



MAREMED Project  
MARitime REgions cooperation for the MEDiterranean

# Adaptation to Climate Change on Coastal Area

## Book 3

### Implementation of a coastal observatory network in the Mediterranean basin

Thematic Coordinator:

Lazio Region (IT)  
ICZM Monitoring Centre  
Ing. Paolo Lupino  
Dott.ssa Silvia Bellacicco  
Geom. Alessandro Bratti

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<b>Authors</b>	Paolo Lupino <sup>1</sup> , Silvia Bellacicco <sup>1</sup> , Alessandro Bratti <sup>1</sup> <sup>1</sup> (ICZM Monitoring Centre of Lazio Region)
<b>Address</b>	Viale del Tintoretto, 432 - Rome (IT)
<b>Contact</b>	Paolo Lupino tel. +390651689055 <a href="mailto:palupino@regione.lazio.it">palupino@regione.lazio.it</a>
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## “Working hypothesis for the feasibility of a European Network of Coastal Observatories”

### 1. Introduction

Region Lazio, together with many other Mediterranean coastal administration bodies, has been sharing experiences in coastal defence and adaptation policies according to ICZM principles for 10 years. From BEACHMED (2002-2004) to the most recent initiatives, a series of best practices have been set up not only in the framework of technical solutions (models, data processing, maps, etc.) but also in the context of governance issues, such as new administrative procedures, and agreements. Aware of the need for new and more powerful tools to face future challenges, including climate change effects, Mediterranean cohesion, blue growth and economic crisis, a series of initiatives are being developed in order to outline and launch “BEACHMED-3 Macro-Project” - a sort of multi-sectoral and multi-level Mediterranean mini-programme to be funded by an array of sources. One of these initiatives is FACECOAST (“Face the challenge of climate change in the med coastal zones” - [www.facecoast.eu](http://www.facecoast.eu)), a cluster formed by European projects that focus on coastal issues, including RESMAR. This cluster has already promoted a project proposal called COASTGAP, gathering the experiences of 9 European projects, which was launched in the last MED programme call. EUROMCODE (European Interregional Observatories for Mediterranean Coastal Defence) is a network of observatories that is part of this well-structured process; it is an initiative committed to concretely help administrations monitor their coasts. Sharing methodologies and even coastal services (remote sensing surveys, protocols, models, dataset, etc.) directly among the public bodies involved in coastal management, is the best way to improve their knowledge and thus develop their governance skills. This paper analyses objectives, aims and organisational aspects as well as the next steps for the creation of a Network of Mediterranean Observatories.

### 2. From Beachmed to FACECOAST

Lazio Region, together with many other Mediterranean coastal regions, has been involved for 10 years in a series of European initiatives dealing with coastal risk management against climate change effects and other natural/anthropogenic threats.



From the EU-funded Beachmed project “Environmental Recovery and Maintenance of Eroding Littorals with the Use of Marine Sandy Deposits” (2002-2004), to Beachmed-e “Strategic management of beach protection for sustainable development of Mediterranean coastal zones” (2005-2008), to COSTANCE “Regional action strategies for coastal zone adaptation to climate change” (2009-2012), to MAREMED “MARitime REgions cooperation for the MEDiterranean” (2010-2013), this long list of European projects represents one of the most organic and coherent actions in this field, undertaken by 12 Mediterranean coastal administrative bodies directly involved in coastal management. This unique feature of the partnership and the longstanding collaboration brought to a significant capitalisation and many effective actions on the coastal zone.

The will to consolidate and improve this experience led to the cluster FACECOAST “Face the challenge of climate change in the med coastal zones”, a grouping of 14 European projects, founded in November 2011, and currently including more than 100 partners (Fig. 1).

It aims to gather and capitalise the contributions of European projects dealing with coastal defence against natural and anthropogenic risks (such as erosion, flooding, salt water intrusion, subsidence) in the framework of policies on the adaptation to climate change (sea level rise, increase of extreme phenomena, etc.) and sustainable development.

The target is to promote and create a space to exchange experiences on Mediterranean coastal defence against erosion and flooding hazards and subsequent risks, taking into account the Integrated Coastal Zone Management approach as well as non-Mediterranean experiences.



**Figure 1 – FACECOAST cluster meeting, 20<sup>th</sup> June 2012, Lazio Region offices**

The main cluster activities can be summarised as follows:

- exchange different governance approaches to go beyond territorial fragmentation;
- exchange different approaches to involve policymakers;
- develop synergies between different sectors and different policies (eco-innovation, transports, tourism, agriculture, urban growing, etc.) for facing coastal adaptation to climate change according to ICZM principles;
- raise awareness on natural/human coastal risks for Mediterranean areas at European level;
- avoid/reduce overlaps and repetition among project activities;
- design, on the grounds of past and current experiences, an organic and coherent set of initiatives (preparatory, planning, structural and monitoring) able to influence and cope with the issue concerned in the Mediterranean area at a large scale (Macro-project).

Therefore the main issue (coastal defence) is open to other interdisciplinary and multi-sectoral contributions (projects, clusters, etc.) as “link units” through which exchange with other interlaced issues.



FACECOAST membership is open not only to the MED Programme projects but also to the other cooperation programmes (ENPI CBC, IPA-Adriatic, Cross Border MARITIME Italy-France, INTERREGIVB, etc.) or sectoral programmes (FP7, LIFE+, etc.).

The cluster formula already produced outputs like COASTGAP, a project proposal gathering the best practices of 9 European projects, which has been recently submitted in the context of the MED Programme call on Capitalisation (October 2012).

This report on “Working hypothesis for the feasibility of a European Network of Coast Observatories” represents another initiative of the FACECOAST cluster, developed as a concrete collaboration between the project MAREMED and RESMAR.

### 3. Towards a European Network of Coastal Observatories

This objective had already been outlined in Project Beachmed-e by a specific sub-project (OBSEMEDI) which designed the structure of a “European Interregional Observatory of the Mediterranean for Coastal Defence (EURIOMCODE)”. In that study, the widespread awareness of the need to monitor coastal hazards phenomena as a whole - given their Mediterranean scale and structural nature - was clearly proved by questionnaires and meetings and it was endorsed by a specific political act: [the Bologna Charter](#).

