EMBRC
EUROPEAN
MARINE
BIOLOGICAL
RESOURCE
CENTRE

EMBRC-ERIC Business Plan

UPDATE [2017]

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EMBRC-ERIC Business Plan Update, 2017

Contributing Authors
Ilaria Nardello, Antonio Villanueva, Bernard Kloareg, Wiebe H.C.F. Kooistra, Marco Borra, Lucie Salvaudon, Simon Berkowicz, Matthieu Merciecca.

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Background: This document was based on a template from the European Investment Bank and draws from the previous exercise by Thorndyke et al, 2013: "EMBRC Business Plan".

Purpose of the Document: This document is intended for Stakeholders, National Research Funding Agencies, business and industry as well as NGOs and policy shapers and makers, concerned with marine bioresources, biotechnology as well as basic and applied scientific research. It describes the EMBRC-ERIC organization, its user strategy, governance, management and financial plans, and its detailed implementation plans for the next three years, as well as a forward look into its future. The EMBRC-ERIC business plan ultimately describes the added value that this Research Infrastructure will bring to its stakeholders and society in general, within EU 2020 and beyond. This document will be reviewed and updated at least every three years, forming the basis for each new budgetary cycle of EMBRC-ERIC.

The editorial team wishes to thank all the reviewers from the EMBRC Committee of Nodes and EMBRC Implementation Board for their useful comments.

Cover Photographs and credits
Y. Fontana, Station Biologique de Roscoff (UPMC/CNRS)
Stazione Zoologica A. Dohrn, Naples
Christian Sadet
UK National Facility for Science Diving
Laurent Ardhuin, Observatoire Océanologique de Banyuls sur Mer (UPMC/CNRS)
ECIMAT-UVIGO

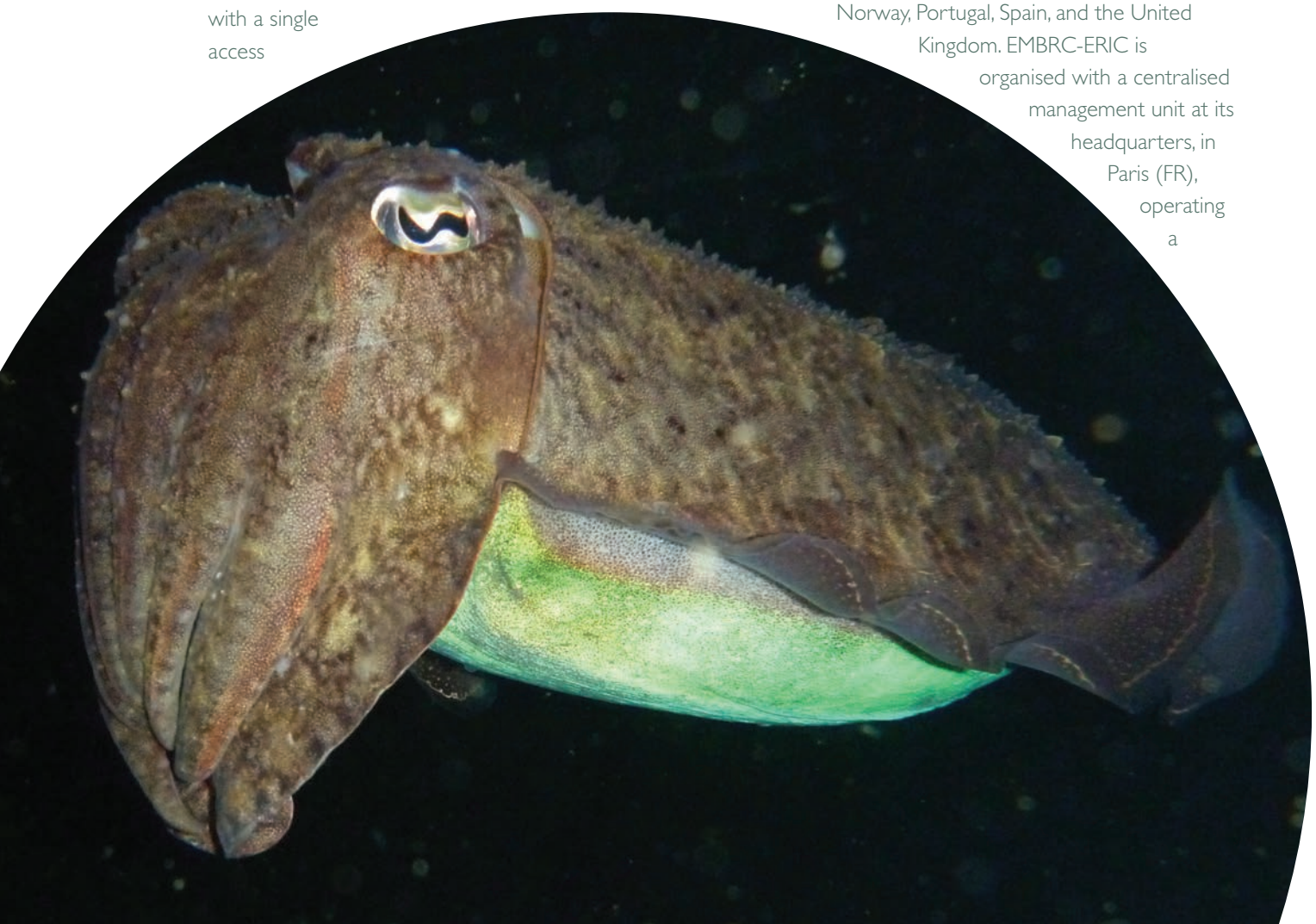
EMBRC-ERIC, 4 Place Jussieu, BC93, 75005 Paris (FR)
Email: info@embrc.eu
Web: http://www.embrc.eu

Executive Summary

Our seas and oceans control the Earth's climate and provide a rich and largely unexplored reservoir of biodiversity with great potential to contribute to food and energy security, human health and industrial production. Acquiring sufficient understanding of marine ecosystems to allow the sustainable exploitation of marine biological resources will require a step change in scientific endeavour. In order to secure Europe's global competitiveness and address Europe's grand challenges related to energy, food, job security, human health, climate change and on-going environmental degradation, it is now necessary to mobilise and link the currently fragmented infrastructure and human resources in Europe. To help meet these challenges, the European Marine Biological Resource Centre (EMBRC-ERIC) was established to provide a strategic delivery mechanism for the provision of large scale and high quality marine science in Europe. The vision is for EMBRC-ERIC to be a global reference Research Infrastructure for fundamental and applied marine biology and ecology research, with a single access point to a comprehensive range of services, resources and knowledge.

The European Research Infrastructure Consortium (ERIC) legal form will enable the governance and organisational tools for seamless distributed operation, coordinated by the central management & administration unit (EMBRC-ERIC Headquarters). This architecture will largely enhance the potential of each Node and Operator by providing a common reference strategic framework, large international visibility, interoperability of service protocols and data collections, and a close connection to the EU Research Framework. **The ERIC will ultimately generate the necessary conditions to enable a sustainable framework around the EMBRC operators.**

EMBRC is currently in the implementation phase with nine countries actively supporting its application as European Research Infrastructure Consortium (ERIC), planned for April 2017: France (Host country), Belgium, Greece, Israel, Italy, Norway, Portugal, Spain, and the United Kingdom. EMBRC-ERIC is organised with a centralised management unit at its headquarters, in Paris (FR), operating a



distributed organisation of National Nodes, with state-of-the-art facilities and services located at leading marine stations and research centres across Europe. The central organisation allows the strategic provision of marine research infrastructure through a single access portal. EMBRC-ERIC will be governed through its Statutes, Rules of Operation and Service-Level Agreements with the National Nodes and their operators. EMBRC-ERIC will operate on a balanced Technological Core Facility business model, producing both economically evaluated output and non-financially evaluated output. A socio-economic impact study carried out during the preparatory phase calculated an Economic Net Present Value (ENPV) for EMBRC of over M€300 during its lifetime, demonstrating a clear societal benefit and contribution to several dimensions of regional, national and European development.

With a dedicated promotion and marketing strategy, EMBRC-ERIC will attract users from across the life sciences including biological disciplines, environmental and conservation sciences, biotechnology and biomedicine as well as from industry and the technology sector. By bringing users from these various communities together, EMBRC will enhance interdisciplinary bridges and facilitate novel, innovative collaborations between public and private sectors. EMBRC-ERIC will work towards interoperability of protocols, continuous updating of methodologies, technological synergy and complementarity of platforms, common training and shared planning of future large-scale investments in buildings, capital equipment, and human resources.

Joint Development Activities (JDAs) will continuously improve the existing services as well as enable the development of new services adjusted to the scientific and biotechnological research priorities of academic, governmental and industrial users and in response to emerging societal challenges. EMBRC-ERIC will provide the environment, facilities and expertise for the education and training of students and professionals in the life sciences.

EMBRC will be central in tackling grand scientific and technological challenges:

- Understanding **marine ecosystem functioning** for healthy future oceans.
- Resolving the **extent of the world's ocean marine biodiversity**.
- Unlocking the potential of the marine realm for **new biomaterials**.
- Developing **scenarios for changing oceans**, e.g. through the improvement of ecological models.
- Providing **traditional and new marine biological models** to further fundamental life sciences discoveries.
- Developing **enabling technologies**, standards and methods supporting scientific breakthroughs.

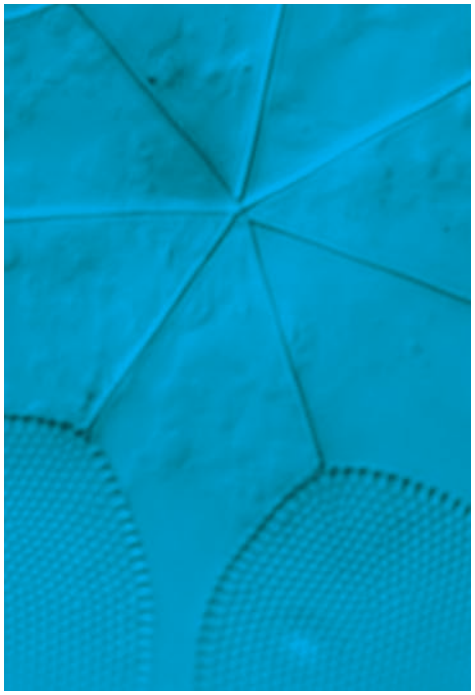
Funding of EMBRC-ERIC will come from multiple funding streams including membership fees, national and European public sources and a gradually increasing income from service delivery and access fees during the operational phase. EMBRC-ERIC access fees will be based on full economic cost for users from the public sector and commercial rates for users from the private sector. While the national Nodes are responsible for the maintenance and development of their infrastructure under EMBRC-ERIC access through national budgets, the EMBRC-ERIC Headquarters, who are responsible for the strategic leadership,

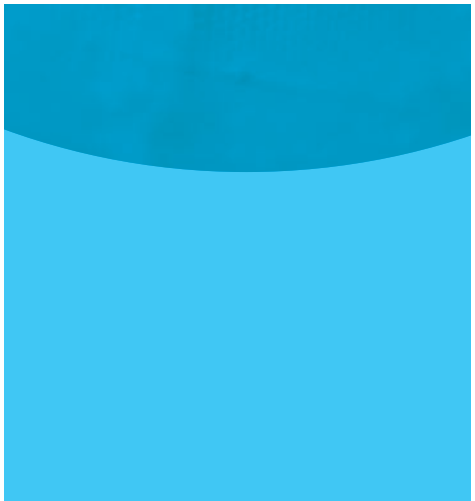
management and administration of the Research Infrastructure, will be financed via annual subscription fees from the EMBRC member states. **All nine signatories of the Memorandum of Understanding agreed to financially support the establishment of the ERIC already during the last two years of Implementation Phase, 2016 and 2017, adding to the substantial Host Premium devolved since 2015, creating *de facto* a cohesive organisation long before the onset of the Operational Phase**.

EMBRC-ERIC follows a progressive implementation plan. After eight years of preparatory phase and two years of implementation, EMBRC-ERIC will enter a spinning-up phase in its first three years of operation, dedicated to: improving user access; strengthen the connection with users from industry, academia and policy; foster co-development strategies with cognate RIs; and integrate the RI in regional/national/European strategies for cohesion, socio-economic development, and innovation. At full operation, EMBRC-ERIC will be established as a global reference for marine biology and ecology, with a unique portfolio of biological resources, access services, technology platforms and analytical workflows.

1

EMBRC-ERIC Objectives and Strategy





1.1 The Vision

The European Marine Biological Research Centre (EMBRC-ERIC) is a supra-national distributed Research Infrastructure designed **to further fundamental and applied marine biology and ecology research** in renowned marine biological stations and institutes across Europe and associated European Union countries. By providing access to state-of-the-art national facilities, EMBRC-ERIC will provide the necessary and relevant services, facilities and technology platforms to study marine organisms and ecosystems. EMBRC-ERIC will help promote the development of blue biotechnologies by supporting fundamental and applied research activities in medicine, nutrition, aquaculture, natural products, and fisheries, among others.

The vision is for EMBRC-ERIC to be a global reference Research Infrastructure for fundamental and applied marine biology and ecology research.

1.2 The Context

Europe played a key-role in the creation of marine stations in the second half of the XIX century. These undertakings, which happened within a short period of ca. 30 years, were prompted by the necessity to study in detail the evolution of life, which originated and developed in the oceans, and to understand the diversity, sustainability and exploitation of marine life.

Emergence of marine stations in the late 19th century
'Laboratoire des Dunes' Pierre-Joseph Van Beneden, Ostend, Belgium (1843)
Stazione Zoologica A. Dorhn, Naples, IT (1872)
Station Biologique de Roscoff, Roscoff, FR (1872)
Marine Biological Association in Plymouth, UK (1884)
Observatoire Oceanologique de Villefranche sur Mer, France (1885)
Observatoire Oceanologique de Banyuls sur Mer, France (1891)
Misaki Marine Biological Station, Japan (1886)
Marine Biological Laboratories, Woods Hole, MA (1888)
Cold Spring Harbor Laboratory, Long Island, NY (1890)
Hopkins Marine Station, Monterey, CA (1892)
The Gatty Marine Laboratory, St Andrews, UK (1896)

Mainly dedicated to marine life observation, in the field and in the laboratories, the marine stations have accumulated knowledge and data for decades, with an estimated one thousand coastal laboratories and institutes located around the world's oceans.

With the onset of genomic and the related post-genomic technology, experimental approaches in marine biology and ecology are today as sophisticated as in human life sciences. This fundamental advance has facilitated the study of marine life as a major resource for basic science. It has fostered a diverse research, development and innovation (RD&I) community that has contributed to global societal challenges for sustainable production of food, therapeutics and energy, for environmental protection and remediation, as well as for improving the efficiency of a variety of industrial processes.

1.3 The Lead-up to ERIC: FP6 and FP7

The EMBRC concept originated in the Network of Excellence (NoE) "Marine Genomics Europe" funded under the 6th European Framework Programme for Research and Technology Development (FP6), where the necessity of bringing together the community of marine biologists through sharing of omics technologies and infrastructure was first underlined. The FP7 Integrated Infrastructure Initiative (I3) project **ASSEMBLE** (2009-2014) was the first step towards formalizing this concept. Five of the 9 countries in the EMBRC consortium (France, Israel, Italy, Portugal and the United Kingdom) participated in this I3 project. Transnational Access activities in ASSEMBLE were very successful, with topics covering a large range of disciplines from marine biology/oceanography to chemical ecology and biotechnology.

EMBRC was integrated into the **European Strategy Forum for Research Infrastructures** (ESFRI) roadmap in 2008 and was granted a **Preparatory Phase contract** under the 7th European Framework Programme for Research and Development (FP7) conducted between 1/2/2011 and 31/1/2014, during which it developed a blueprint of the RI including a plan for EMBRC activities and services, governance structure and business plan. A business plan was presented to the project participants and EMBRC stakeholders in December 2013.

A **Memorandum of Understanding** to establish a legal structure to operate EMBRC (EMBRC MoU) entered into force in December 2013 and has now been signed by seven EU member states (Belgium, France, Greece, Italy, Portugal, Spain and UK) and two associated countries (Israel and Norway). France was selected to host EMBRC, with Headquarters in Paris, and has been managed by an Executive Director since September 2015.

Since then, EMBRC has benefited from a substantial Host Premium contribution, accompanied by the Member's financial support of the **EMBRC Implementation Phase** (2016-2017), for the proper preparation of the operational phase. This was further supported by a **second Preparatory Phase contract, under the 8th** European Framework Programme for Research and Development (H2020), which has delivered important elements of our business plan and the first step application to ERIC status.

Current funding (2017) includes contributions from the EU H2020 Framework Programme for Research Infrastructures:

1) **AssemblePlus** - Association of European Marine Biological Laboratories Expanded (H2020-INFRAIA-1-2016-2017)

2) **EMBRIC** - European Marine Biological Research Infrastructure Cluster to promote the Blue Bioeconomy (H2020-INFRADEV-1-2014-1)

3) **CORBEL** - Coordinated Research Infrastructures Building Enduring Life-science services (H2020 INFRADEV-4)

4) **ENVRIPlus** - Environmental Research Infrastructures Providing Shared Solutions for Science and Society (H2020-INFRADEV-4-2014-2015)

5) **IMBRSea** - International Master in Marine Biological Resources (Erasmus Mundus, 2017)

Most services are already available to the user community, and accessible through the EMBRC Access Portal (www.embrc.eu). EMBRC-ERIC is expected to become fully operational at the end of 2017, with the establishment of EMBRC as a legal entity in the form of a "European Research Infrastructure Consortium (ERIC)".

1.4 Scientific Challenges and Gaps Addressed

In the context of growing population pressures, the world is facing increasingly complex challenges such as human health and ageing populations, sustainable supply of food and energy, and climate change and environmental degradation. Marine biological sciences and ecological research can make an increasingly important contribution towards:

- Understanding **marine ecosystem functioning** for healthy future oceans;
- Resolving the **extent of the world's ocean marine biodiversity**;

- Unlocking the potential of the marine realm for **new biomaterials**;
- Developing **scenarios for changing oceans**, e.g. through the improvement of ecological models;
- Providing **traditional and new marine biological models** to further fundamental life sciences discoveries;
- Developing **enabling technologies**, standards and methods supporting scientific breakthroughs.

