



**EMBRC**  
EUROPEAN  
MARINE  
BIOLOGICAL  
RESOURCE  
CENTRE

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# Strategic Report on New Infrastructures Requirements

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## *Deliverable D2.3*

The EMBRC preparatory-phase



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## I. Introduction

The distributed Research Infrastructure (RI) EMBRC (European Marine Biological Resource Centre) will provide access to research platforms, vessels and services in support of marine biology and research utilising marine resources in Europe. This report identifies current and potential future gaps in the provision of infrastructure required for the effective operation of the RI. Work Package 2 (WP2), charged with Planning of Research Services and Science Strategy, has identified five key research themes (see D2.1. Report on Key Thematic Areas) that the core objectives of EMBRC will address. It is necessary to identify new research themes and topics that are likely to be of future importance and key interest to stimulate research, provide headroom for identified new research areas and build capacity to promote scientific and technological advancement.

This report will inform the development of future construction plans (WP4.3) and therefore financial planning (WP6) and the EMBRC business plan (WPI). One of the predominant inspirations of EMBRC is to avoid unnecessary duplication of research efforts and infrastructure investments. Further meetings will be required at the on-set of Construction Phase EMBRC (cpEMBRC) to determine the locations and distribution of new infrastructure in relation to planned centre expansions that will fulfil requirements outlined in this report.

### *Background information used for this document*

In preparation of this document, ppEMBRC partners have been asked to draft a full list of services that can be provided by their centre. These lists are available to view at <http://www.embrc.eu/index.php/services.html> and provide essential supporting information for this document. It is noted that the returns from this survey are in parts incomplete and it is likely that future gaps in service provision will become apparent as the full range of available services continues to be populated. The ASSEMBLE user community and EMBRC Reference User Group (RUG) were also invited to visit the link and suggest improvements in infrastructure that would be beneficial to them as well as any potential infrastructure gaps.

WP 4 has assembled a comprehensive inventory of existing and planned physical infrastructure, whilst WP 3 has formulated an E-Infrastructure strategy. These reports, along with the survey of users, provided the starting point for this future infrastructure report.

## 2. Strategic Infrastructure Recommendations

This section will outline the recommendations of WP2 for major infrastructure and service categories, give examples of required improvements and recommend, where appropriate, in which phase action needs to be taken.

### 2.1 Services

#### 2.1.1 Ecosystems and habitats access

EMBRC partner organisations provide access to a range of ecosystems from warm-temperate to polar regions. Access requirements are likely to be dynamic and flexible provision able to adapt to future needs of the independent research community and industrial R&D will be essential. There should be continuous monitoring of ecosystems/habitats available for access, coupled with review of gaps in coverage to ensure that the RI meets current and future scientific trends. It is acknowledged that certain habitats present particular access difficulties, notably:

- **The Polar Regions** There is uncertainty as to whether or how access can be provided through the RI. These extreme environments are of high intrinsic interest due to the specialised organisms found there and their sensitivity to climate change. With the exception of AWI, few EMBRC partners are able to provide direct access to Polar regions, current access being provided through national programmes and collaborations. A strategy for co-ordinating and improving access to Polar regions via EMBRC will need to be developed further. Note that the addition the Danish aspiring partner “Artisk Station” (Greenland) would provide access to an additional polar site. This should be finalised by the first year of the construction phase.
- **Deep sea sites (2000m+)** represent ecosystems with potential high importance but with currently limited access provided by the EMBRC partners. Currently access is limited to HCMR, SLV, SAMS and OOV, with SAMS being the only partner to have access to ecosystems around 4000m. As with polar regions, current EMBRC partners generally gain access to deep sea ecosystems through collaboration and through national or European programmes. Access to deep-sea sites for the collection of specimens and the deployment of remote laboratories should be co-ordinated through collaboration with national and international programmes in deep sea research (such as INDEEP). EMBRC should play a role in **facilitating co-ordination**, where appropriate.
- **Tropical reefs.** Currently there is no immediate access to a tropical coral reef site through EMBRC. Consideration should be given to whether EMBRC should provide or facilitate access to tropical reefs and other sites of high tropical biodiversity or whether access should continue to be provided through national and international collaborations (e.g. Institut pour la Recherche et le Développement » (IRD) and the « Museum National d’Histoire Naturelle » (MNHN): Both are members or associated to the PRES “Sorbonne Université”, to which UPMC also belongs). Alternatively access can be gained to Mediterranean coral reefs through the inclusion of the aspiring partner “Interuniversity Institute for Marine Science – Eilat” in Israel.