In Project COSTANCE, the hypothesis of a European Grouping for Territorial Cooperation (Regulation EC No 1082/2006) as a possible structure for the network was analysed, and EURIOMCODE was mentioned in its [Final Declaration](#), signed by 9 Mediterranean coastal administration bodies. This declaration stated the will *“to build a network of the existing coastal Observatories (EURIOMCODE proposal) aimed to identify common standards in coastal survey activities (INSPIRE), analyze coastal morphological dynamics in the Mediterranean and share monitoring services even by creating a European grouping of territorial cooperation (EGTC)”*. Moreover, the European Commission and the Committee of the Regions decided to propose a reform of the currently long process for the creation of the EGTCs and simplify it, making the rules more flexible and promoting EGTC as the preferred instrument for territorial cooperation in European policies. The upcoming revision of the Regulation might improve the legal aspects of EGTC, thus giving local and regional authorities a good reason to exploit this instrument.

One of the main objectives of MAREMED Project (within its *“Adaptation to Climate Change in coastal areas”* theme) is to set up a network of observatories at Mediterranean level *“to monitor coastline changes and extreme climate events, to be shared by the different levels of governance”*.

Also RESMAR project is working on a specific task concerning a *“Cross-Border Centre for the study of littoral dynamics”* to be carried out by a *“network of stakeholders to allow them to confront each other, develop shared methodologies about data gathering and analysis on current coastal dynamics ... in the perspective of ICZM”*.

It clearly appears that a “critical mass” of EU projects, going towards a network of Mediterranean observatories, has been created and that it is now time to try to join together the current individual initiatives in order to step forward.

Nevertheless a structured and functional network of observatories must be considered a medium-term objective, in view of the difficulties (administrative, technical, economic, etc.) associated with its real accomplishment. Only a multi-level action can cope with it.

Starting from the simplest type of administrative agreement (Memorandum of Understanding, Protocol, etc.), the network can grow and take also into account more advanced administrative solutions like EGTC (European Grouping for Territorial Cooperation), if the conditions are suitable.

The technical opportunities and reasons for establishing a network are getting more and more evident thanks to the increasing performances of the remote sensing monitoring systems (satellite, Lidar, etc.) which could surely be managed in an easier and cheaper way by an associated group of users. However tangible and documented proposals in this regard are yet to be set up.

Finally, it is necessary to create the economic conditions for network subsistence, starting from a low-cost solution (using only existing funds already allocated by the partners), then using episodic funding (funds from European projects), and finally using more structured solutions (funds from EU DGs, POR-ERDF, international bodies like MAP, UfM, etc.).

Given such an articulated path, the network idea should be included into strategic programmes like POR-ERDF or even in specific Macro-Projects in order to be managed in a more profitable and coordinated manner.

Thanks to the joint efforts of FACECOAST cluster, the Macro-Project BEACHMED-3 has been presented in the last Capitalisation call of the MED Programme (October 2012) within the project proposal “COASTGAP”. The network was described as follows:

*WP4- Ph4.1/A - Design of the Macro-Project “BEACHMED-3”. The first action will concern a preliminary sketch of the Macro-Project “BEACHMED-3” where some specific topics will be analyzed in order to individuate the best fitting sub-projects able to get concrete steps ahead towards EU, MED countries and regions. The topics are strictly related to many of the COASTGAP BPs undergoing capitalization, which hints and spurs will be gathered from. The main concerned topics of the action will be developed to respond to the following aims:*

.....

*d) Launch a network of public organization (preferably coastal administrations) for Mediterranean coastal survey and transferable priority pilot work for the adaptation to CC and the sustainable protection of Mediterranean coastal stretches;*

This multiple action must be constantly fed by contributions of any kind in order to support, enrich and integrate this pathway.

The collaboration between MAREMED and RESMAR projects, on the grounds of previous remarkable works, can thus be a very important opportunity to step ahead in the process of creating a network.

For this network to exist, one main point must be borne in mind: no one will join the network (or will actively participate of it) until the usefulness of the network is concretely proved.

So the strategy for improving this initiative is to let potential members understand what the network could offer in the future (like coordinated coastal monitoring campaigns). But, before conditions are suitable for carrying out such engaging activities, the core of the network must be based on the tools and advantages that are available at present, such as useful coastal management applications, information published on Web-GIS, etc.

Therefore the rationale of the network is first based on “*what the network can do for its members*” and then “*what the members are expected to do for the network*”.

#### 4. Beachmed-e/OBSEMEDI results



The feasibility study carried out in sub-project OBSEMEDI (Beachmed-e project, 2005-2008) showed it is preferable not to focus on a single centralised observatory but rather on a “Network of Observatories” composed of existing or potential organisations (Fig. 2).

The **organisational units**, which are already experienced in coastal morphological monitoring, play a key role, in particular if they are already integrated in the related administrative structures in charge of coastal protection or in structures with competences in this field.

Indeed, the strategy is to prefer the administrative structures directly in charge of coastal defence, so that the link between the “Network of Observatories” and the planning activity can be effective and ensured (due to clear structural reasons).

Therefore the working method used for the development of sub-project OBSEMEDI included the necessary contribution from experts and the scientific community, and focused on what already existed or could potentially be developed in public administration bodies in charge of spatial planning and coastal protection management. In addition, OBSEMEDI included the following activities:

- 1. CURRENT STATUS:** census and analysis of the bodies that carry out coastal monitoring activities, in particular regarding morphological aspects and dynamics, and climate phenomena

2. **NEEDS:** investigation on the information needed by the bodies in charge of coastal protection and its supply
3. **METHODOLOGY:** proposals for the network of observatories in terms of organisation and operation (aggregation structure, possible activities to perform, costs, etc.).
4. **RESOURCES:** estimation (in terms of costs and organisation) of the costs currently paid for coastal monitoring and the potential costs to be paid by public and private stakeholders interested in supporting monitoring activities

As detailed below, the “Network of Observatories” can effectively be made of a network of independent monitoring units, directly linked to each competent Administrative Authority, and other Mediterranean extra-territorial units in charge of more specific activities.