Acting at the interface between biomedical and environmental sciences, and the biotechnology sector (Fig. 1), EMBRC-ERIC will play a key role in unlocking the potential of the marine realm for new concepts and as drivers for technology development and industry innovation, tackling the societal grand challenges, and supporting the related needs for new technologies, materials and models:

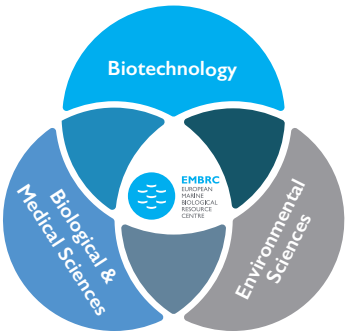


Figure 1. EMBRC-ERIC position within the strategic research landscape.

(Adapted from Marine Board Position Paper 15[i])

Securing human health and well-being

In recent years, the chemistry of natural products derived from marine organisms has become the focus of a much greater research effort. Currently there are many marine natural products in various phases of clinical development, mainly in the oncology area, with more on the way and several products already on the market. Nevertheless, the seas and oceans represent a huge potential source of new drugs, innovative treatments and diagnostic tools for human health. The main challenges facing pharmaceutical discovery from marine bioresources are linked to: legal aspects (secure access to marine resources, property rights and intellectual property); quality of marine resources (identification and variability); technology (screening of active compounds and de-replication, preventing repeated rediscovery); and structural costs of drug discovery from natural products and especially marine products.

Sustainable supply of high quality and healthy food

Marine Biotechnology is essential to satisfy the growing demand for healthy products from fisheries and aquaculture in a sustainable way. The growing demand for marine food will need to be increasingly delivered through intensive aquaculture. Since 2001, rapid biological and biotechnological progress has resulted in a more efficient and environmentally responsible aquaculture and a greater diversity of marine food products. Marine Biotechnology has contributed significantly to increasing production efficiency and product quality, to the introduction of new species for intensive cultivation and the to the development of sustainable practices through a better understanding of the molecular and physiological basis for reproduction, development and growth, and a better control of these processes. However, commercial aquaculture continues to face challenges in understanding and controlling reproduction, early life-stage development, growth, nutrition, disease and animal health management and environmental interactions and sustainability. The scope is also large to contribute to develop food additives and super foods based on the key natural biomarine ingredients, both for human as well as animal supplements. This particular area could largely impact the circular economy, in that many such ingredients can be recovered from the processing industry discards.

Securing environmental health

Marine Biotechnology is playing an increasingly important role in the protection and management of the marine environment. Achievements in this field have been less substantial than expected during the last decade and most of the applications routinely used nowadays still rely on traditional

i. Querellou J. et al. (2010). Marine Biotechnology: A Vision and New Strategy for Europe. Marine Board Position Paper 15. McDonough N., Calewaert J-B. (Eds.). Marine Board-ESF, Ostend, Belgium. ISBN 978-2-918428-26-8, 94pp.

methods based on chemistry and microbiology. This is mainly the result of the complexity of marine ecosystems on one hand, and the gap between results in marine genomic approaches and the development of derived commercial assays and products on the other hand. However, the potential contribution of marine biotechnology for environmental applications is enormous and requires urgent attention.

Industrial products and processes

Proteins and enzymes from marine organisms already contribute significantly to industrial biotechnology but can also support novel process development in the food and pharmaceutical industries or in molecular biology and diagnostic kits.

Sustainable alternative sources of energy

The ocean is an untapped, sustainable source of bioenergy. There are many examples of the production of bio-energy from marine organisms, but the production of biofuel from microalgae presents perhaps the most promising option to harvest this huge energy potential. The theoretical production of oil from microalgae is considerably higher than that of terrestrial crops but, to achieve viability, the cost of production will need to be significantly reduced and the scale of production increased, while maintaining environmental sustainability. To cultivate microalgae for the generation of bio-energy is an important challenge for Marine Biotechnology in the 21st century.

1.5 ERIC Objectives

The objectives of the established and operational EMBRC-ERIC will be to:

Offer users from academia and the private sector access to a portfolio of state-of-the-art research platforms, biological resources, analytical services and data;
Improve the quality of access by developing common standard quality practices and unique integrated workflows of specialized services;
Strengthen the connection of science with users from industry through the establishment of Expert Centres for blue biotechnology innovation;
Educate the next generation of research scientists through exposure to and training on excellent infrastructures and services, as well as advanced technology; train researchers, also from the private sector, to utilize advanced technologies; to enhance the managerial competence and technical skills of the RI personnel;
Engage the European maritime regions to collaborate in the development and integration of EMBRC-ERIC and contribute to consolidate their Research and Development and Innovation (RDI) policies.

1.6 Outline of ERIC's Business Model

The EMBRC-ERIC is designed to deliver an impactful, long-lasting, resourceful RI, through: i) Scientific and technological excellence; ii) Long-term financial commitment by Members; iii) A link with the EU policy framework; iv) Internationalization.

Primarily devoted to public research support and knowledge generation, EMBRC-ERIC shall also strengthen its ability to work in association with industry to support European RD&I processes, especially with respect to EU Blue Growth and Circular Economy objectives. A staged development of the EMBRC facilities (later referred to as "Blue Regional Innovation Centres – BRICS") is planned to enable the operators to adopt industry-friendly practices, addressing a progressively increasing Technology Readiness Level, also in collaboration with cognate Research Infrastructures in EU and USA.

The sustainability of the EMBRC-ERIC business model rests on the basic assumption that the value generated by the Consortium (sum of tangible and intangible output) will match or exceed the public investments sustained by Member governmental authorities. However, **the evaluation of EMBRC-ERIC will need to consider the fundamental ambition of this ESFRI RI, well beyond the mere commercial value of its activity: the delivery of non-financially evaluated products, such as scientific breakthrough and education, will remain a paramount remit for EMBRC-ERIC.**

EMBRC-ERIC's Elements of sustainability
Demonstrated scientific leadership
Long-term financial commitment by members
Balanced governance structure, supported by ethical and scientific committees
Coordinated operations
Internationalisation
Permanence of key personnel
Close connection with the EU policy framework
Trust generated by the ERIC label

In summary, the business model (Fig. 2) encompasses the following elements:

1. The Input (or Core Resources)

National Nodes (national infrastructures and research teams)

- The national Nodes, with their local infrastructures and research teams, are the essence of the EMBRC-ERIC. The research teams have the ability to work horizontally (broad multidisciplinarity, in groups, nationally or transnationally) or vertically (in depth monodisciplinarity, in one or more groups, nationally or transnationally) to tackle complex projects, or deliver new enabling technologies. Transversal disciplinary teams may form and jointly address scientific and technology gaps, such as sector-specific technologies and scientific breakthroughs.

Stakeholders (Public and Private).

- Public funding will support the core functioning of the EMBRC-ERIC Headquarters, with annual contributions by Members and Observers;

- Public National and regional investments will support the EMBRC-ERIC Nodes directly, ensuring the maintenance and continuous upgrade of state-of-the-art facilities and innovative services, also in line with the strategic development objectives of EMBRC;
- Private stakeholders, such as companies and Foundations, will be approached to support the development of the Consortium, in the form of medium-term partnerships.

2. Process (or Strategic Leadership)

Governance

- EMBRC-ERIC governance (Fig. 10) is designed to allow a balanced operation between Headquarters and Nodes and implement a high level of service, supported by ethical and scientific committees. The EMBRC-ERIC Headquarters will coordinate the Nodes through Service Level Agreements (SLAs), between EMBRC-ERIC and the legal entities operating the Nodes, which will define the services, resources, level and mode of access to the facilities by the user. Within each Node, a Liaison Officer will be the point of contact for EMBRC-ERIC, relaying the service offer from the Operators, and checking on the delivery of services. Their role, with the support of EMBRC-ERIC HQ, and under the supervision of the Node Director, will also be to support the development of local innovation systems, in relation to regional authorities and other RIs, and the Blue Regional Innovation Centres (BRICs).

Equipment

- Regular national investments by Members ensure that the RI installations are maintained in state-of-the-art conditions. Practices to lower the costs of the RI equipment will be established, such as evaluating leasing options, marketing, and co-development strategies with industry.

Human Resources

- The EMBRC-ERIC Operators are among the most solidly established marine research stations in Europe and the world, some of them having being at the forefront of marine biology and ecology research for more than a century. All the Operators have permanent staff to maintain the operability of the stations, and can count on experience and resources to maintain a dynamic environment. The headquarters will be staffed by a permanent Secretariat managed by an Executive Director.

Projects

- The current pre-EMBRC-ERIC Consortium is a recognized EU leader in scientific excellence for Marine biological and ecological sciences services, as demonstrated by the suite of EU projects awarded since inception. This leadership will be instrumental in attracting future funding from national and European agencies for fundamental and applied research, and to further and jointly develop the EMBRC-ERIC.

EMBRC-ERIC's EU Scientific Leadership

The EMBRC concept originated in the Network of Excellence (NoE) "Marine Genomics Europe" funded under the 6th European Framework Programme for Research and Technology Development (FP6). The FP7 Integrated Infrastructure Initiative (I3) project ASSEMBLE (2009-2014) was the first step towards formalizing this concept. Five of the 9 countries in the EMBRC consortium (France, Israel, Italy, Portugal and the United Kingdom) participated in this I3 project. Transnational Access activities in ASSEMBLE were very successful, with topics covering a large range of disciplines from marine biology/oceanography to chemical ecology and biotechnology. EMBRC was granted a Preparatory Phase contract under the 7th European Framework Programme for Research and Development (FP7) conducted between 1/2/2011 and 31/1/2014, during which, it developed a blueprint of the RI including a plan for EMBRC activities and services, governance structure and business plan. This was further supported by a **second Preparatory Phase contract**, under the 8th European Framework Programme for Research and Development (H2020), which delivered important elements of our business plan and the first step application to ERIC status.

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3. Output (Evaluation)

Non-financially evaluated products

- Scientific breakthrough, Publications and seminars will contribute to the advancement of science through publication and scientific networking.
- Quality (consistency, accuracy, precision, traceability): Professionalization of services, with an access charter, clear service offer description, unique entry point, pricing policy, etc. will enhance EMBRC attractiveness.
- Education: EMBRC-ERIC will participate in the education and training of the next generation of marine biologists, ecologists and biotechnologists, in academia and industry.
- Dissemination: EMBRC-ERIC will strive to outreach to the general public and especially youth to explain in simple terms the importance of the oceans and seas in all aspects of our lives.
- Knowledge Transfer (publications, seminars...): KT practices will strengthen the knowledge-based economy and put marine sciences at the forefront of the European research and innovation agenda.
- Interoperability: Shared procedures, methods and standards will facilitate the shared use of outputs (data, processes, procedures…) and increase the durability of EMBRC-ERIC products.

Financially evaluated Products

- New Services: New access services will be generated through Joint Development Activities (JDAs) of the Consortium, to be offered to the private and public sector, fostering innovation and generating new IP.
- Training Programmes: these will be designed based on user needs from industry and academia for continuous training of their HR, to develop specific skills along with public and private innovation requests.
- Technology Transfer/ IP and licensing/spin offs: EMBRC will be a broker of the IP generated in the Nodes through the Consortium activity, providing high visibility and value for the IP generated.

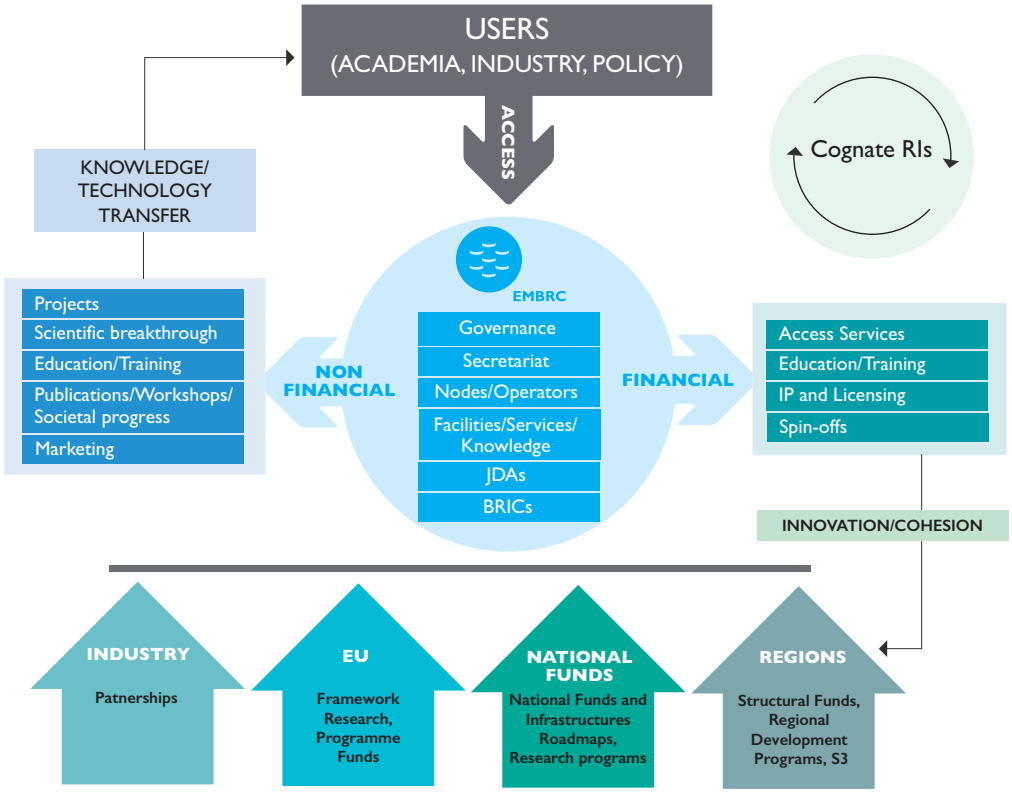


Figure 2. EMBRC-ERIC Business Model.

1.7 Societal Benefits and Horizon 2020 Funding Strategy

EMBRC-ERIC will provide key scientific services and infrastructure support for the Blue Growth Agenda. This agenda highlights five cross-cutting priority sectors including (1) blue energy, (2) aquaculture, (3) maritime, coastal and cruise tourism (linked to clean/pristine environment), (4) marine mineral resources, and (5) blue biotechnology. Blue Growth is highlighted by the European Commission Horizon 2020 framework programme in the societal challenges "Health, Demographic Change and Well Being", "Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the Bioeconomy", and "Climate action, environment, resource efficiency and raw materials". At the interface between Life sciences, environmental sciences and biotechnologies (Figure 1), EMBRC-ERIC will provide a mutually beneficial single point of contact between a diverse marine biological science community and other bodies including the European Union, national and regional governments, trade organisations, maritime and blue biotech clusters and individual companies. The RI will provide the scientific services and infrastructure to meet several of the "Grand Scientific & Technological Challenges" identified by the European Commission:

Societal Challenge pillar calls:

- **Blue Growth – Demonstrating an ocean of opportunities** (H2020-BG-2016-2017)
- **Sustainable food security – resilient and resource-efficient value chains** (H2020-SFS-2016-2017)
- **Bio-Based innovation for sustainable goods and services – Supporting the development of a European bioeconomy** (H2020-BB-2016-2017)
- **Greening the economy** (H2020-SC5-2016-2017)
- **Blue Growth calls 2018-2020**

Industrial leadership pillar calls:

- **Nanotechnologies, advances materials, biotechnology and production** (H2020-NMBP-2016-2017)
- **Industry 2020 in the circular economy** (H2020-IND-CE-2016-17)

Excellent Science pillar calls:

- **Fostering the innovation potential of research infrastructures** (H2020-INFRAINNOV-2016-2017)
- **Marie Sklodowska Curie Actions Staff Exchange Programmes and Co-Founding Schemes**
- **European Research Council**
- **Coordination and support action** "ERIC Network"

And also

- **ERANET-Cofund**

This involvement will continue to be implemented in the H2020 work programme, in particular following the strategic orientations "Healthy economy, food systems and lifestyles" "Climate change and resilience", "Innovations on land and sea" and "circular economy".

1.8 Value-Added Component of an ERIC

The European Research Infrastructure Consortium (ERIC) legal form will enable the governance and organisational tools for seamless distributed operation, coordinated by the central management & administration unit (EMBRC-ERIC Headquarters). This architecture will largely enhance the potential of each Node and Operator by providing a common reference strategic framework, large international visibility, interoperability of service protocols and data collections, a close connection to the EU Research Framework. It is already evident from the last two years of the implementation phase how the ERIC is a vector of integration for the community of operators, around common strategic objectives as well as a different functional organisation, which will bring economy of scale and a harmonious development of the Infrastructure, also according to the user needs, which will be strategically consulted. The ERIC ultimately generates the necessary conditions to enable a sustainable framework around the EMBRC operators.

Table 1- Added value of the EMBRC-ERIC

Scenario	Without EMBRC-ERIC	With EMBRC-ERIC
Infrastructure	Lower level of organization. Harder for a potential User to find and access a suitable operator.	Single-point access system for a User.
	Not fully utilised.	Pooling of resources and shared infrastructure.
Costs	Under-utilised platforms leading to higher unit of access cost.	Platforms have increased use, likely to reduce unit costs.
	High risk for the RI to operate at a loss.	Optimal recovery of costs.
Data collection	According to local practices.	Definitions and harmonization of data collection practices.
	Fragmentation of repositories.	Centralised repository and/or networked resources.
	Low or no data interoperability.	Inter-operability.
Data access	Complex procedures to access fragmented datasets.	Single entry point to services and data.
	Lack of visibility for the data collected and loss of economic value.	High visibility of data facilitates adding value to them by the research and industrial community.
	Institutes only offering access to in-house researchers.	Research infrastructure available to external users.
Service provision	Service protocols dominated by local practices.	Integrated workflows, with shared access practices and standard operational procedures established.
Innovation and industrial liaison	Limited ability to respond to industry needs.	Trained staff, networked liaison officers, strategy for innovation, industry-standard practices; Wider ability to provide solutions for industrial innovation.
Scientific impact	Low connectivity of local research teams, low dissemination and knowledge transfer.	Joint capabilities, across a multidisciplinary domain; high potential to deliver a broader societal impact that an individual Operator could achieve.
Internationalisation	Lower levels of international cooperation, fewer opportunities for researchers to move.	Largely enhanced visibilty through the promotional activity by the Headquarters, estbalishment of Cooperation strategies, funded staff-exchange programmes.