- **Test sites, impacted sites and artificial reefs.** The EMBRC RUG noted the importance of providing access to test sites for new technology (e.g. marine renewable energy platforms) and sites where their environmental impact can be assessed. Currently there are few sites listed for such by ppEMBRC. Such sites are in close proximity to a number of ppEMBRC partner laboratories and access to these should be investigated. A detailed inventory of sites that are heavily impacted by anthropogenic activities, such as marinas, dumping grounds, artificial reefs will be required in order to co-ordinate access. This should be available early in cpEMBRC.

### 2.1.2 Scientific Diving Infrastructure

Scientific diving should be promoted as a service offered by EMBRC and its potential highlighted to the user community. Scientific diving accessible to visitors is carried out at several centres in Europe and is provided by several EMBRC partners. The development of co-ordinated scientific diving provision will need to address rigorous national guidelines on professional diving in some countries and diverse standards on training and procedures between countries. A 3-phase plan is recommended for the short/medium term to improve the provision of scientific diving through the EMBRC: i) maintain and strengthen the network of scientific diving centres to support local scientific diving facilities to allow them to deliver high-quality and safe service to users; ii) lobby for the wider acceptance and more formal endorsement of ESD (European Scientific Diver) and AESD (Advanced European Scientific Diver) throughout Europe. Certification requirements will be difficult to enforce across Europe due to varying legislation regarding scientific diving. ; iii) promote wider integration of the current network to include standardisation of experimental techniques, data recording (to include focused training) and research targets in order to facilitate co-ordinated and comparable pan-European and international research programmes. To maximise the effectiveness of this drive to improve and increase scientific diving, the European Scientific Diving Panel (ESDP) of the European Science Foundation Marine Board should be involved in this process. ASSEMBLE is launching the first scientific diving workshop among its members in October 2012 and, amongst others, the promotion of scientific diving, standards and requirements of scientific diving, as well as standardisation of diving techniques will be discussed. EMBRC should support the findings and conclusions of this workshop wherever possible to establish a seamless and high-quality service.

### 2.1.3 Organisms

Provision of living organisms and facilities for their culture and husbandry is at the core of the EMBRC. A large number of species are currently available representing an exceptionally diverse range of taxa. Clearly, provision of organisms needs to correspond with demand from users but should also take into account the ethical guidelines and international guidelines for the conservation of species and habitats or access to biological and genetic resources, as stated inter alia in the United Nations Convention on the Law of the Sea part XI (marine scientific research) and the Convention on Biological diversity.

- A key uncertainty in assessing the effectiveness of provision of organisms is in calculating demand and future requirements. Current demand will to a large degree have been shaped

by availability of organisms. However, assessing future demand in response to a broader and more efficient supply is associated with uncertainties. There will be a need to review demand and supply regularly during the development of the cpEMBRC through the scientific and technological review system (D2.4). Obtaining a thorough break-down from ASSEMBLE concerning the range of current demands for organisms and how this has shifted is essential in determining current, and predicting future demand.