The necessary relation between the “Network of Observatories” and the scientific community or other entities in charge of this matter will be developed through links to other networks, in order to promote a suitable flow of information and possibly share products and services. For this reason, and particularly to establish wider links, it is important to collaborate with other European projects, especially those developed mainly in scientific contexts, like VIIFP, aided by FACECOAST cluster.

The outputs of OBSEMEDI are available on the website [www.beachmed.eu](http://www.beachmed.eu), and a Web-GIS draft version of the censed observatories is already online at [www.facecoast.eu](http://www.facecoast.eu).

n.	Country	Region	Structure
1	Italy	Lazio	Regione Lazio - Direzione Ambiente - CMGIZC (Centro di Monitoraggio per la Gestione Integrata della Zona Costiera)
2	Italy	Abruzzo	Regione Abruzzo - OO.MM e Qualità delle Acque Marine
3	Italy	Basilicata	Regione Basilicata - Dipartimento Infrastrutture, Opere Pubbliche e Mobilità
4	Italy	Calabria	Regione Calabria - Autorità di Bacino Regionale
5	Italy	Campania	Regione Campania - Settore Programmazione Interventi di Protezione Civile sul Territorio; Difesa del Suolo
6	Italy	Emilia-Romagna	Regione Emilia-Romagna - Servizio Pianificazione di Bacino e della Costa;
7	Italy	Friuli Venezia Giulia	Regione Friuli Venezia Giulia - Dir. ambiente e lavori pubblici - Servizio Infrastrutture civili e tutela delle acque da inquinamento
8	Italy	Toscana	Provincia di Grosseto
9	Italy	Liguria	Regione Liguria - Settore Ecosistema costiero
10	Italy	Toscana	Dipartimento dell'Ambiente e del Territorio - Unità di Servizio "Pianificazione, Difesa del suolo e delle coste"
11	Italy	Toscana	Provincia di Lucca
12	Italy	Marche	Regione Marche - Progettazione delle opere pubbliche e difesa della costa
13	Italy	Toscana	Provincia di Massa Carrara - Settore Difesa del Suolo - Ufficio Difesa delle Coste - Opere Maritime
14	Italy	Molise	Regione Molise - Servizio Opere idrauliche e marittime; Servizio Beni Ambientali
15	Italy	Toscana	Provincia di Pisa
16	Italy	Puglia	Regione Puglia - Settore Ecologia
17	Italy	Sicilia	Provincia Regionale di Ragusa - 10° settore geologia e geognostica - 10° settore geologia e geognostica
18	Italy	Sardegna	Regione Sardegna - Servizio della Conservatoria delle Coste
19	Italy	Sicilia	Regione Sicilia - Dip. Territorio e Ambiente - Servizio Assetto del Territorio e Difesa del Suolo; Unità Operativa Difesa delle coste
20	Italy	Toscana	Regione Toscana - Direzione Generale delle politiche Territoriali e Ambientali - Settore Tutela del Territorio
21	Italy	Veneto	Regione Veneto - Direzione difesa del suolo
22	Spain	Baleaic Islands	Ministerio de Ciencia e Innovación - SOCIB (Sistema d'Observació i Predicció Costaner de les Illes Balears)
23	France	Corse	Region Corse - Office de l'Environnement Corse
24	France	Languedoc - Roussillon	Direction Régionale de l'Équipement du Languedoc-Roussillon
25	France	Languedoc - Roussillon	Conseil Général de l'Hérault
26	France	PACA	Région PACA - Service mer de la Région, Direction de l'Agriculture, des Ressources Naturelles, Environnement et Energie
27	Greece	Crete	Hellenic Centre of Marine Research (HCMR) - Cretan Branch
28	Greece		The Hellenic Navy Hydrographic Service
29	Greece	Crete	Ministry of Economy and Finance - Public Cadastre Service - Branch of Heraklion
30	Greece	Crete	Ministry of Economy and Finance - Public Cadastre Service - Branch of Lassithi
31	Greece	Crete	Prefecture of Chania - Directorate of Technical Services
32	Greece		Prefecture of Evros - Directorate of Technical Services
33	Greece	Crete	Prefecture of Lassithi - Directorate of Technical Services
34	Greece	Crete	Region of Crete - Directorate of Environment and Physical Planning
35	Greece	East Macedonia and Thrace	Region of Eastern Macedonia and Thrace - Directorate of Environment and Physical Planning

**Figure 2 – List of coastal Observatories identified by OBSEMEDI sub-project**

In the following chapters the list of monitoring services individuated by OBSEMEDI is commented, while the upgrade of each service record elaborated during OBSEMEDI is accomplished by MAREMED in collaboration with other European projects.

#### **4.1. Coastal monitoring services**

For the establishment of a “Network of Observatories”, the **monitoring needs** or **services required** to this aim must be outlined.

According to provisions like the Flood Directive 2007/60/EC, ICZM Protocol and Maritime Spatial Planning, when the main objective is spatial planning, records about coastal morphological alterations, anthropogenic factors, climate changes, flood risk, overlapped uses, etc. are to be gathered in the medium-long term (20-500 years) whereas the results to be achieved must be obtained at a territorial scale (regional, national and international).

This task belongs to the coastal administration bodies which, by the essential help of scientists and technicians, have to deploy programmes, plans and policies on coastal zones in practical terms. Should their full involvement as protagonist in this process lack, monitoring activities are going to remain a theoretical exercise without practical utility.

Consequently one of the main points of the Network is its linkage to coastal administration bodies at different levels.

Other reasons that can be associated to the need of a main objective are linked to the definition of quality standards for local monitoring activities, in order to allow control and analysis of coastal erosion phenomena to be easier and more reliable.

Many administration bodies share the same need, but it is undeniable that different levels of requirements exist according to the specific geographical and geo-morphological features of beaches and associated interests (tourism, environment, infrastructure, etc.).