1.9 Infrastructure description

Full name of the RI:
European Marine Biological Resource Centre

Short name or abbreviation:
EMBRC-ERIC

Legal status:
Final ERIC application submitted (April 2017)

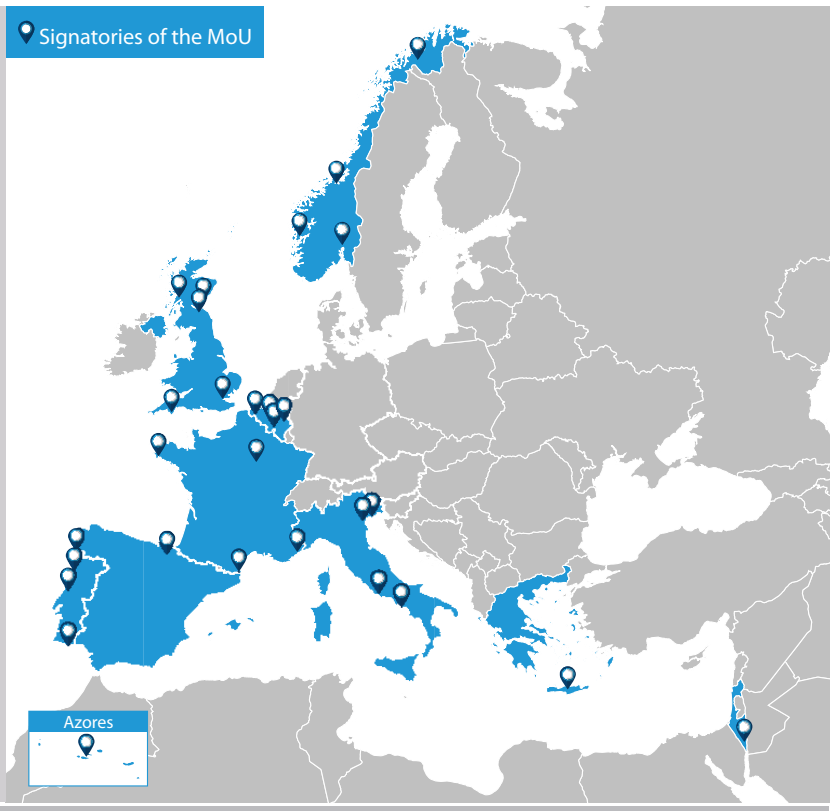
Operational status:
All services are active (http://www.marinetraining.eu/)

Coordination institution:
Université Pierre et Marie Curie, Paris 6 (UPMC)

Coordinator:
Dr. Ilaria Nardello, Executive Director

Contact:
+33.1.44276161
secretariat@embrc.eu

Website: www.embrc.eu



RI member countries: Belgium (BE), Greece (GR), Spain (ES), France (FR), Israel (IL), Italy (IT), Norway (NO), Portugal (PT), United Kingdom (UK)

Table 2 - List of Liaison Officers

Name	Website	Contact
EMBRC-FR, France	embrc.eu/france	Liaison_FR@embrc.eu
EMBRC-GR, Greece	embrc.eu/greece	Liaison_GR@embrc.eu
EMBRC-IT, Italy	embrc.eu/italy	Liaison_IT@embrc.eu
EMBRC-NO, Norway	embrc.eu/norway	Liaison_NO@embrc.eu
EMBRC-PT, Portugal	embrc.eu/portugal	Liaison_PT@embrc.eu
EMBRC-UK, The United Kingdom	embrc.eu/united-kingdom	Liaison_UK@embrc.eu
EMBRC-BE, Belgium	embrc.eu/belgium	Liaison_BE@embrc.eu
EMBRC-IL, Israel	embrc.eu/israel	Liaison_IL@embrc.eu
EMBRC-ES, Spain	embrc.eu/spain	Liaison_ES@embrc.eu

1.10 Implementation Strategy

Included in the ESFRI roadmap in 2008, EMBRC enters its operational phase in 2017 with a progressive implementation.

Since 2015, the Executive Director has managed a substantial Host Premium, part in cash and part in-kind, to prepare the establishment of the EMBRC-ERIC. All nine signatories of the MoU have also agreed to financially support the establishment of the ERIC during the last two years of Implementation Phase, 2016 and 2017, and agreed to the monetary volume envisaged to support the first cycle of the EMBRC, 2018-2022.

The EMBRC core budget progressively builds up, reflecting the spinning-up and consolidation of the various activities, to reach a maximum in 2022. The budget volumes have been smoothed over the period 2017-2022 (frontloading of the budget). In this way, **the Operational-Phase budget has accumulated during the Implementation Phase, already, creating de facto a fully operational organisation.**

1.11 Contribution to European Policies and Priorities

As the only marine Research Infrastructure in biological and medical sciences, in the Health and Food domain, EMBRC-ERIC will rapidly become the focal point for implementing the strategic research and innovation agendas based on marine bioresources, and marine environmental protection policies, at all levels:

At the regional and national level, EMBRC-ERIC will support the regional smart specialisation strategies, in close contact with the CPMR (Conference of the Peripheral Maritime Regions) for a concerted implementation of their Blue Growth strategy. EMBRC-ERIC will act as a catalyst for investment and job creation in the regions. Some of the regions where the infrastructure is implemented are remote coastal areas (with declining fisheries industries and other socio-economic problems) with unemployment rates above the European average. Direct jobs will be created during the implementation and operation phases, a proportion of which will be highly skilled and well paid. Indirect jobs will also be created to service the infrastructure and as a result of increased scientific and economic activity. EMBRC-ERIC will contribute to the creation of spin-off and start-up companies in areas related to technology development, exploitation of marine bio-resources and protection of biodiversity. This will increase economic activity and will help diversify the economy in the regions. Given the distributed architecture of EMBRC-ERIC, Europe can be thought as embedded in a constellation of marine stations which embody the EMBRC-ERIC, reaching out to the peripheral maritime regions of Europe, and promoting excellent science, capacity building, and knowledge transfer, and fostering the euRopean marine-based bio-economy.

At the European level, EMBRC-ERIC will provide the scientific services and technology infrastructure to meet several of the **"Grand Scientific & Technological Challenges"** identified by the European Commission, including human health and the ageing population, self-sufficiency in energy supplies, food security, climate change, and regulation of access to marine biodiversity, a topic where EMBRC-ERIC will play an important role together with other actors such as EC DG Bioeconomy, EC DG Research&Innovation, EC DG MARE and EC DG ENV as well as those involved in addressing the Nagoya protocol. EMBRC-ERIC will interface with and become a reference research infrastructure for relevant Joint Programming Initiatives (JPIs), namely JPI OCEANS (for marine research coordination between national funding agencies), FACCE JPI (agriculture, food security and climate change research), JPIAMR (research of antimicrobial resistance), JPI HDHL (Healthy Diet for Healthy Life), and JPI CLIMATE. EMBRC-ERIC will also interact with the ERA-NETs related to these JPIs, showcasing the EMBRC-ERIC RI. ERA-NETs already active for the marine sector include SEAS-ERA (marine sector coordination of RTD), AMPERA (coordination action to foster prevention and best response to accidental marine pollution), BiodivERsA (networking European biodiversity research), and MarineBiotech (European research network for marine biotechnology research and development).

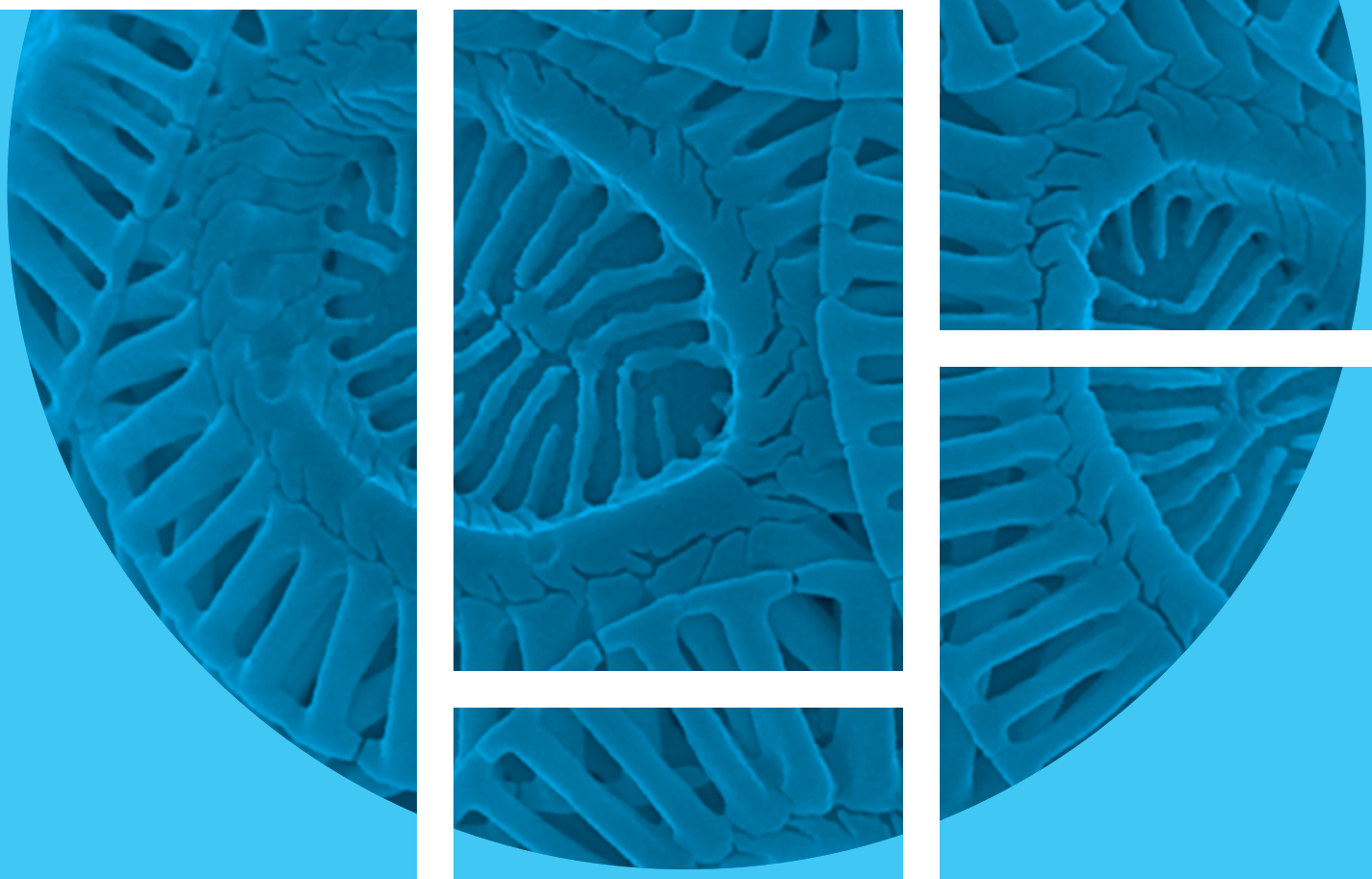
EMBRC-ERIC will bring higher visibility and increased interregional and international cooperation. While macroeconomic conditions in some countries can constitute an obstacle to implementation of EMBRC-ERIC, the level of economic development of these regions can facilitate funding of infrastructure. The international use of the infrastructure and the high mobility of researchers of EMBRC-ERIC marine stations and laboratories will result in higher visibility and will act as a catalyst to attract companies and investment to the regions promoting their development. EMBRC-ERIC will also act as a focal point of knowledge, innovation and exchange of information for SMEs that will benefit in particular the less developed regions, reducing inequalities, promoting employment and increasing European societal cohesion.

Table 3 - Monitoring parameters

Impact indicators	EMBRC-ERIC contribution to impact indicators
Excellent Science (Grants, ERC-Project, high Impact publications, etc)	Visiting scientists, new users
Mobility of students, researchers, employees…	Education and Training programmes, Staff-Exchange Programmes
New enabling technologies (JDA)	Core Budget, Research Grants
Number of jobs created (economic growth)	Liaison officer as business providers, technology transfer officers, project managers
Turnover (economic growth)	Promotion, Liaison officer as business providers, projects, visiting scientists, new users
Number of patents	EMBRC R&D Projects and Joint Development Activities
Number of blue companies created in the region	BRICS in support of local innovation ecosystems

2

EMBRC-ERIC User Strategy



2.1 The ERIC Value Proposition

The EMBRC-ERIC value proposition is based on a series of publicly available surveys and studies carried out within the framework of European projects (such as INTERREG project "Atlantic Blue Tech", 2015; ERAnet-MBT "Marine Biotechnology Strategic Research and Innovation Roadmap", 2016) or the EU Commissions studies (ECORYS Report, 2014).

These reports point to research infrastructures as key elements to deliver innovation and scientific breakthrough, increasing the accessibility with a visible entry point and simplification of the administrative procedures. Based on these elements, the key elements of the EMBRC-ERIC's marketability, summarized below, encompass the ability to deal with complex projects, a unique entry point and administration system and excellent quality of services.

EMBRC-ERIC's Elements of Marketability
A single-entry point: the EMBRC-ERIC website will centralize all the information and access procedures;
Access to an exclusive portfolio of services and unique data: EMBRC-ERIC will represent excellent European marine resources, with access to natural areas, biological systems, marine data, state-of-the-art technology, excellent expertise, that will ensure quality-controlled delivery of the services;
Immediate and simultaneous consultation of world class research services throughout Europe: EMBRC-ERIC will enable the comparison of the best matching offers corresponding to User needs, from all available infrastructures;
Coordination of multiple facilities and services, even in different geographic locations, to respond to complex user requests: by centralizing the services from different Nodes, EMBRC-ERIC will enable the building of projects using resources from several locations and optimize the service rendered;
Quality assured processes thanks to standard operational procedures (ex. Reduced lead-time, an answer within 15 days…), with the support of EMBRC-ERIC headquarter staff and Node liaison officers;
Simplification of administration procedures (contract/invoice, currency, reference…): EMBRC-ERIC will be the single contractor with the users, even for projects requiring different services.

As a baseline for user demand, the ASSEMBLE project (FP7) enabled transnational access to 618 projects over the 48 months of its duration and over 200 scientific publications to date.

Given the increasing attention to the marine environment in recent years, the access request is expected to grow accordingly. A detailed user demand analysis will be necessary to refine the service offer and pricing policy options. These aspects will be adequately addressed as soon as the EMBRC-ERIC services are operational and we can analyse User feedback. For the purpose of the present exercise, the data analysed and the experience available in the Consortium provides a sufficiently strong basis for the User case. A validation of the proposed business case, developed from the above elements, was carried out between June and December 2016, with representatives from industry user categories as well as the service provider representatives.

2.2 ERIC as a Platform for Innovation

As a research infrastructure, EMBRC will provide a sound platform for disseminating relevant research outputs to the private sector, facilitating the up-take of new discoveries. An important task for EMBRC-ERIC will be to foster original, sometimes unconventional, collaborations that lead to new products and technologies. Sectors of application of the specific EMBRC-ERIC portfolio of knowledge and Technology will be identified; collaborations between academic marine biology institutes and enterprises, at the regional, national, transnational and

international levels will be fostered; the Technology Readiness Level (TRL) of EMBRC-ERIC generated knowledge and discoveries will be promoted and raised (Fig. 3).

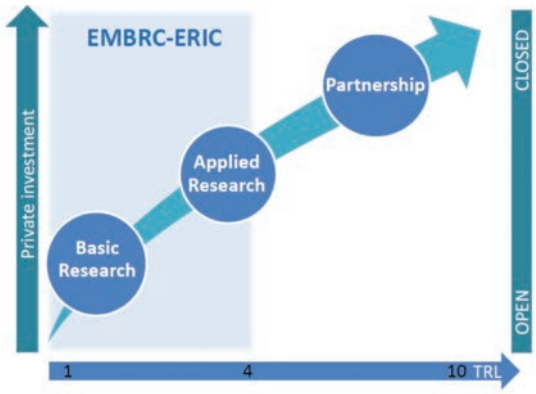


Figure 3 - Investment by private companies (blue), and openness of the research along the technology readiness level (TLR) gradient.

In order to fulfil its objective of strengthening the connection of science with users from industry, EMBRC-ERIC will help the establishment of expert centres for blue biotechnology innovation by its Operators. These expert centres, or BRICs (Blue Regional Innovation Centres) will answer the needs of industrial users by fostering the conditions for innovation in the private sector, and permit a continuum from basic to applied research, performed within the Operator's premises or at higher-level demonstrator facilities.

Depending on their developmental stage, such facilities can range from existing labs, with the simple implementation of the EMBRC access practices, to genuine science parks, requiring several years to be developed. Four stages can be defined (Table 4) on the path to professionalization of services, which will enable different TLR levels: from pre-competitive applied research (Stage 1), to private research, where industrial partners have their own facilities and develop large-scale proof of concept in collaboration with public research organisations (Stage 4).

Table 4 - Stages of the BRICs

Stages	TRL	Level of services	Organisation criterias	Impact
1 Exploration *Achievable by all Members at the onset of operational phase*	Pre-competitive only	According to local practices	Signing the EMBRC charter for good practices, In-house small capacity	Local
2 Towards innovation	+ Technological and/or concept + competitive research	Implementation of quality process	In-house + separate facilities	Regional
3 Incubator	+ Demonstration + Commercialisation	One person dedicated or more	Physically independent entity	National
4 Science park	+ Product on the market place	Dedicated team and services including promotion of the SP	Physically and legally independent entity	European

While the BRICs will mainly be implemented through national and regional funds, EMBRC-ERIC will provide guidance for good practices, support the education and training of the Liaison Officers as "technology brokers", and help attract private investment in the regions.

Linking to other RIs through the INFRADEV-4 projects, e.g. EMBRIC model, and forming strategic alliances with international R&D platforms (e.g.: The Marine Biotechnology Research Centre - CRBM, Quebec, CA; and Marine Biotechnology Centre of Innovation - MBCOI, USA) can help expand the innovation potential of EMBRC-ERIC to cover a wider value chain.

2.3 ERIC Multidisciplinary User Community

The EMBRC-ERIC user community covers a very wide panel of scientific fields, using approaches as diverse as molecular and cell biology, biochemistry, genomics, behavioural and reproductive biology, ecology, population genetics and host-pathogen relationships. Application sectors range from gene and cell engineering (molecular farming, cell factories), bio-refineries, biostatistics, software development, nutrition, medicine and health care, aquaculture, crop disease control and environmental remediation, to bioenergy and biomaterials.