- High demand for wild-caught organisms will need to be managed effectively to avoid depletion of local stocks and ecosystem impacts. This will require the development of guidelines and/or quotas to ensure sustainable collection as for example the biological transfer agreement under development by the Mediterranean Science Commission (ciesm.org).
- Aquarium and culturing facilities are generally available at all EMBRC centres. However, specific requirements for organism culture, husbandry and experimentation may not be met by the centre(s) that provide the organism. The full range and specific attributes of individual facilities will need to be identified to match needs so that collection and culture can be co-ordinated.
- Licensing of experimental work on regulated organisms (e.g. cephalopods and vertebrates) is an issue for visiting scientists. New regulations and certificate requirements at national and European levels need to be understood and complied with. While ensuring that appropriate licences are in place is the responsibility of licence holders and certificate holders, EMBRC co-ordination should ensure that guidelines are issued and followed. Regulations and logistics for remote specimen provision need to be established, as highlighted in D10.2, 7.5.1 Specimen supply services.

#### **2.1.4 Bioinformatics and e-Infrastructures**

- **Molecular and bioinformatics support and expertise** represents one of the major bottlenecks to the EMBRC programme with potential gaps in the provision of services already identified. Currently only 5 of the 13 ppEMBRC partners have dedicated bioinformatics platforms and services. Demand for bioinformatics support for sequence assembly, annotation and modelling in the environmental and 'omics sciences is likely to outstrip the current rate of supply of expertise. EMBRC should aim to increase the spread of bioinformatics expertise amongst the partners during the construction phase, with the aim of having bioinformaticians on hand at every node by the onset of the operations phase. In this respect the role of EMBRC partners in provision of training is of paramount importance and there is a pressing need to co-ordinate a programme of training opportunities that will address the needs.
- **Data standards.** Standardisation of large omics datasets is a priority for EMBRC. Links with the international Genomics Standards Consortium (GSC) have already been made and EMBRC is an aspiring partner in the GSC. EMBRC partners should aim to adopt the relevant international standards for all data types (i.e. GSC standards for all omics and associated metadata). Additionally, EMBRC should encourage partners to submit all data to the relevant

public data repositories (this is required by most funding agencies) and provide advice and training through the bioinformatics node for such submissions..

- **Hardware.** All nodes will require access to dedicated computer clusters capable of storing and analysing datasets of ever increasing size and complexity and effective internet connections to support massive data transfer. A central EMBRC portal for depositing and accessing data whilst visiting a node is desirable and will require all stations to have sufficiently high data transfer capabilities (see D3.1. Report on survey of e infrastructure requirements and potential eWork-flow scenarios). This will enable access and transfer of data for users visiting multiple EMBRC nodes and/or partner RIs.

### 2.1.5 Other Services

Services, facilities and platforms for which no gaps in current or future provision have yet been identified include: Research vessels and platforms; molecular platforms and associated facilities; imaging and microscopy; analytical facilities; and teaching and hosting facilities. For these categories there is generally wide, though variable coverage, distributed amongst the partner organisations. It is likely that gaps in the provision of services through these infrastructure components will only become apparent during the construction and operations phase when a clearer picture of demand and future developing areas emerges.

## 2.2 EMBRC node minimum service requirements

All EMBRC nodes must ensure that a minimum of lab space and basic facilities are available for visiting scientists, and EMBRC should define what these basic facilities should be. EMBRC should also outline, by the onset of the construction phase, the minimum service requirements for each EMBRC node. This should take the following into consideration:

- Minimum availability of facilities for external/visitor (i.e. EMBRC) use
- Minimum lab space requirements: wet and dry lab space and accompanying consumables.
- Minimum molecular facilities: i.e. PCR machines, gel rigs, pipettes.
- Office and computing space.
- Minimum computing and informatics requirements (see D3.1 & 3.2)
- Administrative, logistic and technical assistance (see deliverable 10.2)

## 2.3 Knowledge and Technology Transfer Programme

EMBRC has a pressing need for a knowledge and technology translation (KTT) mechanism. This is a vital service for EMBRC to encourage the involvement of industrial and SME partners. Currently there is no plan set up for this mechanism, although some ppEMBRC partners have such in-house services. A workshop should be planned, inviting KTT officers from ppEMBRC partners to discuss how this should operate: a) as an over-all EMBRC KTT platform; b) each partner to have in-house KTT service?