On a preliminary basis, the expected **needs** can be summarised as follows:

1. **Classification of coastal stretches** at local 1:50.000/1:10.000 scale according to the Sea Region Data Specification of INSPIRE and according to the Corine-Erosion classification (which now includes only attributes up to 1:100.000 scale).
2. **Characterisation of coastal areas** in relation to shoreline changes in the medium-long term (morphological dynamics, hazard assessment, etc.), morphological, sedimentological and environmental characteristics (typical slope, dune systems, *Posidonia* seabed, vegetation line, size of sediments, etc.), social and economic factors (exposed assets) in order to introduce elements of an ecosystemic approach.
3. **Quantitative assessment of erosion/flood phenomena** (in terms of areas affected by erosion/flood, risk assessments, volume for beach nourishment, etc.)
4. **Research and definition** of methodologies, protocols and certifications for a correct monitoring and its efficient application.

The needs are also different in terms of **time priority** because some administration bodies are already prepared to perform systematic and integrated monitoring and can thus focus immediately on more advanced thematic details, while other administration bodies in general still need to define the phenomenon.

In MAREMED a pilot project, leaded by Liguria Region, is currently making progress on DATA MANAGEMENT. A first attempt to set up a homogeneous or at least compatible dataset at a local scale (1:50.000/1:10.000), consistent with the Sea Regions Data Specifications of INSPIRE, shall be proposed.

As for future objectives, the Network of Observatories will be interested in joining experiences currently in progress, like the PEGASO ICZM PLATFORM, in order to “*facilitate the application of the ecosystem approach to the Mediterranean and Black Sea coasts - linking the knowledge and information of the different elements that are required for the equitable and sustainable management of both coastal land and waters*”.

Moreover this kind of activities have now found a new opportunity linked to the Marine Strategy Framework Directive (2008/56/CE) which is involving all European countries in gathering coastal-marine data, defining homogenous monitoring methodologies and finding ecosystemic indicators such as the assessment of the cost of marine environment degradation.

In Italy a first assessment of the cost of degradation elaborated by ISPRA and based on the costs afforded to prevent and contrast degradation (concerning pollution, fishery stocks, marine litter, etc.), shows that in relation to the global annual amount of 1.5 billion € (2009), the cost of coastal defence represents the most expensive item (30%).

It is therefore undoubtedly worthy to develop a Network of Observatories based on coastal defence and ICZM that should carry out mainly two types of activities, as the following:

1. **Operational services:** services mainly based on data gathering (by remote sensing activities, specific devices and even the simple gathering of paper documents) and the related processing required for their presentation (post-processing, data base insertion, etc.)
2. **Consultative services:** services mainly based on the elaboration and development of methodologies and standards useful for a homogeneous and worldwide comparable monitoring dataset about marine-coastal zones, and indicators for Decision Support Systems, planning activities, governance tools for ICZM and MPS.

#### **4.2. The Operational Services**

Some of the **operational services**, from the simplest to the more complex ones, that a “Network of Observatories” should be able to provide in order to meet the needs described in this preliminary phase, can be listed as follows:

1. **Collection of information by local stakeholders** (administration bodies, public and private stakeholders, etc.). The information on local phenomena contributes to support the analysis on the territory while detailing them (reports, papers, published administrative documents, etc.).
2. **Collection of photographs** both from the ground (manual or automatic photos taken by web-cams) and aerial photos or satellite images, for the historical memory of the coasts involved;
3. **Census of the public works** and interventions on the coast;
4. **Identification of the Exposed Values (EVs)** on the coastal zone, as environmental assets, productive areas, tourist establishments, populated areas with infrastructures, etc. The identification of the EVs is required to calculate the risk according to an ecosystemic approach.
5. **Ground survey of the shoreline** by manual systems (GPS) or by automatic local systems (e.g. rectification of images from the web-cam). The survey of the shoreline enables to perform quick monitoring and assessment at a local level for rapidly changing areas and, more generally, it enables to perform assessments at territorial level.
6. **Sedimentological and mineralogical characterisation** by periodic sampling on the sub-aerial beach and nearshore. This characterisation is paramount for reading models and defining project intervention parameters (compatibility range).

7. **Definition of the network of coastal benchmarks** through the check of existing benchmarks and building those required to perform accurate surveys. The reference network is a fundamental element to guarantee the due accuracy of surveys and their effective comparability.
8. **Bathymetric and topographical surveys** of coastal morphology using precision systems (multibeam, singlebeam, GPS RTK, etc.). This is vital for the project activities and for verifying assessments at a territorial level. This kind of survey should be extended to the whole coastal zone but, being onerous, it should concern at least the coasts under erosion, and under accretion (situated upstream of coastal works, deltas of channels and natural rivers, etc.).
9. **Bathymetrical and sonar surveys of the seabed** of the continental shelf for the monitoring of sand deposits (exploitation check, environmental survey, etc.)
10. **Acquisition of new coastal aerial photos and satellite imagery** for territorial monitoring. This type of survey represents the most diffused system for verifying, at territorial scale, the evolution of the shoreline and coastal elements coastal (soil use, settlements, upper limit of *Posidonia*, etc.)
11. **Systematic comparison of shorelines** using manual and mathematical systems to assess or update the estimations on littoral changes in terms of area or volume. This service represents the most diffused system for a territorial assessment of shoreline dynamics.
12. **Collection and elaboration of climate data** using wave meter buoys or hind casting systems. Not only are climate statistics vital for modelling applications, but they also allow comprehensive and more accurate assessments on erosion phenomena to be made by relating them to specific climate periods.
13. **Use of models for the assessment of future scenarios** at territorial scale. The use of duly simplified calculation matrixes according to the assessment scale, makes it possible to plan interventions taking into account their dynamics (different sequences of interventions, different climate scenarios, etc.).
14. **Acquisition of interferometric data for assessing the subsidence phenomenon** along the coasts. This service provides a more detailed assessment of the phenomenon in terms of time and space on the territory, compared to the levelling campaigns – which are important for checking accuracy. It provides an effective contribution to individuate the areas more exposed to salt water intrusion risks and to plan interventions at a regional scale.

Certainly, many of the operational technical services mentioned above will not be provided directly by the Observatories of the Network. All Observatories are usually supported by specialised structures (Universities, survey companies, technical consultants, etc.) but they carry out the fundamental role of coordination providing them with the necessary specifications to obtain appropriate and useful results and gathering data for their historical databases.