A main relay in linking EMBRC-ERIC with the marine biological science community is EuroMarine, a bottom-up organization formed in 2013 by the consolidation of three former FP6 marine Networks of Excellence (MarBEF, EUR-OCEANS and MGE) in order to contribute to setting the research agenda in marine sciences in Europe. The EuroMarine partnership spans 17 European member states as well as 5 non-European countries. The scientific scope of EuroMarine ranges "from genes to ecosystems", highlighting the key role of genomic approaches in marine biology and oceanography. It recognizes EMBRC-ERIC as a major infrastructure partner, while EMBRC-ERIC sees itself as a major "hardware" resource for this scientific community. Creating strong ties and collaborations with Joint Programming Initiatives (JPIs) and ERA-Nets will also be pursued to cover comprehensively Europe's research community.

EMBRC-ERIC will develop a **Knowledge and Technology Gap Forum** and capture the need of the user community in academia, industry and policy, including cognate RIs, the Euromarine scientific community, the Biomarine Business Convention industrial community, and the EU/national/regional public agencies, among others.

EMBRC-ERIC will also link with other, non-marine communities, including those of other ESFRI RIs. RIs in the biomedical and environmental sciences constitute important relays to novel user communities, especially to users who wish to pursue research workflows through services of multiple RIs (enabled through H2020 Infradev-4 projects), to make marine resources available for industrial applications (European Marine Biological Resource Infrastructure Cluster (EMBRIC), to adapt marine model species for novel applications in biomedical and fundamental biological research (Coordinated Research Infrastructures Building Enduring Life-science Services (CORBEL) and to integrate data and methodologies across different environmental sciences (Environmental Research Infrastructures Providing Shared Solutions for Science and Society (ENVRI+). These projects are powerful tools for solidifying the RI communities as well as making all of the public and private research communities aware of their existence and the possibilities they offer.

EMBRC-ERIC services will be open to users from both public organisations and the private sector. Based on previous activity, public research by national and regional agencies or public research organisations is envisaged to represent 80% of the demands at the starting phase. The private sectors that are potential customers of EMBRC-ERIC services are the food and feed, human and animal health, environment (bio-remediation, bio-sensors etc.), energy, product and process industries, but also museums, foundations and investors looking for expert advice on project feasibility. After analysing and adapting the EMBRC-ERIC service offer, demands from SMEs and large industries are expected to increase.

Table 5 - EMBRC-ERIC products, services and users

Service	Examples	User/disciplines	Access mode
Biological resources	• Biobank material • Culture collections • Preserved samples collections • Sampling upon request	Governmental (Nagoya); Research (Life Sciences, Natural, Biological and, Environmental Sciences); Education; Industry; Policy (monitoring prog.)	On-demand on-site and/or remote (shipment) access through a service fee; or competitive application process, in case of subsidized access. Material Transfer Agreements (MTAs).
Ecosystem access	• Coastal research vessels • Scuba diving facilities • Submersibles (ROVs, AUVs) • Sampling facilities and equipment • Other	Education; Research (Environmental sciences, Natural sciences, biological sciences)	On-demand on-site access through a service fee; or competitive application process, in case of subsidized access.
Experimental facilities	• Aquaria and mesocosms • Wet laboratories • Dry laboratories • Climate rooms • Field experiments	Research; Education; Industry	On-demand on-site access through a service fee; or competitive application process, in case of subsidized access. The services offered can be delegated to the EMBRC staff or co-produced between the user and the EMBRC staff, in the case of open or pre-competitive research; or produced independently by the user, in the case of competitive and pre-competitive research.
Technology platforms	• Aquaculture • Biological analysis • Imaging • Molecular biology and omics • Structural and chemical analysis • Remote sensing and telemetry • Other	Research; Education; Industry	On-demand on-site access through a service fee; or competitive application process, in case of subsidized access. The services offered can be delegated to the EMBRC staff or co-produced between the user and the EMBRC staff, in the case of open or pre-competitive research; or produced independently by the user, in the case of competitive and pre-competitive research.
Training and education	• Marine Training e- Platform • Courses on state of the art technologies	Research; Education; Industry	Open-access multi-disciplinary E-Learning Platform. This open-source web service runs on a PHP Drupal Platform fitting the XCRI-CAP standard ("eXchange of Course Related Information"), ensuring possibilities to exchange data with similar platforms in other domains.
E-infrastructure, data and associated services	• Data access system • Analysis platform • Data archiving platform • Data publication platform	Research; Education; Policy	Virtual access and on site access through EMBRC portal. Depending on their origin, project data can undergo a moratorium period before they are released into the public domain.
Supporting facilities	• Conference and meeting facilities • In-house lodging • In-house catering	Research; Education;	On site access through competitive application process.
Expert advice	• Feasibility studies • Experiment design • Environmental impact studies • Biological sample identification • Other	Research; Investors; Industry; Policy; NGOs ;	

2.4 Large Enterprises and SMEs

A first insight into industrial user criteria for service selection revealed a need for easier access to the technological and expertise services provided, particularly in terms of speed of access, definition of projects plans, and reduced administrative burden. High standards of quality, traceability, and procedure certifications are also fundamental qualities sought by such users. Under these conditions, and provided satisfactory IP protection arrangements, users from the private sector will find a benefit in soliciting services from EMBRC.

The services of interest also depend on the size of the private users. On the one hand, micro ` small enterprises, with limited investments in their own equipment, will have a requirement for externalised technology services. On the other hand, large companies with their own in-house facilities will more likely require services for knowledge-based expertise or marketability solutions (Fig. 4).

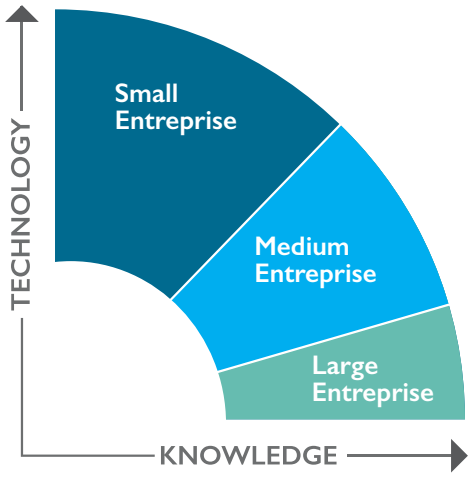


Figure 4. Simplified representation of industrial needs in research and innovation.

A demand for co-development of technology or technology supply may also come from market leaders to support the technological challenges identified by the EMBRC user community, providing new tools for investigation or maintenance services for the Infrastructure.

2.5 ERIC Services: examples

EMBRC-ERIC is built upon some of the most advanced and well-equipped marine stations and laboratories in Europe, with top-level marine biological research. EMBRC will offer a single access entry point to a range of marine ecosystems and organisms as well as a series of state-of-the-art services, metadata and platforms including (1) aquaria and culture facilities, (2) biological collections, (3) 'omics platforms (genomics, proteomics, metabolomics), (4) e-infrastructure, (5) imaging and microscopy platforms, (6) coastal research vessels and instrumentation, (7) scientific diving, (8) teaching and seminar facilities, (9) education and training courses, (10) libraries, and (10) accommodation or advice in finding accommodation.

The comprehensive services offered by EMBRC-ERIC will help users to achieve their research objectives. All EMBRC-ERIC platforms and services are run by dedicated expert staff available to assist users. EMBRC-ERIC will advertise its services through several media and potential users can check the EMBRC-ERIC service database containing comprehensive and detailed information about all EMBRC-ERIC infrastructure, ecosystems, organisms, and human resources. The **service database is searchable online** and linked with the EMBRC-ERIC online application system designed for EMBRC-ERIC users. A fully detailed Inventory of the Services, Resources and Facilities of EMBRC-ERIC, organized by Operator, is described in the project "European Marine Biology Resource Centre preparatory phase 2" (PP2 EMBRC), deliverable 2.1: Integrated Database on Services, Resources and Facilities under EMBRC.

Access to marine ecosystems

EMBRC-ERIC provides access to a range of marine ecosystems, including kelp forests, coral reefs, intertidal rocky shores, lagoons, mudflats, deep-sea environments as well as planktonic and pelagic communities. Special sites and extreme environments are also provided including (1) volcanic cold seeps, that can be used as proxies for the future high CO2/low pH oceans, (2) polluted low-oxygen sites that enable environmental impact studies, and (3) artificial habitats such as renewable energy test sites for research on bio-fouling etc. Access to subtidal ecosystems will be provided through research vessels, remotely operated and autonomous underwater vehicles (ROV/AUV), scientific diving and in-situ monitoring equipment. Specialised services are available for satellite tag

and sensor designs for tracking large marine organisms, such as mammals and turtles in their natural habitat.

Provision of marine biological resources

The provision of marine biological resources for research purposes is a fundamental service of EMBRC-ERIC. EMBRC-ERIC will provide marine organisms for research and technological development purposes both collected from the wild and cultivated. The organisms, or their parts, to be provided range from vertebrates, invertebrates and seaweeds to microalgae and protists, bacteria and viruses, including taxonomic reference collections of past and present regional biodiversity. Mutant and transgenic strains will be available for key model species.

Ethical standards and nature conservation requirements limit the availability and/or types of research on certain species such as mammals, turtles and those on the IUCN Red List of Threatened Species. Strict adherence to ethical standards and 3R policies (Reduce, Reuse, Recycle) will be ensured. EMBRC-ERIC guarantees conformity with national and international regulations concerning collection, maintenance/cultivation and shipping of biological resources. Provision of some organisms may be restricted by seasonal occurrence or abundance. Ethical issues will be overseen by the EMBRC-ERIC Ethical board. Organisms are generally made available at the EMBRC-ERIC nodes but some organisms, laboratory cultures, cell lines, tissues, tissue cultures and DNA can be provided remotely by courier. Examples of culture collections include: Culture Collection of Algae and Protozoa (CCAP), the Roscoff Culture Collection (RCC), the Plymouth Culture Collection of Marine Microalgae, and the MOLA collection of bacterial strains. Remote access to biological resources will be subject to Material Transfer Agreements stipulating terms and conditions of use, including guidelines for proper disposal and environmental protection. Collaboration with RI MIRRI and LifeWatch is envisaged.

Access to experimental aquaria and mesocosms

An extensive range of experimental aquaria and tanks are available to EMBRC-ERIC users for rearing and experimenting with marine organisms. Also available are specialised control facilities to modulate environmental conditions (i.e. temperature, salinity, pH and various water purification systems), to keep invasive species and genetically modified organisms (GMOs), as well as bioreactors, mesocosms, greenhouses, licensed marine vertebrate holding tanks and experimental facilities. Technical support for these facilities is provided.

Access to 'omics platforms

EMBRC-ERIC users will have access to standard molecular laboratories and high throughput molecular analysis tools through genomics, proteomics and metabolomics platforms. These facilities include a range of state-of-the-art equipment including sample manipulation robots, next-generation sequencers, laser scanners, and specialist equipment for mass spectrometry, flow cytometry, and magnetic resonance. In particular, EMBRC-ERIC Nodes will play a central role in the development of a global network of Genomic Observatories.

Access to high-resolution bio-imaging platforms

Bio-imaging platforms comprise equipment for scanning and transmission electron microscopy, confocal laser scanning microscopy and state-of-the-art image analysis. The platforms also include the required sample preparation facilities, e.g. for thin sectioning and staining. EMBRC-ERIC will collaborate with the BMS RI Euro-BioImaging regarding procedures, good practices, standards and complementary services.

Access to e-infrastructure

The EMBRC-ERIC e-infrastructure will process, curate and store large datasets of sequences, metadata, historical time series and library resources. Software and bioinformatics technical support will be available for sequence assembly, annotation, and statistical, phylogenetic and other analyses. Collaboration with RI Elixir is envisaged.

Access to training and education programmes

Education and Training service offer is a major remit for EMBRC-ERIC, already well positioned in this domain, with numerous examples of important activity:

- The Marine Training Network – A web-based platform developed by EMBRC to offer an overview of current Marine and Maritime education, whilst being a supporting framework to foster new training initiatives with exchange of best practice including a set of tools for assistance and insights in Marine and Maritime ocused trainings". In other words, the Marine Training Platform had as objective to become the **one-stop-shop** for **trainees** in search of European Marine and Maritime training initiatives, for **trainers** in search of assistance for organizing European Marine and Maritime training initiatives, for **stakeholders** in search of insights into European Marine and Maritime training initiatives.
- The IMBRSea Master Programme - The International Master in Marine Biological Resources (IMBRSea), is a joint Master programme organized by eight leading European universities in the field of marine sciences; Ghent University (BE), University of Pierre and Marie Curie (FR), University of the Algarve (PT), University of Oviedo (ES), Galway-Mayo Institute of Technology (IE), University of the Basque Country (ES), Polytechnic University of Marche (IT), and University of Bergen (NO), supported by 14 EMBRC operators.

Access to expert advice

EMBRC-ERIC will propose advice to Users on Feasibility studies, Experiment design, Environmental impact studies, Biological sample identification and other topics. Interest for these services has been clearly expressed, among others, by investors and business angels in marine bioresources.

Access to conference and hosting facilities

Accommodation and catering facilities for users are available in-house or in close proximity to EMBRC-ERIC marine stations. Some EMBRC nodes will have in-house accommodation and catering facilities for users. A variety of facilities are also available for seminars, (video-) conferences and teaching.

2.6 The ERIC brand

The objective over the next 10 years is to further develop the EMBRC-ERIC ethos and brand. The ethos of providing state-of-the-art scientific support in a framework that delivers a quality product on time and in a useable format will promote the excellence of the EMBRC brand. The development of this programme will involve:

- Trust, generated by the ERIC status recognition process
- Close connection to EU Research Framework
- Talent attraction and retention by competitive career tracks
- Partnering scientific and technology excellence
- Allowing a geographically distributed organization
- Co-development strategies with agencies to support societal innovation and cohesion with a variable scale of operation and territorial impact (regional, national, transnational, international)
- Tax benefits

2.7 Market Trends and Outlook

Marine waters provide resources and services estimated at 60% of the total economic value of the biosphere, and with the increasing demand for marine products and the emergence of novel usages of marine species (e.g. for marine renewable energy), marine life is becoming a new frontier in the bioeconomy of our territories.

As a Research Infrastructure, a core output of EMBRC-ERIC will be knowledge-based scientific production in the field of Marine Biology. Europe has the largest production of scientific publications in both fundamental and applied research of this area, which also correspond to the highest number of research institutes performing this research activity. This pool of researchers constitutes the base for a strong demand for access to marine biology resources and research platform and services, such as those offered by EMBRC-ERIC.

EMBRC-ERIC will strive to maintain and strengthen the EU leadership in the marine biology research in a highly competitive context (Fig. 5).

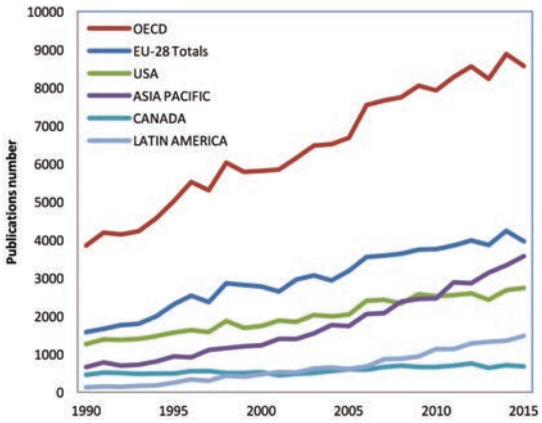


Figure 5. Publications in Marine & freshwater biology (source: InCites, Web of sciences).

Given the potential of marine biology for commercial applications, EMBRC-ERIC will also be a pivotal instrument promoting innovation in commercial markets, by enabling access to infrastructure resources by private customers. As a unique research infrastructure dedicated to marine bioresources access, EMBRC-ERIC will rapidly gain a high profile. From previous and current experience, as well as drawing on the promising market trends of the marine biotechnology sector, the EMBRC-ERIC ambition is to have a **20% industry customer base**, relying on the EMBRC-ERIC services and knowledge base.

Trends in the sector of Marine Biotechnologies predict a global growth rate of 6-8% of the market size, up to 4.8 billion euros in 2020, and 6.4 billion by 2025[ii]. With the excellence of its scientific research (36% of articles in Blue Biotechnology are published by European teams)[iii], Europe has a high potential for development in this sector, although European industries represent only 17% of the global market at the moment. Based on an estimated annual growth rate of 6-8% in the coming years, 10.000 marine jobs will be created in Europe in the coming years[iv].

The Organisation for Economic Co-operation and Development (OECD) has placed strong emphasis on the fact that biological resource centres (BRCs) are an essential part of the infrastructure requirements for the development of bioresources[v]. In a recent report[vi] focused on the contribution of marine biotechnology to economic and social prosperity, the importance of Research Infrastructure for generating and sharing knowledge was again emphasised. EMBRC-ERIC will play a central role in addressing this need, and contribute to establish a prominent European Blue Bioeconomy.

2.8 Main Markets and Technology Drivers

The establishment of EMBRC-ERIC scientific community coincides with the advent of the Big Data revolution. This is a change that transcends the frontiers of individual sciences facilitating more

ii. Smithers Group (2015) The Future of Marine Biotechnology for Industrial Applications to 2025. Available at: http://www.smithersrapra.com/products/market-reports/biomaterials/the-future-of-marine-biotechnology-for-industrial.

iii. ECORYS (2012) Maritime Sub-Function Profile Report Blue Biotechnology, Blue-Growth Scenarios and Drivers for Sustainable Growth from the Oceans, Seas and Coasts

iv. ECORYS (2014) Report for DG Maritime Affairs and Fisheries, Study in Support of Impact Assessment work on Blue Biotechnology, ECORYS Consultants. Brussels.

v. OECD, 2004. http://www.oecd.org/science/biotech/33784888.pdf

vi. OECD, 2013. http://dx.doi.org/10.1787/9789264194243-en

efficient interdisciplinary approaches and a revolutionary efficiency in addressing complexity, such as the one that marine life and environment represents. This comes at the cost of need for developing new ways to collaborate and train, a concern that has been addressed from the beginning within EMBRC and in collaborations with other networks. The scientific and technological challenges that can thus efficiently be tackled by the research community of EMBRC-ERIC are relevant to the research, education, policy and industry sectors. These sectors are also stimulating the development of EMBRC-ERIC, with their needs for the following activities, products and services:

- **Enabling technologies for research excellence**

  The EuroMarine partnership is a main relay in linking EMBRC-ERIC with this science community. Spanning over 17 European member states as well as five non-European countries, this bottom-up organization was formed in 2013 by the consolidation of three former FP6 marine Networks of Excellence (MarBEF, EUR-OCEANS and Marine Genomics Europe). The scientific scope of EuroMarine ranges "from genes to ecosystems", highlighting the key role of genomic approaches in marine biology and oceanography. EuroMarine recognizes EMBRC as a major infrastructure partner, while EMBRC sees itself as a major "hardware" resource for this scientific community.

