energies.

15. [Indian Ocean Area](#) [FR (RE, YT) – All Indian Ocean Countries]:

LRAs' investments in blue economy may be funded through the Interreg Indian Ocean Area programme, under the following three thematic objectives (TOs): TO1 '*Research and Innovation*'; TO5 '*Climate change and risk prevention*'; and 'TO6 '*Environment and resource efficiency*', with eligible actions indicatively focusing on the promotion of research and innovation on biotechnology, energy and climate change sectors, on sustainable fisheries management, on cooperation in the tourism sector, and on the development of capacities for the prevention of risks associated with maritime activities (e.g. pollution, shark risk).

- **[Cross-border cooperation \(CBC\) Interreg programmes](#)**

CBC aims at addressing a series of common challenges which are to be jointly identified by bordering regions. Among the 11 TOs outlined in the EU Cohesion

Policy in accordance with the EU 2020 strategy, several are related to Blue Growth themes, including: TO 4 “*Low Carbon Economy*”, TO 6 “*Environment and resource efficiency*”, and TO 7 “*Sustainable transport*”. Many cross-border cooperation programmes for 2014-2020 have already outlined their funding priorities accordingly, e.g. Interreg V-A Italy-France focuses on improving territory accessibility and sustainability of ports' activity, Interreg V-A Greece-Cyprus focuses on efficient use of energy and sustainable transport, environmental protection/conservation and risk prevention (including improvements in Maritime Spatial Planning and ICZM), etc.

Appendix I – References

Andersen J.H. and Stock A. (eds.), Mannerla M., Heinänen S., Vinther M. (2013), [*Human uses, pressures and impacts in the eastern North Sea*](#), Aarhus University, DCE – Danish Centre for Environment and Energy. 136pp. Technical Report from DCE – Danish Centre for Environment and Energy No.18

COGEA (2014), [*Studies to support the development of sea basin cooperation in the Mediterranean, Adriatic and Ionian, and Black Sea*](#), contract number MARE/2012/07 - REF. NO 2 (in collaboration with AND international, Eurofish international organisation, POSEIDON Ltd, AZTI Tecnalia and CETMAR)

COGEA (2013), [*Study on Blue Growth, Maritime Policy and the EU Strategy for the Baltic Sea Region*](#), contract number MARE/2012/07 - Ref. No 1 (in collaboration with AND international and Eurofish international organisation)

Ecorys (2014a), [*Study on Deepening Understanding of Potential Blue Growth in the EU Member States on Europe's Atlantic Arc Sea Basin Report*](#), FWC MARE/2012/06 – SC C1/2013/02 (in consortium with MRAG and s.Pro)

Ecorys (2014b), [*Study on Blue Growth and Maritime Policy within the EU North Sea Region and the English Channel*](#), Final Report, FWC MARE/2012/06 – SC E1/2012/01 (in consortium with MRAG and s.Pro)

Ecorys (2012), [*Blue Growth Study - Scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts*](#), European Commission

European Commission, Directorate-General for Maritime Affairs and Fisheries (2015), [*Non paper on the size, nature and dynamics of the blue economy*](#), 15 September 2015

European Environment Agency (2016), [*European bathing water quality in 2015*](#), EEA Report No 9/2016, ISSN 1977-8449

Eurostat (2016a), [*Indicators by coastal and non-coastal regions*](#), [*Statistics illustrated*](#), web page last modified on 19 May 2016

Eurostat (2016b), [*Maritime economy statistics - coastal regions and sectoral perspective*](#), ISSN 2443-8219, web page last modified on 25 February 2016

Girard S. and R. Kalaydjian (2014), [French Marine Economic Data 2013](#), Ifremer, Marine Economic Data Unit

Svensson L.E. and Pendleton L. (eds.) (2014), [Transitioning to a New Blue Economy: Proceedings of the Economics of the Ocean Summit](#), NI CP 14-01, Durham, NC: Duke University

Further reading

Committee of the Regions (2015), [Opinion on the European Union Framework for Data Collection in Fisheries](#), Proposal for a Regulation of the European Parliament and of the Council concerning the establishment of a Community Union framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy, CdR 5241/2015, NAT-VI/007

Committee of the Regions (2014), *Opinion on the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - [Innovation in the Blue Economy: realising the potential of our seas and oceans for jobs and growth](#)*, CdR 4835/2014, NAT-V/044

European Commission, Directorate General Maritime Affairs and Fisheries (2016), [Blue Growth: sustainable growth from the oceans, seas and coasts](#)

European Commission (2012), Directorate General Maritime Affairs and Fisheries, [Green Paper Marine Knowledge 2020 from seabed mapping to ocean forecasting](#), COM(2012) 473 final, ISBN 978-92-79-25350-8

Eurostat (2012), [Eurostat regional yearbook 2012: Focus on coastal regions](#)

Eurostat (2015), Regions in the European Union: Nomenclature of territorial units for statistics, NUTS 2013/EU-28, European Union, 2015

Kalaydjian, R. (2016), 'Maritime Accounts in the European Union: Coping with Limited Information', *Journal of Ocean and Coastal Economics*: Vol. 2, Article 2. DOI: <http://dx.doi.org/10.15351/2373-8456.1050>

MAVA Fondation pour la Nature (2016), [Scoping study: Blue economy for a healthy Mediterranean- Measuring, Monitoring and Promoting an environmentally sustainable economy in the Mediterranean region](#), UNEP, MAP, Plan Bleu, RAC for SCP, PAP/RAC

The Economist Intelligence Unit (2015), [*The blue economy Growth, opportunity and a sustainable ocean economy*](#), An Economist Intelligence Unit briefing paper for the World Ocean Summit 2015

Related EU Regulations

[REGULATION \(EU\) No 1291/2013](#) of the European Parliament and of the Council of 11 December 2013 establishing Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020) and repealing Decision No 1982/2006/EC

[REGULATION \(EU\) No 1299/2013](#) of the European Parliament and of the Council of 17 December 2013 on specific provisions for the support from the European Regional Development Fund to the European territorial cooperation goal

[REGULATION \(EU\) No 1300/2013](#) of the European Parliament and of the Council of 17 December 2013 on the Cohesion Fund and repealing Council Regulation (EC) No 1084/2006

[REGULATION \(EU\) No 1301/2013](#) of the European Parliament and of the Council of 17 December 2013 on the European Regional Development Fund and on specific provisions concerning the Investment for growth and jobs goal and repealing Regulation (EC) No 1080/2006

[REGULATION \(EU\) No 1303/2013](#) of the European Parliament and of the Council of 17 December 2013 laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund and repealing Council Regulation (EC) No 1083/2006

[REGULATION \(EU\) No 1304/2013](#) of the European Parliament and of the Council of 17 December 2013 on the European Social Fund and repealing Council Regulation (EC) No 1081/2006

[REGULATION \(EU\) No 1305/2013](#) of the European Parliament and of the Council of 17 December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005

[REGULATION \(EU\) No 508/2014](#) of the European Parliament and of the Council on the European Maritime and Fisheries Fund and repealing Council Regulations (EC) No 2328/2003, (EC) No 861/2006, (EC) No 1198/2006 and (EC) No 791/2007 and Regulation (EU) No 1255/2011 of the European Parliament and of the Council