The Network can improve the standards by reciprocal comparison and reach a better monitoring performance by joint collaboration.

#### **4.3. The Consultative Services**

The second type of services (consultative technical services) consists in providing methodologies and information related to the coastal monitoring system in general. Some of them can be listed as below:

1. Definition of evaluation criteria, compliant with international regulations, to **represent and analyse coastal erosion/flooding phenomena**;
2. Individuation of the **most significant geo-indicators**, at watershed scale, for coastal monitoring, and definition of protocols;
3. Individuation of the most significant **indicators for monitoring social and economic aspects** of the coastal zone and definition of a specific protocol;
4. **Data certification procedures** (aerial photographs, satellite images, campaign surveys) to feed the databases of the administrations bodies involved;
5. Elaboration and testing of **methodologies to define vulnerability, hazard, risk** and the main coastal adaptation options in line with resources, needs and expectations of the different coastal areas;
6. **Optimisation of the resources** made available by different participants (acquisition of data, images, services, etc.) in exchanging activities.

#### **5. Next steps for the Network**

The next steps for a better characterisation of the network and its practical take-off, can be resumed as follows:

1. **Updating the census of observatories** managed by coastal administration bodies (directly/indirectly), their characterisation (services offered, typology of data gathered, degree of interoperability);
2. **Updating and deepening coastal monitoring services** characterisation in order to write a “coastal monitoring book” where observatories can compare, share and adapt their activities;
3. **Launching European initiatives** to finance/promote the start-up of the Network.

In the following chapters the current activities related to the next Network steps are briefly illustrated.

##### **5.1. Census of the observatories**

The census of observatories is carried on with MAREMED project, with the help of FACECOAST cluster. A new layout has been adopted for the form of the database (Fig. 3), so that consultation of observatory information can be more clear and immediate. The form is divided into five different sections, reporting:

- General information on the observatory;
  - List of coastal survey activities performed and information on them;
  - Information on the availability of coastal data;
  - List of EU projects carried out;
  - List of publications, articles, etc.

The database has been implemented through the FACECOAST Web-GIS (Fig. 4).

**GENERAL INFORMATION ON THE OBSERVATORY**

**INFORMATION ON THE STRUCTURE**

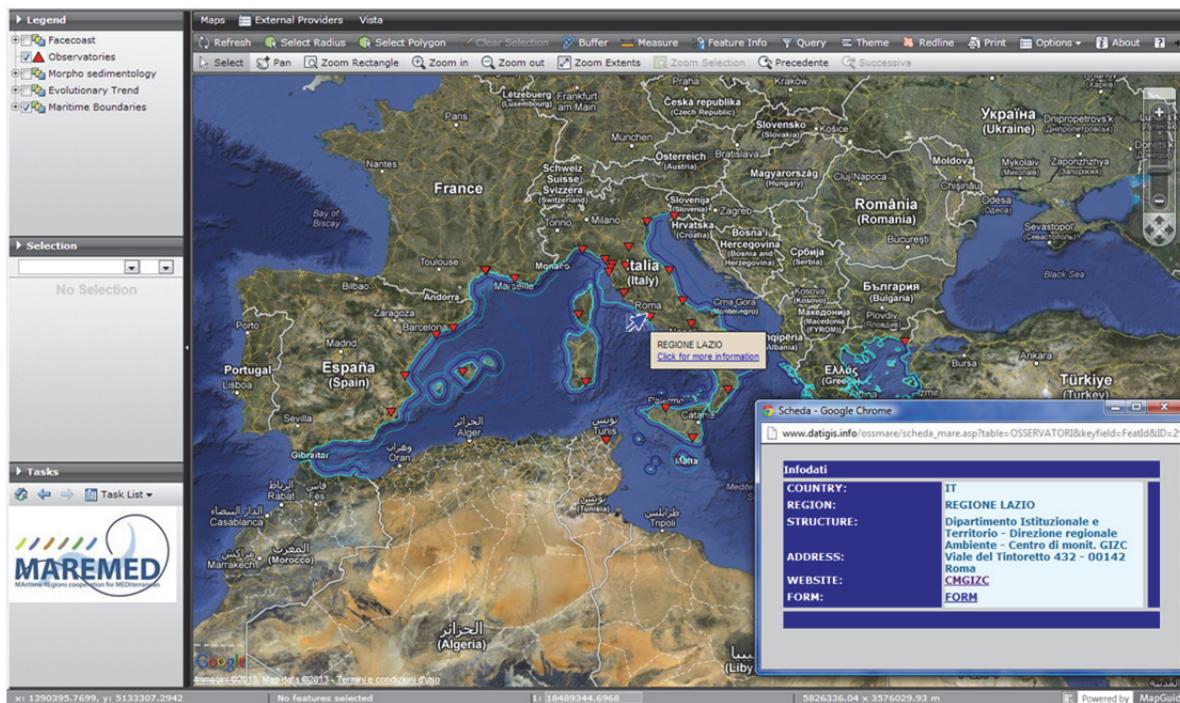
**COASTAL SURVEY ACTIVITIES**

**DIGITAL DATA AVAILABILITY**

**PARTICIPATION TO EUROPEAN PROJECTS**

**PUBLICATIONS, PROCEEDINGS, ARTICLES, ETC.**

**Figure 3 – New layout of observatory database form - example for Lazio Region**



**Figure 4 – Observatory database on FACECOAST Web-GIS**

The Final Report on the “Option for coastal information systems”, commissioned by DG Environment to Thetis S.p.a. (2011), is another important source of information for a census and update of Coastal Information Systems.

### ***5.2. Coastal monitoring services***

The updating and further analysis of coastal monitoring services – which had already been carried out in its first version by Beachmed-e/OBSEMEDI (“COASTAL SERVICES - Operative and consultative services for the Coastal Monitoring”) - is developed in two European projects: RESMAR and MAREMED.

The challenge is to compare definition and assessment of the main monitoring services and merge them in a report shared by MAREMED and RESMAR.