  There is also strong potential and initial contacts for international links with regions interested in the utilization of marine biological resources and which are interested in implementing an EMBRC-RI type model, such as Latin America (e.g. Chile, Brazil, Uruguay, Argentina) and Eastern Asia (e.g. India).

- **Education and training**

  The need is for the next generation of marine scientists to receive adequate training and hands on experience in expert centres; also industry users are actively seeking training opportunities over advanced equipment or research protocols. Education is a main remit area for EMBRC-ERIC and an impact area of the H2020 strategy.

- **Labelling/Certification**

  Complex regulations are in place to obtain full legal clearance for access to biological material, including genetic material, whether freshly collected on-site, cultured, or available in collections. The EMBRC_ERIC Users of all sorts require access to legally compliant samples and collecting procedures, driven by the European and national legal frameworks, such as the United Nations Convention on the Law of the Sea (UNCLOS), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the European Marine Strategy Framework Directive, the Convention on Biological Diversity (CBD) and its Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from Their Utilization.

- **Industry application markets**

  Marine (blue) biotechnology promises a very large field of innovation in diverse economic sectors. According to the report "Blue Growth Study – Scenarios and Drivers for Sustainable Growth from the Oceans, Seas and Coasts" commissioned by the DG Mare, the European blue economy sector employs 5.4 million people and generates a gross added value of almost 500 billion € per year[vii]. Application sectors range from gene and cell engineering (molecular farming, cell factories), biorefineries, biostatistics, software development, biosensors, nutrition, medicine and health care, aquaculture, crop disease control and environmental management and remediation, to bioenergy and biomaterials. In detail:

  - **Health and personal care**

    Seven pharmaceutical drugs of Marine origin are currently on the

vii. https://ec.europa.eu/maritimeaffairs/policy/blue_growth_en

market, but according to a recent study on cancer[viii], about 600,000 novel compounds, potentially leading to novel anti-cancer drugs are waiting to be discovered. Treatments from marine organisms could be worth between USD 563 billion (EUR 428.5 billion) and USD 5.69 trillion (EUR 4.33 trillion).

Marine products for personal care/cosmetic are also on the rise, with a growing public demand for natural products, and supported by a strong European industry, leader worldwide *(value of more than EUR 72 billion)*. In Europe, the cosmetic market employs over 1.5 million people and makes important investments in research & development (25,000 scientists and 10% of all patents granted in the EU during 2009) since the market is sustained by continuous innovation. In this context, marine biotechnology and the untapped resources of marine biodiversity are only at the beginning of their development and have the potential to become an important source of innovations in the health and personal care area (ECORYS report).

- **Food**

  The market for food products and ingredients of marine origin is growing, mainly driven by the development of seaweed products, which provide enriched or fortified food or food additives like vitamins, probiotic elements and antioxidants.

  Aquaculture, the historical industry of marine food production, is a strategic market area for growth in Europe which in majority relies on imports. However, even though European aquaculture only accounts for 10% of European seafood consumption, the annual production grows by 20% per year and exports high value products such as organic salmons. In Scotland, the income from aquaculture has recently exceeded that from capture fisheries. Marine biotechnology has the potential to make significant contributions to the sector in the quest to increase production, production efficiency and minimise impacts (ECORYS report).

- **Energy**

  Several algal strains are under experimentation for the production of biomass for biofuels. The exploitation of this sector is still at the pilot/demonstration stage and will require important investments in knowledge generation to understand how to scale up the production.

- **Environment**

  The market for environmental applications of marine products and organisms is only just emerging. As ecosystem services are now economically valued, the impact that marine biology and biotechnology applications can have is expanding, from marine-biology derived ship coatings, which will ultimately reduce fuelling costs, to remediation of damage by pollution, global warming and the offsetting agenda.

2.9 Data Policy and Access

Access to EMBRC-ERIC will be open to all types of users, including from all European and non-European countries. Requests for access will undergo a streamlined process involving eligibility, feasibility and scientific excellence evaluation. The EMBRC-ERIC technical and scientific description and the EMBRC-ERIC Rules of Operations provide further details regarding the conditions for user access.

Access will be monitored and user satisfaction measured with a feedback mechanism as part of quality assurance for continuous improvement of access and services.

EMBRC-ERIC will promote e-infrastructure interoperability and standardization in order to deal with large volumes of different types of generated data, and develop or adopt community endorsed data handling protocols, tools and expertise.

EMBRC-ERIC will promote open source and open access principles of/for data and will foster knowledge transfer and the dissemination of data and information. The details of the EMBRC-ERIC data policy are described in its Rules of Operation, together with a Data Management Plan. EMBRC-ERIC will liaise with existing European initiatives of

viii. Erwin, P. M., Lopez-Legentil, S., & Schuhmann, P.W. (2010). The pharmaceutical value of marine biodiversity for anti-cancer drug discovery. Ecological Economics. 70: 445-451

relevance for environmental and biological data and bioinformatics, such as ELIXIR and Lifewatch, and recognized data repositories such as EurOBIS, Emodnet, PANGAEA, GEOSS and COPERNICUS.

2.10 Access Mode

Six types of access modes will be available with a high quality of service, ranging from tailor-made research completely externalized by the user to EMBRC-ERIC Operators, to remote access to EMBRC-ERIC open data, depending on user needs. They are represented in Table 6 against the envisaged pricing policy.

Table 6 - EMBRC access modes

Access Mode	Pricing policy
1. Tailor-made research, research project • **All-in-one**: The user externalises the totality of the project to EMBRC-ERIC operators, from the definition of the research protocol to the running of the experiments. • **Co-produced service**: The EMBRC-ERIC operators help the user to define the research protocol and may conduct experiments with the User's research teams. • **Delegated service**: The user defines the research protocol and the experiments are conducted solely by the EMBRC-ERIC operators with no on-site intervention from user personnel.	Custom service price or research contract with shared IP with the User*
2. Routine services (off the shelf): The user chooses from a catalogue of analytical services or biological resources provided by EMBRC-ERIC. The services are then provided solely by the EMBRC team with no on-site intervention from user personnel.	MTA, standard service price
3. Access-only: The user is given on-site access for their staff to ecosystems and marine biological resources, to experimental aquaria and mesocosms, in order to run its own experiments / projects. Access to biological resources can also be remotely provided, i.e. the user receives the material at their premises.	Access fee
4. Expert Advice: the EMBRC-ERIC operators provides advice and expertise on specific aspects (taxonomy, 'omics, imaging, protein structure, experimental design, feasibility, etc.) of the user's project.	Consultancy fee or research contract with shared IP rights
5. Training: On-site or E-learning training is provided to users regarding general education, use of the platforms, novel techniques, experimental protocols, etc.	Training fee
6. Virtual access: access to the EMBRC-ERIC's e-infrastructure, including large datasets and virtual research environments.	Open Access

** The "user" is the external commissioner of the services from the EMBRC*

Access procedure

A standard and clear procedure for managing user access requests within EMBRC-ERIC is envisaged, enabled by the Service Level Agreements (SLAs) and implemented by the EMBRC-ERIC Secretariat in interaction with the Liaison Officers in the Nodes (Fig. 6).

The first point of entry for users will be the EMBRC-ERIC website, with a service offer interface presenting the service portfolio and an on-line Access Request form.

Access requests financially supported by public funding managed by EMBRC-ERIC (notably TNA funding) will be screened for ethical compliance and practical feasibility by in-house RI staff at the requested sites, and subsequently evaluated by a largely external User Selection Panel (USP) and ranked based on scientific/technological quality and originality, pertinence to EMBRC thematic priority areas, environmental impact/ethics, and innovation potential of the submitted proposals.

Access requests utilising own funding will be checked for eligibility based on ethical compliance and feasibility.

EMBRC-ERIC will monitor quantity of access, type of user (academia, industry, policy, others), geographic distribution, and user satisfaction through a feedback mechanism, implemented as part of quality assurance for continuous improvement of access services.

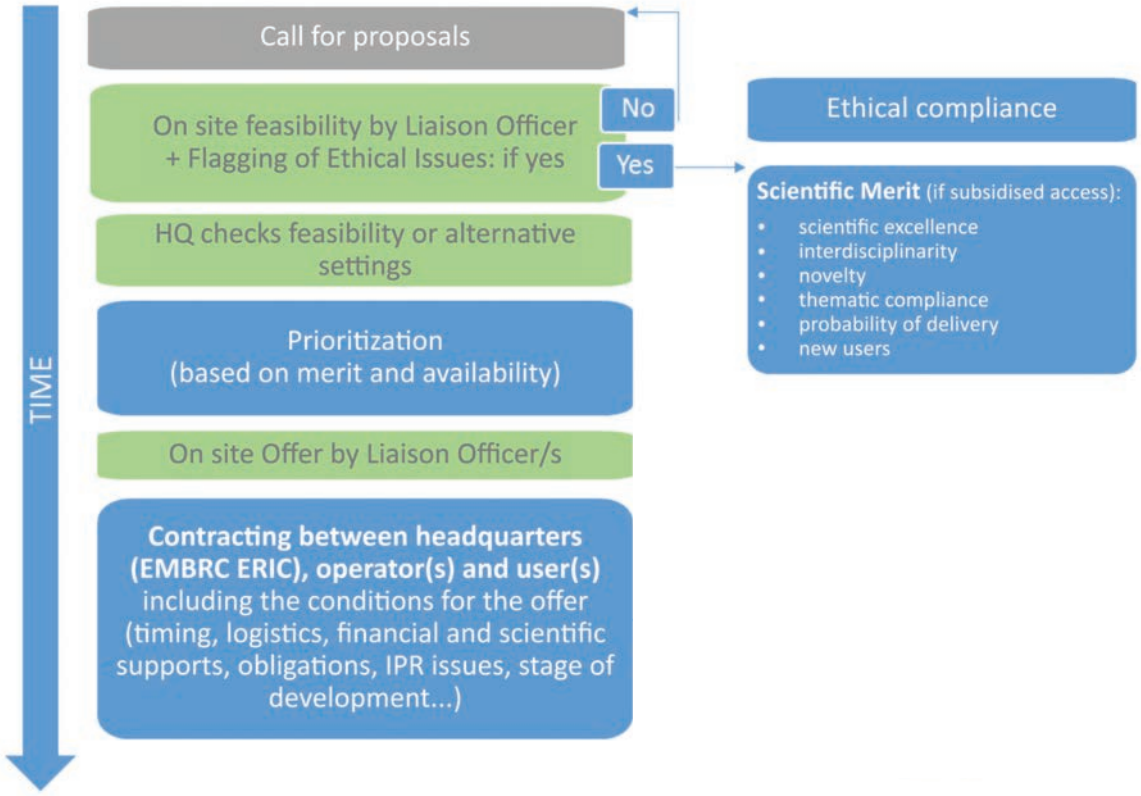


Figure 6. Procedure for service-access based on EMBRC-ERIC financial subsidies.

Billing and pricing policy

The Operators will determine the price of their service offer, based on a Full Economic Cost (FEC) model, determining the access price, including costs for consumables, personnel, use of the facilities, expert advice and training. The units for on-site access to platforms, research and logistical services, experimental facilities and laboratory space (and associated assistance by expert staff) will be per-person-per-unit time (typically day or half-day). Remote access to biological resources and analytical services will be per-item (e.g. microbial strain, whole organism for multicellular organisms, samples for analyses).

Once the service provision terms are agreed, service agreements will be formalised between the end user and the operators providing the services. EMBRC-ERIC Headquarters will play a coordination role in the service contracting and billing process, and in monitoring the service provision. EMBRC-ERIC can also act as the billing agent on behalf of the Nodes, where required (e.g.: complex projects involving many operators).

User request-processing workflow

The work flow of EMBRC-ERIC will enable the circulation of information top-down from User requests to the Nodes, and bottom-up with service offers and pricing from the Nodes to the Users, with EMBRC-ERIC HQ as the central hub collecting, analysing and sorting the information to the appropriate target (Fig. 7). Billing, invoicing, fees collections and redistribution will also follow the same centralized scheme. EMBRC-ERIC will adapt to users from all categories (public/private, members / non-members) and to complex typologies of requests, involving several Operators. EMBRC-ERIC HQ will also be able to monitor the different category of Users, service requests, and feedback, in order to continuously improve the variety and quality of their service offer, based on User needs.

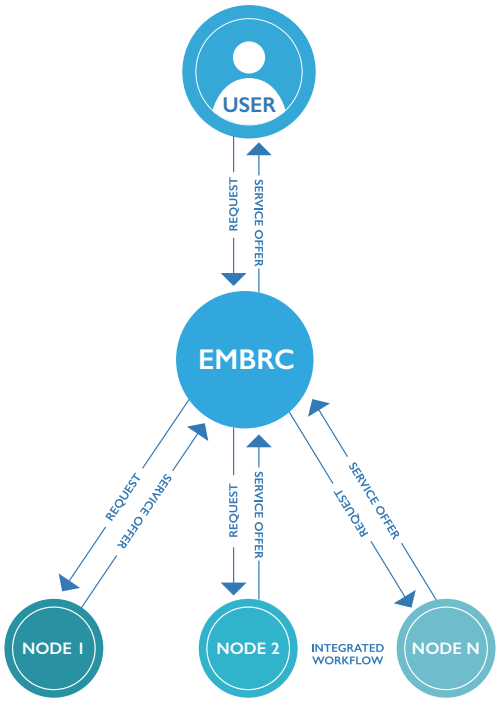


Figure 7. Diagram of flow between Users, EMBRC-ERIC HQ, Nodes and Operators for the provision of services.

2.11 Communications and Branding

Communication objectives

With a mission to establish a reference community around EMBRC-ERIC, composed of scientists, policy makers, industries, investors and general public, the overarching objectives of this communication plan are to:

- Increase EMBRC visibility;
- Support the establishment of the EMBRC prominence in marine biology and ecology research, as well as in support to marine policy, and RD&I activities;
- Advertise the EMBRC service offer and ultimately increase the number of users;
- Support the structuring of a reference community around EMBRC, including stakeholders and users from academia, industry and policy, and the general public;
- Strengthen the organizational effectiveness.

Branding

With reference to an EMBRC corporate identity (Fig. 8), the EMBRC Secretariat will use the corporate communication material models: presentations, e-mail signatures, header letters, business cards, etc., in order to ensure external legibility of the brand. The national Nodes will also adopt the prescribed national branding features in all instances of their representation of EMBRC, especially with regard to presentations and their web presence.

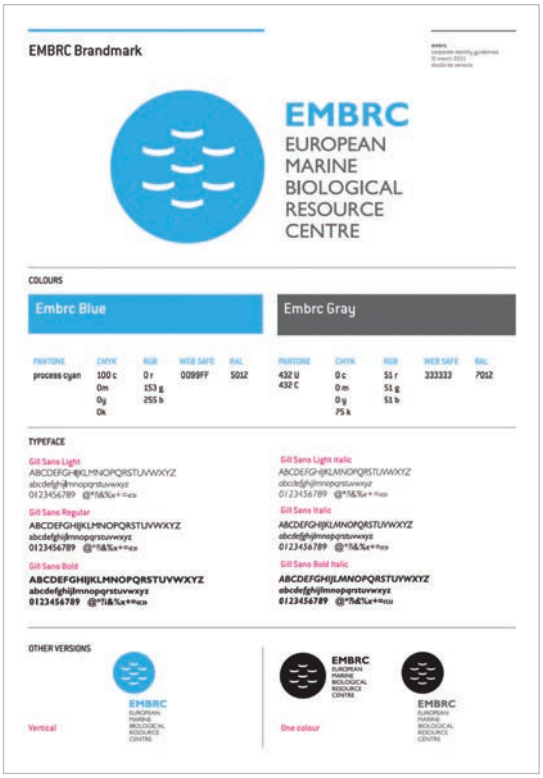


Figure 8. EMBRC corporate identity guide.

Reference community

Marine Biology, Ecology and their application are very transversal to the various domains of science and industry sectors. There will be a rather broad and varied community around EMBRC taking into account the complexity of the realm the EMBRC-ERIC can impact on. Nonetheless, EMBRC is currently included in the ESFRI WG for Food&Health, with a main remit in that domain, together with the other Biological&Medical Research Infrastructures, such as EU Open Screen, Infrafrontier, MIRRI, ECRIN, ELIXIR, etc..., and the life Sciences and Biotech communities in general. The Environment domain is also a reference, which collaborates with other RIs in the ENVRI Plus project and on many different projects related to marine ecology.

Table 7 - Communication target audience

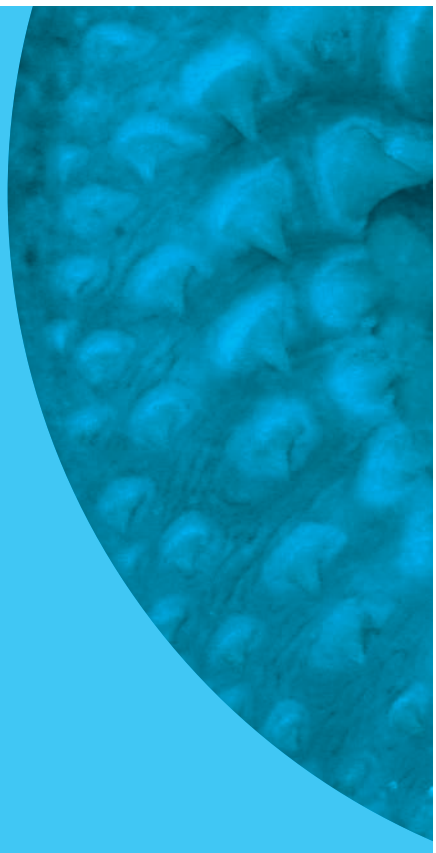
External	**Science & Technology** • EUROMARINE • ERC Scientific Community • MSCA Scientific Community • JPI • European Marine Board • Journals: Nature, Science • Cognate RIs in the Health & Food and Environment domains • Biotech and life sciences research community • Research centers & University networks (SULSA, Biogenouest, CONISMA, MASTS) • EU H2020 projects • KICs • Eurobiogoos • Students and Trainees • Local Communication Offices
	Policy • EU Commission: DG Research & Innovation • EU Commission: DG Research Infrastructures • EU Commission: DG Bioeconomy • EU Commission: DG Mare • CPMR • ERC Council • NCPs • Regional Agencies • MEP Intergroups - EU Parliament Intergroup Sea Rivers Islands Coastal Intergroup • Member States (Ministries, National Agencies)
	Industry • All the companies in the EMBRC regional innovation ecosystem • EU SMEs • Large companies and Multinationals with an interest in Marine Biotech - PharmaMar • Clusters/Competiveness Poles/ Industry associations - EFIB and IFIB - Bioindustry Association • Biomarine Business Convention
	Investors • Aquaspark • Blue Forward • Ocean Impact Alliance • European Investment Bank
	General public (includes younger students and trainees) • Specialised Magazines: National Geographic, The Economist, Renewable Matter • Newspapers with a column on the sea: The Guardian, Irish Times, Washington Post • Local press • Schools • Universities
	International Organisations and NGOs • International Oceanographic Commission (IOC) • Ocean Day Conference • Prince Albert II Foundation • Mission Blue
Internal	**General Assembly** **Committee of Nodes**
	Liaison Officers **Internal Scientific and Technical Community** **Secretariat**

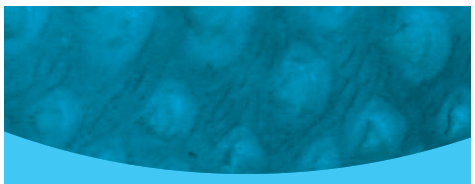
Table 8 - Communication tools

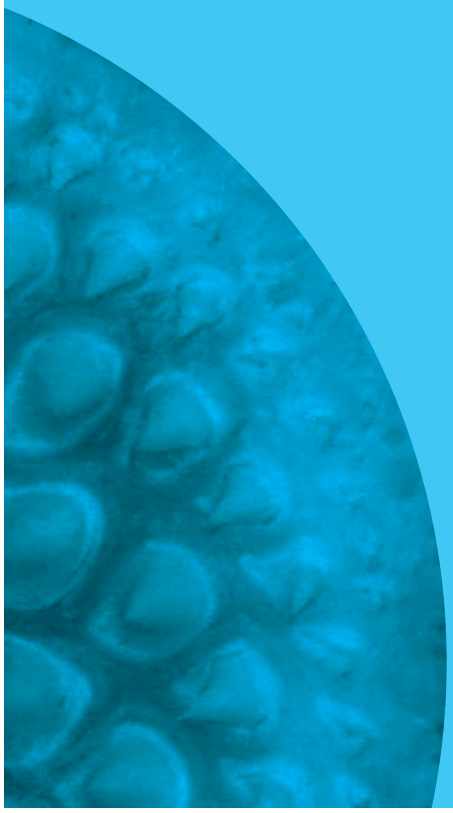
TOOL		Audience	Frequency
E-Tools	Website/ Access portal	External and Internal	On going
	Newsletter	External and Internal	Every months
	Social media	External and Internal	Daily
	E-flyer	External and Internal	In correspondence of events
	e-Calendar	Internal and External	Daily
	RSS feed	Internal and External	As required by User
Printed	Booklets	External	In correspondence of events
	Leaflet	External	In correspondence of events
	Poster	External and Internal	In correspondence of events
	Kakemono	External	In correspondence of events
	Gadgets_I	External	In correspondence of events
	Gadgets_II	Internal	In correspondence of events
	Video	External	Available on the website, updated
Physical	Science & Technology Gap Forum	External	Annual
	Scientific Conference	External and Internal	Every two years
	Other events	External	2 per year
	General Assembly	Internal	2-3 per year
	CoN	Internal	3-4 per year
	Working Groups	Internal	5 per year

3

EMBRC-ERIC Governance and Organisation







3.1 The EMBRC-ERIC Legal Entity

EMBRC-ERIC will be a European Research Infrastructure Consortium (ERIC). ERIC is a legal entity created under Union law and has a legal personality as from the date on which the Commission decision setting up the ERIC takes effect. Its legal personality and extensive legal capacity are recognised in all Member States without requiring transposition into national law or any national legal instrument. An ERIC must be recognised by its host country as an international body or organisation for the purpose of the directives on value added tax or excise duties; an ERIC may conclude agreements with other legal entities.

The legal framework for an ERIC has been designed to facilitate the establishment and operation of research infrastructures of European interest with the involvement of several European countries. Complementing national and inter-governmental schemes, the ERIC Regulation provides a common legal framework based on Article 1872 of the Treaty on the Functioning of the European Union (TFEU). An ERIC is a legal entity with legal personality and full legal capacity recognised in all EU Member States. Its basic internal structure is very flexible, leaving the members to define in the statutes, case by case, membership rights and obligations, the bodies of the ERIC and their competences. The liability of the ERIC's members will generally be limited to their respective contributions. An ERIC is recognised by the country hosting its seat as an international body or organisation for the purposes of the directives on value added tax (VAT) and excise duties. It also qualifies as international organisation for the purpose of the directive on public procurement. An ERIC may therefore, under certain limits and conditions, benefit from exemptions from VAT and excise duties on its purchases in all EU Member States and it may adopt procurement procedures respecting the principles of transparency, non-discrimination and competition but not subject to the directive on public procurement as implemented in national law. The ERIC framework has been developed primarily for new research infrastructures but it can also be used for existing infrastructures if these, exceptionally, consider it to be useful to change their legal status and to become an ERIC. It should be noted that the ERIC is a legal tool which is appropriate only for high-profile research infrastructures with a European dimension.

3.2 The Host Country

The EMBRC-ERIC Host country is France. The EMBRC headquarters are hosted by the University Pierre and Marie Curie Paris VI. The office is housed by UPMC in the newly-renovated Jussieu campus by the Seine river, in the very heart of Paris and of the Sorbonne Universités community of universities and high education schools. The office has organic institutional links to the French leading institutions in the field of marine and biological sciences (UPMC, CNRS, Ifremer, IRD, MNHN, etc.), and is located nearby the French ministries for higher education and research, industry, ecology.

3.3 Full Members and Observers

Table 9 - Full Members list

Founding Partners	
The French Republic (Host Country)	National Center of Scientific Research and University Pierre and Marie Curie : Station Biologique de Roscoff; Observatoire Océanologique de Villefranche sur mer; Observatoire Océanologique de Banyuls sur mer
The Hellenic Republic	Hellenic Centre for Marine Research
The Italian Republic	Stazione Zoologica Anton Dohrn, CNR, Conisma, OGS
The Kingdom of Norway	UNI Research A/S
The Portuguese Republic	Centro de Ciencias do Mar do Algarve
The United Kingdom of Great Britain and Northern Ireland	The Scottish Association for Marine Science. The University Court of the University of St. Andrews: Scottish Oceans Institute. Marine Biological Association of the United Kingdom
The Kingdom of Belgium	Ghent University. Vlaams Instituut voor de Zee (VLIZ): Ostend Marine Station. University of Hasselt. Royal Belgian Institute of Natural Sciences.
The State of Israel	Interuniversity Institute for Marine Sciences in Eilat
The Kingdom of Spain	University of Vigo - Estación de Ciencias Mariñas de Toralla; University of the Basque Country - Research Centre for Experimental Marine Biology and Biotechnology "Plentziako Itsas Estazioa"

3.4 The EMBRC-ERIC Tasks and Activities

Management, promotion and marketing

Marketing of EMBRC-ERIC to make it well known among policy makers, funders and users is of critical importance to ensure EMBRC-ERIC success.

The EMBRC-ERIC Secretariat will be responsible for managing the development and marketing of the EMBRC-ERIC brand. It will coordinate and execute networking activities to promote EMBRC-ERIC with appropriate tools, including the design and maintenance of the EMBRC-ERIC webpage as the central entry point to information about and access to EMBRC-ERIC.

The EMBRC-ERIC Secretariat will maintain a dialogue with stakeholders (users, funding agencies) and will be the reference point for communication with supranational organisations including the European Union and for establishment of cooperation agreements.

Joint Development Activities for new enabling technologies

EMBRC-ERIC will strive to constantly improve the quality and range of its services in support of excellent science. This will be achieved via a coordinated, long-term development programme involving collaboration among all EMBRC-ERIC partners and user groups, including industry.

Joint Development Activities (JDAs) will lead to the implementation of methodologies, protocols, new enabling technologies and interoperability standards, which will be adopted throughout EMBRC, with the objective of developing a top-level, world-class infrastructure, continually raising the quality of the research output. Overarching principles guiding the R&D programme will include protection of the environment (e.g. reduction of pressure on wild stocks by ex situ cultivation; biological security including disease control, quarantine and strict containment of biohazards including genetically modified organisms; standards for energy usage and waste water treatment), ethics and welfare considerations for the use of animals, and health and safety of EMBRC-ERIC personnel and users.

The JDA programme will focus on improving existing services and on developing new services in response to changing scientific and biotechnological research priorities and emerging societal challenges. This will be achieved via a coordinated, long-term R&D programme designed to achieve the following objectives:

1. Achieve the next high-priority **technological and methodological breakthroughs for collection, long-term *ex situ* maintenance and transport of live unicellular and multicellular marine organisms and for development of culture facilities** capable of better simulating natural environments.
2. Create **genetic resources such as mutant collections and transgenic lines** for flagship eukaryotic and prokaryotic model organisms.
3. Adapt and develop **'omics and imaging methods for high throughput environmental biodiversity studies** and functional exploration of key marine models in the tree of life.
4. Develop **new models with high biological or ecological relevance** (e.g. representing key functions in the ecosystem) along with the tools needed for advanced research including permanent cultures of ecotypes and inbred lines, full genome sequence information, genetic tools for functional genomics, pipelines for phenotypic characterisation, and a database providing access to relevant genetic and ecological data.
5. Develop **bio-acoustic imaging technology** for plankton-sized organisms to cetaceans. Drive the technology development of novel sensors, data tags and communications systems for monitoring organismal function and the environment.
6. Develop the **e-infrastructure** component of EMBRC, which will be critical both as a means of managing the resources and as a major tool **to facilitate exploitation of the resources**.

Knowledge transfer to industry and policy makers

EMBRC-ERIC will be included in a platform for knowledge transfer that can reach out to scientists as well as to government and industry. The method for knowledge transfer will follow that developed by several EMBRC-ERIC partners in the CSA Marine Genomics for Users (MG4U). This tool will allow users to find exactly what is relevant to their innovation strategy. In relation to the promotion of EMBRC-ERIC, other dissemination media will be developed, including attendance at specialised business conventions. This activity, led by the EMBRC-ERIC Secretariat, will markedly increase EMBRC-ERIC economic impact.

Access clearance to marine biodiversity

EMBRC-ERIC will be at the forefront of the use of marine biodiversity for research and development purposes. It will strive to give full access and supply marine biological material to users whether this material is available and/or has been collected within the European Union country sovereignty or outside EU territories (foreign providing countries, the High Seas). However, access to marine biodiversity and the use and supply of it are ruled by

legally binding texts within complex international, European and national legal frameworks, such as the United Nations Convention on the Law of the Sea (UNCLOS), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the European Marine Strategy Framework Directive, the Convention on Biological Diversity (CBD) and its Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from Their Utilization. Therefore, EMBRC-ERIC must undertake to provide full legal clearance for access to biological material, including genetic material, whether freshly collected on-site, cultured, or available in its collections. To do so, the EMBRC-ERIC Secretariat will, with the input of the Ethical Board, provide the following services:

- It will analyse EMBRC-ERIC collections and standardise associated procedures (from biological material-transfer agreements to tracking systems) at the nodes following a protocol established by ASSEMBLE.
- It will establish, execute and update a risk assessment methodology and engage with marine station/node representatives to comply with a legal/fair and equitable acquisition of the material and manage the benefit-sharing principle.
- It will provide users, national operators and marine station/nodes with training, best practices, guidelines and standards, together with model agreements to be adapted in the national legal frameworks, to help all of these comply with the various legal binding frameworks.
- It will establish and operate a monitoring and tracking system for the use of the bioresources to ensure the implementation of the benefit-sharing principle.

Education and training

One key task of marine research stations in Europe is to provide education and training via a range of marine biological sciences courses ranging from general marine biodiversity and ecology for Master`s students to specialised training courses for PhD students and research visitors (users). Marine stations are the ideal places to give such courses, since they provide direct access to marine ecosystems and biota, supporting infrastructure, scientific and technological expert personnel, and teaching and training expertise.

EMBRC-ERIC will establish and operate a service dedicated to the organisation of EMBRC-ERIC education and training courses at the Nodes as well as to related activities such as promotion, updating and monitoring of these courses. This EMBRC-ERIC training infrastructure will support the development of tomorrow`s marine and blue biotechnology professionals.

The service will specifically:

- Group and advertise marine training initiatives in a coherent and integrated way (EMBRC-ERIC training hub)
- Liaise with appropriate EC Erasmus programmes
- Attract and actively capture new training initiatives
- Offer a dedicated e-learning platform to facilitate e-training
- Offer a platform through which training grants can be advertised and promoted
- Allow long-term follow-up of training events and trainees

This service will maintain a web portal on training and education that will include a centralised information resource with searchable catalogues, targeted to people in search of training possibilities related to marine research. Calls will be distributed within the RI to solicit proposals for new courses and select on-going course programmes for incorporation in the EMBRC-ERIC training and education programme. Data on performance, effectiveness and impact of EMBRC-ERIC courses will be collected from participants in order to produce assessment reports. A quality control procedure will aid certification of the courses within European higher education curricula.

The EMBRC-ERIC training portal will be set up by the Belgian EMBRC-ERIC node (collaboration between Gent University and Flanders Marine Institute – VLIZ). They will establish a pan-European platform for education and training, helping European scientists, technicians and other stakeholders to navigate the vast realm of courses

related to marine sciences and blue biotechnology. The platform will be set up in a generic way so it can be easily connected with existing, complementary platforms.

Collaboration and interoperability with sister RIs, JPIs and ERA-NETs

EMBRC actively fosters links with cognate RIs, for example via the INFRADEV-4 cluster projects EMBRIC, ENVRI Plus, CORBEL. An EMBRC representative currently vice-chairs the BMS group of RIs, former Biomedbridges, providing coherence to the Health and Food RI structure. Through these mechanisms, EMBRC will foster interoperability and synergies to contribute to a comprehensive European RI service provision (Fig. 9). Examples include:

- Building pipeline services to allow users smart access to a chain of complementary services;
- Sharing procedures, databases and protocols will aid users and contribute to the interoperability and standardisation of data across the European RI landscape;
- Shared organisation of workshops, in particular on standardisation and shared best practice guidelines;
- Coordination of activities regarding knowledge and technology transfer;
- Shared organisation of brokerage events with industry, stakeholders and policy makers and other events for the promotion of ESFRI RIs;
- Harmonisation of access systems among ESFRI RIs to facilitate service provision for RI users.

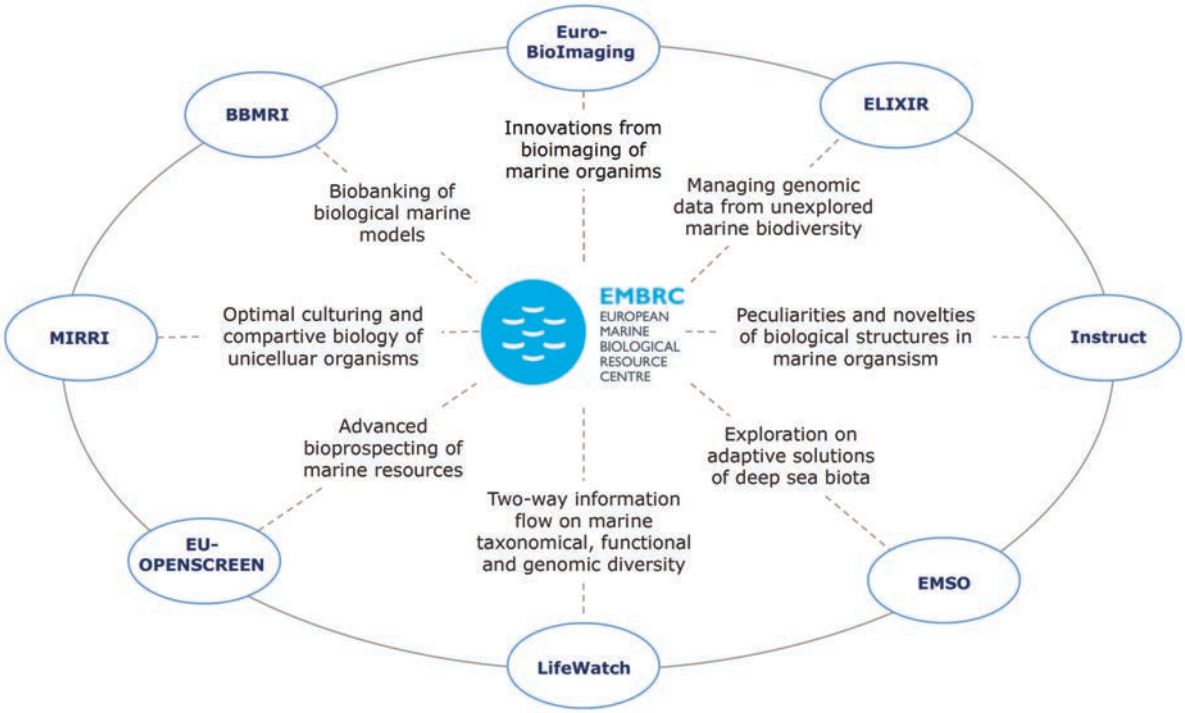


Figure 9. The strategic position of EMBRC-ERIC among other RIs. Some examples for strong complementarities and potential synergies with both BMS and ENV RIs are indicated.

Such developments involve plans for coordinated activities to promote EU RIs and the organisation of matching events with funders and policy makers (EU, JPIs, ERA-NETs), shared knowledge and technological development and dissemination, as well as shared training of technical and administrative RI staff.

3.5 Governance and Governing Bodies

General Assembly

EMBRC-ERIC will be governed by the General Assembly, which comprises two representatives (one representative from the administration, one scientist) of each EMBRC member. The General Assembly has decision-making power related to the EMBRC strategy, governance and scientific development.

EMBRC-ERIC Executive Director

The EMBRC-ERIC Executive Director is the chief executive officer and legal representative of the EMBRC-ERIC. The Executive Director is appointed by the General Assembly and will have full autonomy and independence within the framework provided by the EMBRC-ERIC Statutes. The EMBRC-ERIC Director will head the EMBRC-ERIC Secretariat and appoint its staff.