Each service will be widely illustrated according to the following template:

#### **TOPOBATHYMETRIC SURVEYING OF LITTORAL MORPHOLOGY**

The survey should aim at the morphological description of the coast in order to identify its morphodynamic characteristics and allow the analysis of variations in the area of the sub-aerial beach and in the volume of both sub-aerial beach and the nearshore - up to the depth of closure.

## OPTIMAL\* AREA OF REFERENCE

The scale of acquisition depends on the extent of the survey area, its morphologic characteristics and the method used. For the analysis of evolution trends in the medium and long term, the reference area is the physiographic unit. If monitoring is carried in order to evaluate the impact of coastal structures such as ports, the study zone should consider a length of beach that is one order of magnitude larger than that of the structure. Cartographic representation may vary in scale from 1:1000 to 1:5.000. Survey profiles may be 10 m equidistant, near the structures up to 250 m in longer morphologically homogeneous areas. In order to calculate the sediment budget of a beach, the area of observation should go from the dune toe to the depth of closure related to events that have a similar return period to the time interval that is being considered. This interval can be synthesised in the following: 3-5 years in order to evaluate the effects of a coastal defence structure; 5-10 years for medium-term monitoring in order to plan for defence strategies; 30 years to evaluate secular trends for the scope of coastal planning.

## OPTIMAL\* ACQUISITION FREQUENCY(IES)

The optimal frequency depends on the scope of monitoring. For general monitoring at local level the position of the shoreline should be surveyed at least once a year, always under the same oceanographic conditions. Regarding the evaluation of the effects of a specific defence structure, it is important to perform an initial survey before the construction followed by at least monthly surveys after the construction. For monitoring at the scale of physiographic units, it is advisable to perform the survey every 3-5 years.

## COST(S) PER MEASURE UNIT

<b>Sub-aerial beach (Required planimetric and altimetric accuracy: from 1 (*) to 10 (**) cm)</b>	<b>Considered survey density</b>	<b>Survey times (km/days)</b>	<b>Indicative costs (***)</b>	<b>Remarks</b>
Total Station (*)	50 m section	3	€ 1100/km	
Geodetic GPS (*)	50 m section	5	€ 1100/km	
<i>Laser Scanner</i> (*)	DTM 1x1 dm	1	€ 1100/km	Only for limited zones or structures
Airborne LIDAR (**)	DTM 1x1 m	50	€ 1100/km	Only for wide areas
Aerial photogrammetry (**)	1 m section	30	€ 1100/km	Needs "markers"
<b>Nearshore (Required planimetric and altimetric accuracy: from 10 (*) to 30 (**) cm)</b>	<b>Considered survey density</b>	<b>Survey times (km/days)</b>	<b>Indicative costs (***)</b>	<b>Remarks</b>
<i>Single-beam</i> (*)	100 m section	5	1100	

Multibeam (*)	DTM 1x1 m	3	3300	Difficult to survey between 0 m and – 2 m.
ALB/LIDAR (**)	DTM 2x2 m	40	4400	Surveys also sub-aerial beach but is affected by water turbidity
Side-Scan Sonar (SSS)		3	1100	Morphological survey
Sub-bottom profiler (SBP)	100 m section	4	1100	Stratigraphic survey

OTHER INDICATIONS					
Type of Operating / Consultative Technical Service	Optimal* Area of reference (Max scale: regional)	Optimal* Acquisition Frequency(ies)	Cost(s) per Measure Unit/frequency		Other Indications
Operative Service 6: <b>Topobathymetric coastal survey</b>	Coastal length at least one order of magnitude higher than that of the structure (to monitor the effects of a specific coastal defence structure) or Physiographic unit (to evaluate the evolution trends at medium and long terms)	For general monitoring at least once a year, always under the same oceanographic conditions. To evaluate the effects of coastal defence structures, survey before the construction and afterwards at least monthly. To monitor at the physiographic unit level, it is advisable to survey every 3-5 years.	SUB-AERIAL BEACH  Total Station  Geodetic GPS  <i>Laser Scanner</i>  Airborne  LIDAR  Aerial photogrammetry	€1100/km €1100/km €1100/km €1100/km €1100/km €1100/km	Surveys must be performed in the same season of the year.
			SUBMERGED BEACH  <i>Single-beam</i>  <i>Multibeam</i>  ALB/LIDAR  SSS SBP	€3300/km €4400/km €1100/km €1100/km	

The services will be compared and discussed by the FACECOAST partners concerned.

### **5.3. European initiatives**

The implementation of the Network is one of the specific tasks of the COASTGAP project and many of the partners involved will be called to join it by signing a simple MoU (Fig. 5).

			Project cluster/Programs				
			MED		IPA CBC	MAR IT-FR	FP7
1	Regione Lazio	IT	COASTANCE	MAREMED	MEDGOV		
2	Regione Emilia Romagna	IT	MAREMED	COASTANCE		SHAPE	
3	Department de l'Hérault	FR	COASTANCE				
4	Region of East Macedonia Thrace	GR	COASTANCE	SHIFT			
5	Region of Crete	GR	COASTANCE	MAREMED			
6	Regione Toscana	IT	MAREMED	MEDGOV		RESMAR-PERLA	
7	Regione Liguria	IT		MAREMED		RESMAR-TEP	
8	Ministry of Communication and Work	CY	COASTANCE				
9	CETMEF	FR					THESEUS
10	Universidad Pablo de Olavide de Sevilla	ES					PEGASO
11	Feports	ES	PORTA	MAREMED			
12	Christian-Albrechts University Kiel	DE					COMPASS
13	Split-Dalmatia County	HR					
14	Dubrovnik County Regional Dev. Ag.	HR	COASTANCE				
15	Universidad Autonoma de Barcelona	ES					PEGASO

Figure 5 – Partners of COASTGAP project proposal

The future development of the Network can be outlined in the Macro-Project BEACHMED-3 (general task of COASTGAP) and the hypothesis of a more structured shape will be explored.

For instance in the European project COASTANCE, a specific report about a European Grouping for Territorial Cooperation (EGTC) for a Network of Observatories (EUROIMCODE - European Interregional Observatories for Mediterranean Coastal Defence) was discussed. The feasibility of this kind of organisation and its suitability for such a purpose were thoroughly analysed.