Subsidiary Bodies

Subsidiary bodies can be established to support the GA's work. The EMBRC-ERIC statutes envisage the establishment of a Science and Innovation Advisory Board, and an Ethical Board.

The Science and Innovation Advisory Board will be composed of experts from academia and industrial sectors, elected by the General Assembly. Its function is to advise the General Assembly for strategic planning.

The Ethical Board will be designated to monitor research involving marine organisms, in view of the risks involved with their use and exploitation. The Ethical Board will be an independent group of experts who will deal with relevant ethical issues within EMBRC-ERIC, in accordance with the highest scientific standards and all European and national regulations related to biological resources.

Corporate Functional Organisation

The operation of EMBRC-ERIC relies on the EMBRC-ERIC Secretariat for general management and administration. It will be the central point for communication, dialogue with stakeholders (users, funding agencies) and international promotion of the infrastructure. The Secretariat will organise all governance and management meetings and will be in control of the user access system including handling of user applications and evaluations, coordination of access provision, and related legal and financial aspects. The Secretariat will also coordinate all networking activities and will be responsible for quality assurance and risk management of EMBRC-ERIC activities.

The EMBRC-ERIC Secretariat will have different staff in the implementation phase and in the operational phase. In the Implementation Phase, the Secretariat will consist of an administrative assistant, a Project manager, an EU project Officer, a Legal Officer, and a GA secretary. In the operational phase, the Secretariat will additionally comprise a Financial Manager, an Access Programme Administrator, and a Scientific and Technical Communication Officer.

Another important role in the EMBRC-ERIC operation will be filled by the EMBRC-ERIC Liaison Officers, which will provide the practical link between the central hub (Executive Director and Secretariat) and the Nodes. One Liaison Officer will be positioned at each Node and will work in close collaboration with the EMBRC-ERIC HQ and the marine stations/laboratory directors, under the responsibility of the national Operators.

The EMBRC-ERIC Committee of Nodes comprises the EMBRC-ERIC Director, as Chair, and the Directors of the National Nodes. It will ensure an effective link between the EMBRC central hub and the nodes. The Committee of Nodes will ensure that the decisions made at the GA level are implemented at the nodes and will also provide advice on upgrades, needs and technical issues.

The Committee of Nodes together with the Executive Director, the EMBRC-ERIC Secretariat, the EMBRC-ERIC Liaison Officers and the Local Access Officers will all be part of the Corporate Functional Organisation of EMBRC-ERIC. The EMBRC-ERIC Corporate Functional Organisation will function as the operative structure of EMBRC-ERIC to administrate all services and activities provided by EMBRC-ERIC, implementing the General Assembly decisions within the operational level, with clear lines of communication, in a timely and cost-effective manner.

Figure 10 presents the governance of EMBRC-ERIC.

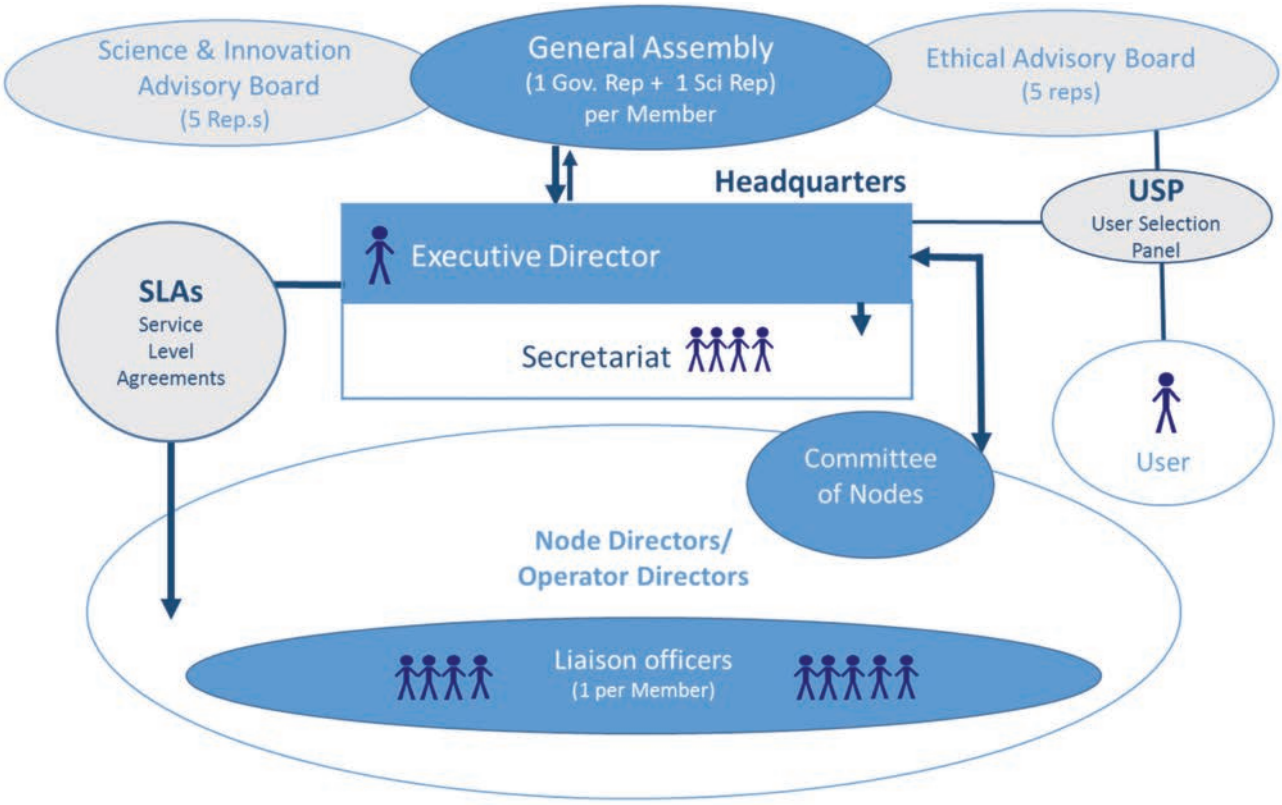


Figure 10. Governance of EMBRC-ERIC.

The EMBRC-ERIC governance structure is designed to provide autonomy to the Executive Level in strategic decision-making, priority setting and service provision. The structure creates effective links between the different levels of the RI via a corporate functional organization, actioned through legally binding Service Level Agreements between HQ and Nodes (or Operators) for the smooth running of daily operations. The EMBRC governance structure relies on the internal organisation and administration of the marine stations and labs, which retain their autonomy over the activities outside the interest of EMBRC-ERIC.

3.6 The Interim Central Management Office for the EMBRC-ERIC

The EMBRC Headquarter is currently hosted at the UPMC, Place Jussieu 4, Paris VI, since 01 September 2015. Until the ERIC is granted, the ED manages the Interim HQ and the EMBRC operations under the administrative responsibility of UPMC, which is also the recipient of EMBRC-project funding and Membership Contributions.

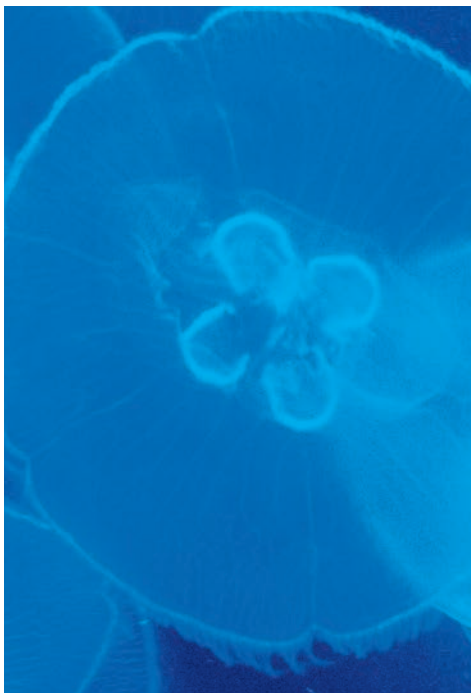
3.7 The Transition Phase from Interim Office to EMBRC-ERIC HQ

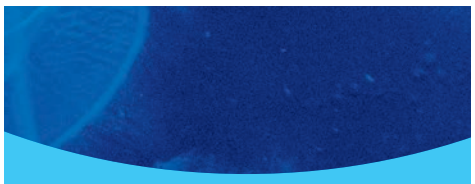
As soon as ERIC status is granted, the ED will register the EMBRC-ERIC as an international organization operating from France. From the previous experience of other ERICs, EMBRC-ERIC shall be registered as a not for profit organization operating under French commercial law.

All the assets that UPMC was holding and administering on behalf of EMBRC-ERIC until that moment shall be transferred to EMBRC-ERIC, to be administered by the Secretariat, under the responsibility of the Executive Director. The transfer of assets will be negotiated with the Host so that it can effectively enter into force at the onset of the Operational Phase.

4

Management and Human Resources





4.1 The HQ Management

The General Assembly (GA) appoints the Executive Director, who is the executive body and legal representative of EMBRC-ERIC. The Executive Director manages the Headquarters with the support of the Secretariat, under her-his direct responsibility. The EMBRC Organigram (Fig. 11) describes the elements and human resources, as well as their functional relationships.

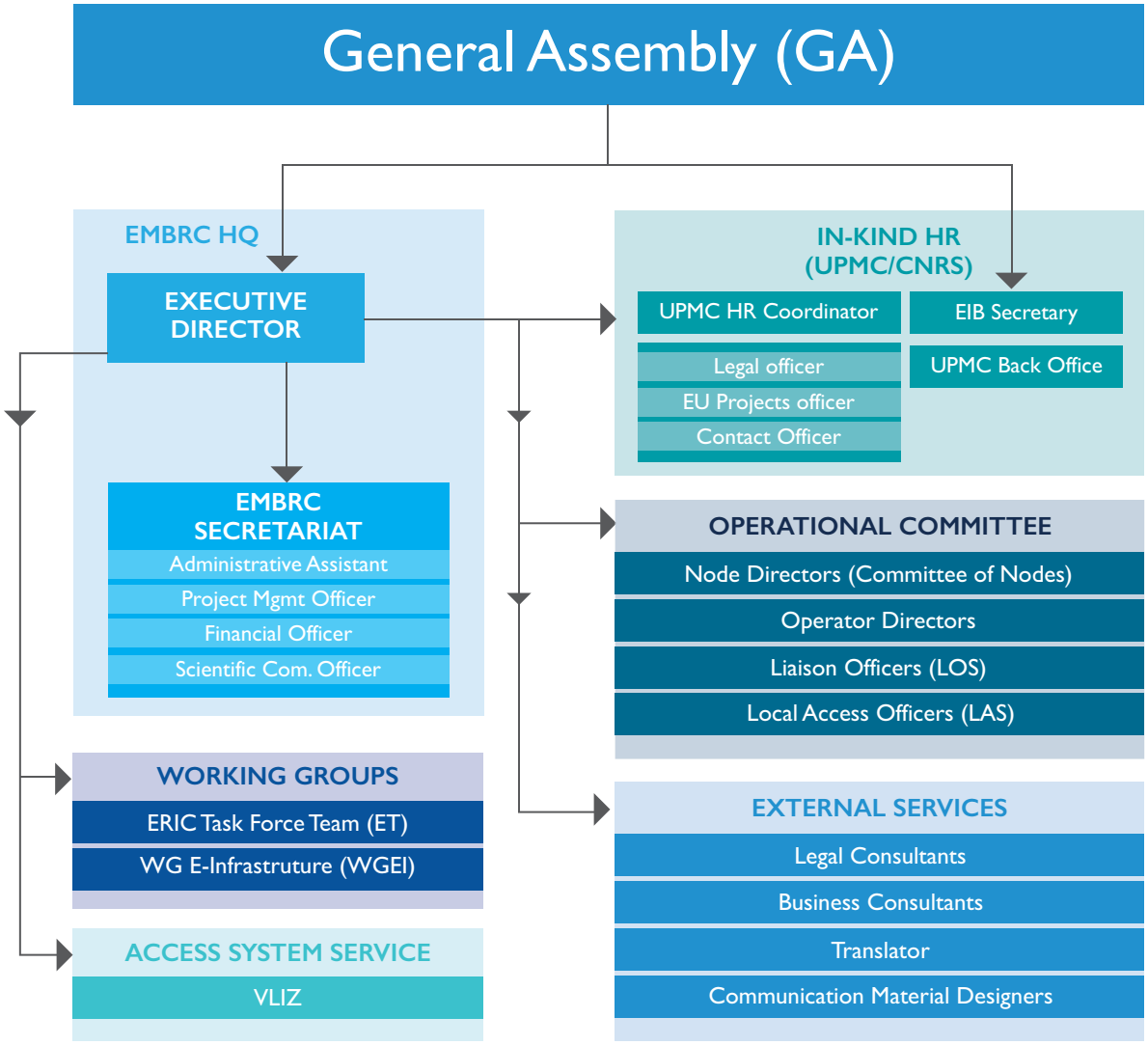


Figure 11. EMBRC-ERIC Organigram.

The personnel directly employed by EMBRC-ERIC are represented in the Headquarters, with the Executive Director (ED) and the Secretariat. On the upper right hand side, the box "in-kind HR by UPMC/CNRS" shows the UPMC personnel also contributing to the activity of the EMBRC Secretariat. Other elements are shown, which enable the operability of the EMBRC, through the Headquarters' central coordination activity.

4.2 Financial Management and Control Systems

The HQ will handle the budget to support the deployment of EMBRC activities and its administrative support function. During the last quarter of each year, the ED presents an annual work plan and associated budget for approval by the GA. The ED also prepares a 5-year outlook report, every three years, to orient the development of EMBRC and secure the appropriate budget. The Financial Officer will maintain and prepare financial accounts for periodic review by the GA, and for tax purposes, including annual auditing. Accounts will be audited on an annual basis by an external auditor and certified for compliance. The payroll services will be outsourced.

To set up the financial function of the HQ, the following must be done:

- Set up bank accounts - An interest-bearing account will be opened to receive contributions from the Members and Observers and pay for operating expenses.
- Appoint signatories on the bank account - To release funds there should be a requirement for the signature of the Executive Director, or at least two signatures from three appointed signatories on the account.
- Establish Financial Agreements for the transfer of funding from Members to EMBRC.
- The ED will be empowered to sign legally binding contracts and agreements on behalf of the EMBRC-ERIC, with third parties.
- Examine taxation issues & liabilities - The tax status of the HQ during the interim phase before the EMBRC-ERIC is incorporated in law will be defined by the tax status of the Host organization: UPMC. However, payment terms and conditions need to be drawn up to take account of EMBRC-ERIC Statutes for the later phase. If the HQ purchases equipment or services on behalf of the EMBRC-ERIC VAT exemption shall apply to non-economic activities, not to economic activities. VAT exemption will be applied for the scientific, technical and administrative operations in line with the objectives of the EMBRC-ERIC. This also includes housing expenses for official use of the EMBRC-ERIC, expenses for conferences, workshops and meetings directly linked to the official activities of the EMBRC-ERIC. However, purchases below €250 and/or travel and accommodation expenses will not be covered by the VAT exemption. The HQ will need to confirm appropriate VAT status with local tax authorities from the outset. Payment and contract terms issued by the HQ need to reflect the limited liability of members.

4.3 Employment Regulations

EMBRC-ERIC will be an equal opportunity employer. Employment contracts will follow national laws and regulations of the country in which staff are employed.

4.4 Gender Balance

EMBRC refers to an equal opportunities plan developed in the preparatory phase. EMBRC-ERIC, as an organization and employer, actively promotes equal opportunities and value diversity. It believes that the only way to achieve scientific excellence is by considering every person on merit, ability, competency, and qualification. EMBRC promotes respect, dignity and fair treatment for all and will not tolerate discrimination, any kind of harassment, victimization, violence and abuse of power. EMBRC does not tolerate discrimination or harassment on the grounds of age, disability, ethnic or national origin, religion or belief, gender, sex, and sexual orientation. EMBRC strives for a balanced representation of females and males as students, technical and academic staff, researchers, funding beneficiaries and board members. Female candidates will be promoted for all new positions established or funded by EMBRC/EMBRC-ERIC. 45% of applicants for the Executive Director position were female, and the established Executive Director is female.

4.5 Talent Attraction, Performance Management and Staff Training

In order to maintain excellent services and achieve our development objectives, EMBRC-ERIC will have a strong policy for capacity building and talent attraction, offering competitive career tracks, incentives for excellent researchers, leadership in EU projects, staff training, competitive salary and benefit packages.

Staff will adopt a Performance Management and Development System (PMDS) with indication of key activity areas, and associated objectives and tasks. The plan will also include the envisaged areas of development and training for each employee. The Executive Director will be in charge of reviewing the plan every six months, through direct interviews with the employees, and ensuring the progressive implementation of the work plan and

of the development path identified. The Core Budget will have a line for internal training which will be used to ensure the development of staff to the adequate level.

The Executive Director will report to the General Assembly as required and will also benefit from training/coaching sessions.

The EMBRC actively promotes the culture of staff-exchanges at both core and national node level as a means to cultivate excellence and best practices. Our staff are already benefiting from exchange activities promoted by projects, such as those offered by RiTrain, Corbel and ENVRIPLus. We will continue to encourage these activities and participate in their design and implementation.

4.6 Premises and Facilities

The HQ is housed by UPMC in the newly-renovated Jussieu campus, in the very heart of Paris. The EMBRC HQ team will have access to prestigious amenities and be part of a vibrant world-class research and cultural environment. The office will have organic institutional links to the French leading institutions in the field of marine and biological sciences (UPMC, CNRS, Ifremer, IRD, MNHN, etc.), and be located nearby the French ministries for higher education and research, industry, ecology.

The HQ facilities include 4 rooms, including a meeting room (total 60 m2), and access to larger, fully equipped (video & phone) conference rooms (estimated for 15 meetings a year, capacity up to 50 persons). Overhead costs for 5-6 persons will be covered (incl. heating, air conditioning, cleaning and maintenance). Support from the UPMC back offices (DGRTT, Communication, Finances, International relationship) is estimated to represent a total of 10 person-days per month.

EMBRC HQ will be able to rely on the administrative, financial and technical support services of the University. These include DGRTT, especially its European Affairs and Technology Transfer.

Offices, which feature specific skills useful to EMBRC HQ (see below).