In order to foster the topics concerning the Network and lay the ground for a wide and suitable sharing of data and methods, projects like COASTANCE and MAREMED, as well as the FACECOAST cluster, proposed to set up an INSPIRE Spatial Data Interest Community (SDIC) called “FACECOAST INSPIRE - *Littoral Administrations grouping to face the challenge of climate change and natural/anthropogenic risks in the Med coastal zones*”.

According to INSPIRE, “SDICs bundle the human expertise of users, producers and transformers of spatial information, technical competence, financial resources and policies, with an interest to better use these resources for spatial data management and the development and operation of spatial information services”.

The SDIC participants are expected to “drive the demand for spatial data and spatial information services” and “environmental monitoring, reporting and development of applications and services for environmental management are among the main driving forces behind the natural formation of SDICs”.

The main tasks of the members of a thematic SDIC are:

- To propose experts to participate in Drafting Teams working on the preparation of detailed

implementing rules of INSPIRE;

- To propose reference material for the development of INSPIRE implementing rules;
- To propose pilot projects to feed or test INSPIRE implementing rules;
- To provide comments on draft Implementing Rules.

This initiative aims at making the activities carried out during the projects dealing with coastal data specifications official and profitable, so that they can feed the INSPIRE infrastructure.

Indeed about 500 SDICs have been created so far, and some of them can be mentioned due to their relevance on coastal monitoring:

<a href="#"><u>SubCoast: A collaborative project aimed at developing a GMES-service for monitoring and forecasting subsidence hazards in coastal lowland areas around Europe</u></a>	SubCoast
<a href="#"><u>MarCoast ESA GSE Stage 2 Project</u></a>	MarCoast
<a href="#"><u>EUCC-INSPIRE pan-European Coastal Information Interest Group</u></a>	EUCC-CIIG
<a href="#"><u>Geo-Information Community in Coastal LANdscape</u></a>	GI-CLAN

SubCoast is mainly focused on coastal subsidence, MarCoast concerns marine environmental and oceanographic aspects at very large scale (oil spills, algal blooms, climate, water quality, etc.), GI-CLAN is a consortium of universities and companies interested in the Mediterranean coastal landscape (urbanism, natural assets, waterfront, etc.) and EUCC-CIIG is a very large purpose SDIC, at European scale, with many objectives concerning ICZM and interested in fostering collaborations with local and regional authorities.

FACECOAST INSPIRE therefore complements them, considering the leading role of the coastal administration bodies at regional/departmental scale, its peculiar mandatory body (cluster of European projects), the topics concerned and the Mediterranean relevance.

The report on “Coastal Services”, as mentioned above, could profitably be one of the documents to be submitted in the next proposal for a SDIC.

## 6. References

Regulation (EC) No 1082/2006 of the European Parliament and of the Council of 5 July 2006 on a European grouping of territorial cooperation (EGTC)

Trifiletti M.L. (2012) - Pre-feasibility Study of a European Grouping for Territorial Cooperation (EGTC). European Academy for education and social research for COSTANCE Project. pp. 32.

Thetis S.p.a (2011) - Options for coastal information systems. European Commission-DG Environment. pp. 477.

ISPRA Paper Report for Marine Strategy - 8 2 mediterraneo\_Costi del degrado

### Projects' websites:

[www.beachmed.eu](http://www.beachmed.eu)

[www.coastance.eu](http://www.coastance.eu)

[www.maremed.eu](http://www.maremed.eu)

[www.facecoast.eu](http://www.facecoast.eu)

[www.pegasoproject.eu](http://www.pegasoproject.eu)

[www.res-mar.eu](http://www.res-mar.eu)

## 7. List of Observatories

N	Nation	Structure	Address
1	IT	REGIONE LIGURIA	Via D'Annunzio 111 - 16121 Genova
2	IT	REGIONE LIGURIA	Via Fieschi, 15 - 16121 Genova
3	IT	REGIONE EMILIA ROMAGNA	Viale Aldo Moro 52 - 40127 Bologna
4	IT	REGIONE TOSCANA	Via di Novoli, 26 Firenze
5	IT	PROVINCIA DI LUIVORNO	Via G. Galilei 40 - 57122 LUIVORNO
6	IT	PROVINCIA DI PISA	Via Nenni n. 24 Pisa
7	IT	PROVINCIA DI LUCCA	Via della Quarquonia, 1 - 55100 Lucca
8	IT	PROVINCIA DI MASSA CARRARA	Via Marina Vecchia, 78 - 54100 Massa
9	IT	PROVINCIA DI GROSSETO	Piazza dei Martiri d'Istia, 1 - 58100 Grosseto
10	IT	REGIONE LAZIO	Viale del Tintoretto 432 - 00142 Roma
11	IT	REGIONE VENETO	Calle Pruli - Cannaregio 99
12	IT	REGIONE FRIULI VENEZIA GIULIA	piazza Unità d'Italia 1 Trieste
13	IT	REGIONE BASILICATA	Via Passarelli, 35 - 75100 Matera
14	IT	REGIONE MARCHE	Via Gentile da Fabriano, 9 - 60125 Ancona
15	IT	REGIONE SARDEGNA	Via Mameli 96-09123 Cagliari
16	IT	REGIONE SICILIA	Via Ugo La Malfa, 169 - 90146 Palermo
17	IT	PROVINCIA REGIONALE DI RAGUSA	Via G. Di Vittorio, 175 - 97100 Ragusa
18	IT	REGIONE PUGLIA	Via delle Magnolie, 6 - 70026 Modugno
19	IT	REGIONE MOLISE	Viale Elena, 1 - 86100 Campobasso
20	IT	REGIONE ABRUZZO	Via Catullo 2 - 65127 Pescara
21	IT	REGIONE CAMPANIA	Via De Gasperi 28 - 80133 Napoli
22	IT	REGIONE CALABRIA	Via Francesco Crispi, 33 - 88100 Catanzaro
23	TN	AGENCE DE PROTECTION ET D'AMENAGEMENT DU LITTORAL	2, Rue Mohamed Bachir Ridha - Le Belvédère, 1002 TUNISIE
24	MA	DRAPOR, SOCIETE DE DRAGAGE DES PORTS	5, Rue Châjarat Addor Quartier palmier Casablanca, 20100 Morocco
25	CY	MINISTRY OF TRANSPORT AND WORKS	165, Strovolou Avenue 2048 Nicosia
26	M	MALTA ENVIRONMENT AND PLANNING AUTHORITY	P.O. Box 200, Marsa MRS 1000, Malta
27	FR	CONSEIL GENERAL DE L'HERAULT	1000 Rue d'Alco 34087 Montpellier Cedex 4
28	FR	EID MEDITERRANEE	165 Avenue Paul Rimbaud 34184 Montpellier Cedex 4 - France
29	FR	DIRECTION REGIONALE DE L'EQUIPEMENT DU LANGUEDOC ROUSSILLON	520 Allée Henri II de Montmorency 34965 Montpellier Cedex 2 - France
30	FR	REGION PACA	Hôtel de Région 27, Place Jules Guesde 13481 Marseille Cedex 20
31	FR	REGION CORSE	22, Cours Grandval - BP 215 - 2025 Ajaccio Cedex 1
32	GR	THE HELLENIC NAVY HYDROGRAPHIC SERVICE	Mesogeion Av, 229-231, 15561 ATHENS
33	GR	MINISTRY OF ECONOMY & FINANCE	Georgiou Georgiadou 65, 71601 HERAKLION CRETE
34	GR	MINISTRY OF ECONOMY & FINANCE	P.O. Box 2214, 71003 HERAKLION CRETE
35	GR	HELLENIC CENTRE of MARINE RESEARCH (HCMR)	Cretan Branch

N	Nation	Structure	Address
36	GR	FOUNDATION FOR RESEARCH & TECHNOLOGY - HELLAS	INSTITUTE of APPLIED & COMPUTATIONAL MATHEMATICS
37	GR	PREFECTURE of RETHYMNON	Directorate of Technical Services
38	GR	PREFECTURE of CHANIA	Directorate of Technical Services
39	GR	PREFECTURE of HERAKLION	Directorate of Technical Services
40	GR	PREFECTURE of LASITHI	Directorate of Technical Services
41	GR	REGION of CRETE	Directorate of Environment and Physical Planning
42	GR	MINISTRY of ECONOMY & FINANCE	Public Cadastre Service - Branch of LASITHI
43	GR	MINISTRY of ECONOMY & FINANCE	Public Cadastre Service - Branch of CHANIA
44	GR	EASTERN CRETE DEVELOPMENT ORGANISATION - (OANAK)	3, Mahis Kritis Str. 71103 HERAKLION CRETE
45	GR	MINISTRY of ECONOMY & FINANCE	Public Cadastre Service - Branch of KAVALA
46	GR	PREFECTURE of EVROS	Directorate of Technical Services
47	GR	REGION of EASTERN MACEDONIA & THRACE	Directorate of Environment and Physical Planning
48	GR	MINISTRY of ECONOMY & FINANCE	Public Cadastre Service - Branch of XANTHI
49	GR	PREFECTURE of KAVALA	Directorate of Technical Services
50	GR	MINISTRY of ECONOMY & FINANCE	Public Cadastre Service - Branch of EVROS
51	GR	PREFECTURE of RODOPI	Directorate of Technical Services
52	GR	MINISTRY of ECONOMY & FINANCE	Public Cadastre Service - Branch of RODOPI
53	GR	GREEK PUBLIC REAL ESTATE CORPORATION	Voulis 7, Athens, Greece
54	GR	PREFECTURE of XANTHI	7, D. Tsetine str. - 69100 Komotini, Greece
55	GR	REGION of EASTERN MACEDONIA & THRACE	Directorate of Public Works
56	ES	GENERALITAT DE CATALUNYA	Departament de Política Territorial Secretaria per la Mobilitat - Direcció General de Ports, Aeroports i Costes - Servei de Plaçament i Estudis
57	ES	GENERALITAT DE CATALUNYA	Departament de Política Territorial Secretaria per la Mobilitat - Direcció General de Ports, Aeroports i Costes Servei de Costes
58	ES	GENERALITAT DE CATALUNYA	Departament de Política Territorial Secretaria per la Mobilitat - Direcció General
59	ES	GENERALITAT DE CATALUNYA	Departament de Política Territorial Secretaria Planificació Territorial Subdirecció General d' Actuació
60	ES	GENERALITAT DE CATALUNYA	Departament de Medi Ambient Direcció General de Desenvolupament Sostenible i Sostenibilitat Subdirecció General de Desenvolupament Sostenible
61	ES	GENERALITAT DE CATALUNYA	A v. Diagonal, 523-525 - 08029 Barcelona
62	ES	COMUNIDAD AUTÓNOMA DE ANDALUCIA	Paseo de la Farola, 12 - 29016 Málaga
63	ES	MINISTERIO DE MEDIO AMBIENTE	Plaça Imperial Tarraco, 4-4 - 43005 Tarragona
64	ES	MINISTERIO DE MEDIO AMBIENTE	Demarcació de Girona
65	ES	MINISTERIO DE MEDIO AMBIENTE	Demarcació de Barcelona
66	ES	COMUNIDAD AUTÓNOMA DE VALENCIA	Calle Joaquín Ballester, 39, 6a planta - 46009 Valencia
67	ES	COMUNIDAD AUTÓNOMA DE MURCIA	Plaza de Santena, 6 - 30071 Murcia
68	ES	MINISTERIO DE CIENCIA E INNOVACION	Carrer Pare Bitz - 07121 Palma de Mallorca SOCIB

### *Med Program*

#### **MAREMED N. 2G MED09-209**

Title: MARitime REgions cooperation for the MEDiterranean - MAREMED

Authors: Paolo Lupino, Silvia Bellacicco, Alessandro Bratti

Address: ICZM Monitoring Centre - Lazio Region (IT) - Viale del Tintoretto, 432 Rome

Contact: Paolo Lupino (paololupino@beachmed.eu), tel. +390651689055 / 9056

<http://www.maremed.eu>

<http://www.cmgizc.info>

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