- **Financial support**. EMBRC HQ will be able to rely on the back-office of the University's Direction of Financial Affairs and of the DGRTT for EU and industrial contracts.
- **Grant Office support**. UPMC's DGRTT is one of the most powerful research support systems available to a single institution in France and in Europe. Largely focused on obtaining, managing and optimising grants, it employs 80 people. This environment will be made available to the EMBRC HQ for grant preparation, negotiations with other partners, financial management, HR contracts and strategic planning, in relation with all EMBRC partners.
- **IT support**. EMBRC HQ will benefit from the support of the University's IT division, covering maintenance, development of new applications and day-to-day support for communications.

4.7 Business Practice and Responsibilities

The EMBRC HQ will operate to the business standards and in compliance with the EMBRC ERIC Statutes and Rules of Operation, in relation to budgetary principles, the keeping of accounts and annual financial audits. As enabled by the Regulations, the ERIC will establish its own procurement rules. A logical filing system in accordance with a quality standard such as ISO 9001 shall be set up.

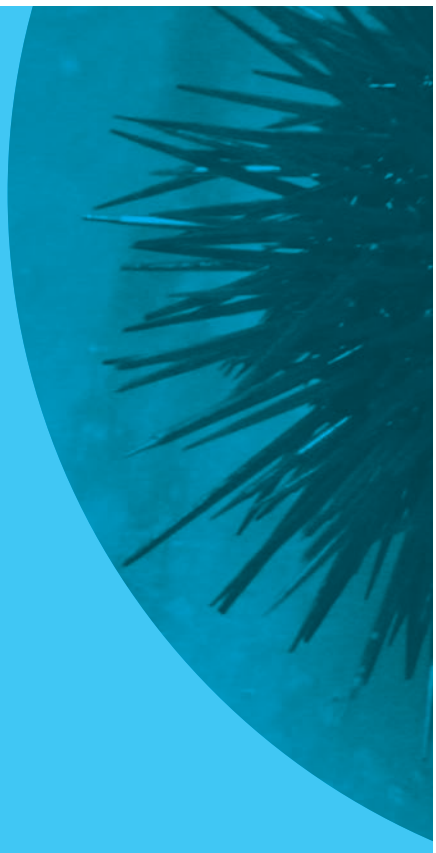
4.8 Insurance and Liability

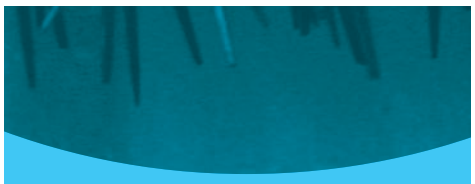
As per standard business practices, the EMBRC-ERIC will be covered by general Liability Insurance. This policy provides both defence and damages of the EMBRC-ERIC premises, employees, products or services cause or are alleged to have caused Bodily Injury or Property Damage to a third party, including visitors. In other words: This coverage protects the business against liability claims, negligence, manufacturing or personnel error, bodily injury, or even property damage. EMBRC HQ premises, including office equipment, computers, inventory or tools, will also need to be appropriately insured for risks related to accidents (fire, flooding, theft, vandalism, smoke damage…).

Liabilities for operations at the Nodes will be covered by **the insurance policies of the Operators**, which will be referred to in the SLAs and each user contract.

5

Financial and Funding Framework





5.1 General Assumptions

Funding for the operation and development of EMBRC-ERIC will come from a variety of sources (Table 10) including contributions by Members and Observers, financial contributions by regions/states, national and European project grants, service fees, industry partnerships and other sources.

The EMBRC-ERIC operations at the Headquarters will be ensured by the Members' commitment, to contribute to the **Core Budget** during renewable 5-year periods or budgetary cycles. .This provides the EMBRC-ERIC with medium-term funding continuity to support the operations planned for each budgetary cycle. A significant Host Premium, partly in cash and partly in-kind, is also an important dimension of the Core Budget.

France, the EMBRC Host country has maintained a strong commitment towards the EMBRC since its conception, with its continuous financial commitment starting in 2015, which, along with the growing contributions by all the Members since 2016, have allowed for the realization of an operational organization well in advance of the formal establishment of the ERIC.

It should also be noted that while the EMBRC-ERIC budget is growing through time, the RI has adopted a criterion for the smoothing of the contributions over the period 2017-2022, realizing a **budget frontloading, starting already during the Implementation Phase**. These procedures were agreed to: i) to ensure a solid preparation of the operational phase; and ii) to start accumulating a contingency budget during the Implementation Phase.

While EMBRC-ERIC will rely on the Core Budget to ensure the basic governance and operation of the infrastructure, it will draw from the EU research Framework Programmes for its development.

Although separate from the core budget, the EU funding attracted by the Consortium are accounted for in the EMBRC total budget (table 10).

The size of the EMBRC-ERIC operation further includes the national and regional funding attracted by the Nodes for the EMBRC infrastructure development and maintenance. These funds are managed directly by the Nodes.

5.2 Member and Host Country Contributions

During the Operational Phase, the following conditions will apply:

Host country

France, as the host country to EMBRC-ERIC, provides a fixed Host Premium as part of the **Core Budget**, including partly monetary and partly in-kind contributions, covering a portion of the Secretariat's staff capacity, office space and related overheads, as well as administrative, financial, legal and IT support costs.

All Members

All Members, including the Host Country, contribute financially to the **Core Budget** with a sum calculated according to a membership formula (below), based on 60% flat rate contribution, 20% GDP-Based contribution; 20% GDP-per-capita based contribution. Monetary Contributions are the preferred type of contribution; in-kind contributions can be accepted, subject to General Assembly approval.

Observers

Observers shall participate to the Core Budget upon a monetary contribution of 50% of the fees, which they would contribute as a full Member, according to the membership formula.

Monetary contributions

Member Annual Monetary Contributions are calculated based on a mixed flat-rate/GDP-based/GDP per capita-based model. The following formula is used:

$$Membership(i) = \frac{\alpha}{N}T + (\beta)\frac{GDP(i)}{\sum_{i=1}^{n} GDP(i)}T + (\Upsilon)\frac{GDP/Capita(i)}{\sum_{i=1}^{n} GDP/capita(i)}T$$

Where:

α: % of flat rate (60%)

β: % of GDP-based rate (20%)

Υ: % of GDP/Capita-based rate (20%)

N: number of EMBRC ERIC members

T: Total Budget minus Host Premium cash contribution

In-kind contributions

The Members may provide the use of some of their resources for the functioning of EMBRC-ERIC. Three types of in-kind contributions are foreseen:

- **Mandatory in-kind contributions**: As a general rule, participation in governance activities is mandatory for all Members. These contributions (staff time, travel money and other resources related to participation in EMBRC governance activities) will not be deductible from one country´s annual monetary contributions.
- **Voluntary in-kind contributions**: Participation in EMBRC-ERIC working groups, project proposal writing and similar exercises will be on a voluntary basis, as per a request by the Headquarters. These contributions (staff time, travel money and other resources related to participation in EMBRC governance activities) will not be deductible from one country´s annual monetary contributions.
- **Requested in-kind contributions**: these relate to staff time, expertise, hardware and/or software use and/or other resources requested by the Headquarters to one or various members to satisfy EMBRC-ERIC needs, which would otherwise be sourced externally. The value of these in-kind Contributions shall be calculated, agreed upon and eventually deducted from those Members Monetary Contributions.

5.3 Income and Revenue

The EMBRC-ERIC will receive several sources of income that will contribute to fund different levels of the organization. With reference to Table 10, below, the EMBRC total income can be categorized as follows:

1. **Core budget**: This is constituted by: a) The Host Premium; and: b) The Contributions by all Members of the Consortium (including the Host Country), and Observers, if present. This Core Budget serves the basic funding for EMBRC-ERIC operation, ensuring the continuous functioning of the EMBRC-ERIC Headquarters, including the continuous coordination with the Nodes;
2. **EU research and RD&I projects**: European research and R&D grants will provide additional funding for the development of specific EMBRC-ERIC activities and/or services, both at the Headquarters and at the nodes. EU projects have already been obtained for a total of 16.9 M€, and EMBRC-ERIC aims at a further five projects in the first years of Operation;
3. **National/regional research infrastructure funds** in support of the local development, typically mobilised by the national RI roadmaps and regional smart specialization strategies;
4. **National/regional research and RD&I project funds** in support of the regional research and RD&I ecosystem development, typically mobilised by local authorities and regional smart specialization strategies;
5. **Service fee**: Based on the service access generated during the trans-national access provision projects, the fully operational EMBRC-ERIC will provide access to an average of 300 users per year, 5-20% of which will come from industry and generate extra revenues. Provision of consultancy services and the exploitation of generated knowledge will contribute to cover the EMBRC-ERIC running costs, in the medium term. In table 10, the figures include TNA funds from EU projects (i.e.: Assemble Plus, EMBRIC, CORBEL);

6. The development objectives of EMBRC-ERIC will seek partnerships with **large industry and/or foundations**, in the medium term.

Table 10 - Estimated monetary income and revenues of EMBRC-ERIC

Type of funding (€ thousand)	START-UP PHASE			FULL REGIME		
	2017	2018	2019	2020	2021	2022
1a. (Core Revenue) Host Premium	560 000	560 000	560 000	560 000	560 000	560 000
1.b (Core Revenue) Yearly Monetary Contribution for full Members	569 735	638 317	638 317	638 317	638 317	638 317
2. EU research or R&D grants	2 282 048	2 724 653	3 184 522	3 040 374	2 947 595	3 016 227
3. National and Regional Infrastructure Running Funds	9 560 961	9 711 587	9 977 688	10 279 250	10 869 343	11 273 348
4. National research or R&D grants	2 798 583	3 938 703	4 698 088	4 153 089	4 001 437	4 014 050
5. Service Provision (including TNA)	1 200 492	1 392 062	1 674 602	1 772 765	1 656 760	1 533 561
6. Industry partnerships	519 866	520 027	482 234	478 099	541 518	571 118
7. Other Income	1 436 398	1 928 473	2 654 251	3 069 127	3 851 188	4 452 076
Total Incomes and Revenues	**18 928 083**	**21 413 823**	**23 869 702**	**23 991 020**	**25 066 157**	**26 058 697**

5.4 Costs

With reference to the Headquarters dimension only, and to the Core Budget expenditure, the costs to for EMBRC, reported in Table 11, include all the following items:

- Personnel costs;
- Operational costs, including: cost of office rental, IT costs, overheads and contingency budget (20% of operational budget)
- Costs related to travel and meetings;

- Costs for IT infrastructure;
- Costs for equipment and instruments;
- Costs of staff training and licences;
- Costs related to specialized service supply (e.g., legal, communication & marketing, IT, and other services);
- Promotional costs and other activity costs;

Table 12 details the planned staff efforts at the headquarters, in terms of Full Time Equivalence.

Table 11 - Cost configuration of HQ

Costs of EMBRC-ERIC (core office) (€ thousand)	START-UP PHASE			FULL REGIME		
	2017	2018	2019	2020	2021	2022
HR	367.995 €	310.394 €	410.920 €	494.373 €	494.373 €	494.373 €
External SERVICE	90.413 €	99.364 €	66.311 €	57.956 €	57.956 €	57.956 €
EMBRC ACTIVITIES (includes JDAs)	69.282 €	198.728 €	265.245 €	328.416 €	328.416 €	328.416 €
TRAVEL	69.282 €	86.943 €	77.363 €	67.615 €	67.615 €	67.615 €
OVERHEADS OFFICES	120.000 €	120.000 €	120.000 €	120.000 €	120.000 €	120.000 €
OPERATIONAL COSTS (inc contingency)	143.000 €	143.000 €	143.000 €	143.000 €	143.000 €	143.000 €
MEETINGS	66.312 €	78.249 €	71.837 €	60.854 €	60.854 €	60.854 €
PROMOTION	14.846 €	18.631 €	16.578 €	14.489 €	14.489 €	14.489 €
EQUIPMENT	14.846 €	18.631 €	16.578 €	14.489 €	14.489 €	14.489 €
TOTAL	**955.975 €**	**1.073.940 €**	**1.187.832 €**	**1.301.191 €**	**1.301.191 €**	**1.301.191 €**
Available Budget	**1.129.735 €**	**1.198.317 €**	**1.198.317 €**	**1.198.317 €**	**1.198.317 €**	**1.198.317 €**
Difference	**173.760 €**	**124.377 €**	**10.485 €**	**102.874 €**	**102.874 €**	**102.874 €**
Frontloaded Budget	**173.760 €**	**298.137 €**	**308.622 €**	**205.748 €**	**102.874 €**	**- €**

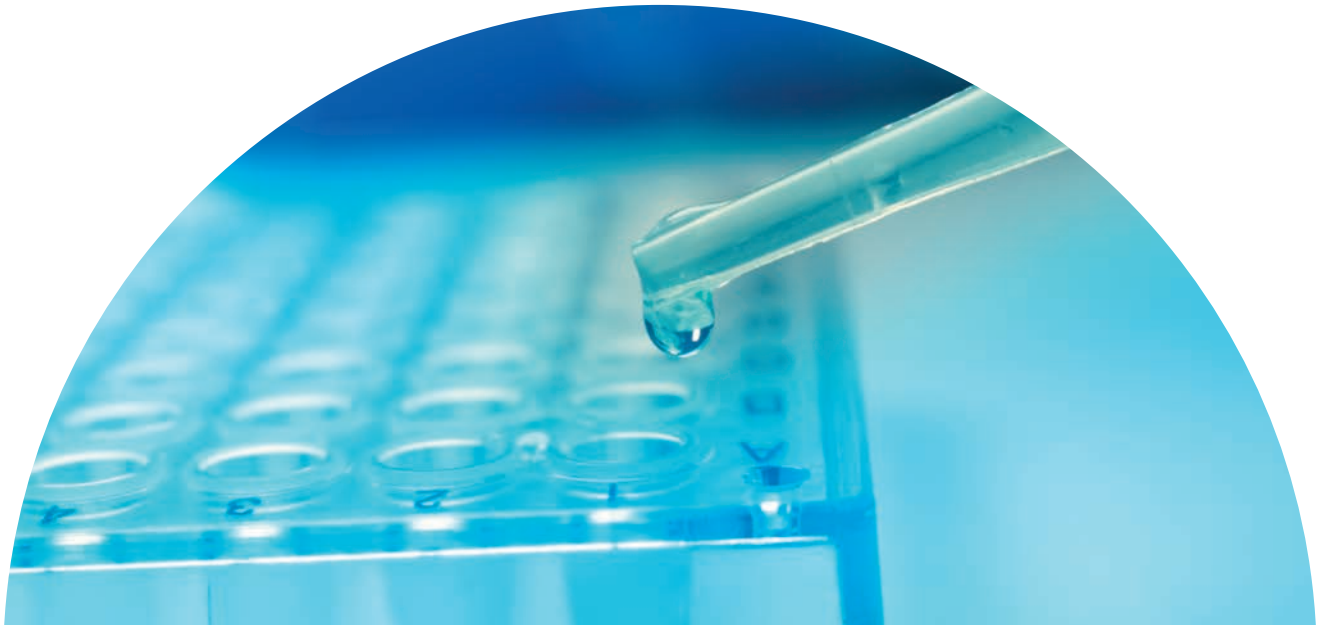


Table 12 - Staff effort years 1-6

COSTS OF EMBRC-ERIC (FTEs)	2017	2018	2019	2020	2021	2022	TOTAL
Executive Director	1	1	1	1	1	1	6
Secretary	1	1	1	1	1	1	6
GA Secretary	0.3	0.3	0.3	0.3	0.3	0.3	1.8
Financial and General Admin Officer	0.5	1	1	1	1	1	5.5
Communication Officer	0.5	0.5	1	1	1	1	5
Legal Officer	0.5	0.5	0.5	0.5	0.5	0.5	3
EU Officer	0.5	1	1	1	1	1	5.5
Project Management Officer	1	0.8	0	0	0	0	1.8
Access Officer	0.1	0.5	0.5	0.5	0.5	0.5	2.6
Total Number of FTEs at EMBRC-ERIC secretariat	5.4	6.6	6.3	6.3	6.3	6.3	37.2

5.5 Voluntary-Staff Cost for Regional Teams (Nodes)

EMBRC-ERIC has established a collaborative work environment where a number of persons contribute part of their time to achieve the EMBRC-ERIC objectives, such as in writing proposals, delivering reports, promoting or representing the RI in conferences and seminars, and participating in Working Groups. The EMBRC has quantified the support received and represented it in Table 13. As the Secretariat grows, the need for voluntary contribution will decrease, however it is envisaged that voluntary contributions by the members will continue. This mechanism strengthens the sense of community and fosters the EMBRC-ERIC identity in the Nodes, giving the opportunity to staff who are not filling a particular governance or operational position (EIB, CoN, Secretariat) to still be closely involved in the running of EMBRC-ERIC.

Table 13 - Voluntary staff cost by regional teams

Voluntary staff costs (€ thousand)	START-UP PHASE		FULL REGIME
	Y1-Y2	Y3	Y4-Y6
Regional Team (FTEs)	1.8	1.5	1.5
Yearly personnel costs	75000	75000	75000
Total	**135000**	**112500**	**112500**

5.6 Five-year Financial Plan

Already managing a substantial budget during the implemmetation phase, EMBRC-ERIC has received the politial and financial commitment from eight of the nine MoU signatories (Norway's decision will be pending until June 2017) to support EMBRC-ERIC for five years, between 2018 and 2022. While, for all intents and purposes, **2018 is referred to as the first year of the EMBRC-ERIC Operation**, and 2017 is considered as a Transition Year; Table 14, below, refers to a six-year planning period. It should be noted that the frontloading, creating a growing budgetary surplus during the transition and startup phase, is gradually absorbed in the full regime phase, allowing for the consolidation of the activities.

Table 14 - EMBRC-ERIC six-year financial plan

REVENUES-COSTS EMBRC-ERIC HQ (€)	START-UP PHASE			FULL REGIME		
	2017 (transition year)	2018	2019	2020	2021	2022
Core REVENUES	18 928 082.6	21 413 822.8	23 869 701.6	23 991 019.8	25 066 157.3	26 058 697.0
Core COSTS	18 754 322.6	21 289 445.8	23 859 216.6	24 093 893.8	25 169 031.3	26 161 571.0
REVENUES-COSTS	**173 760.0**	**124 377.0**	**10 485.0**	**-102 874.0**	**-102 874.0**	**-102 874.0**
Frontloaded Budget	**173 760.0**	**298 137.0**	**308 622.0**	**205 748.0**	**102 874.0**	**0.0**

5.7 Implementation Funding Requirements

Besides the Member's contribution to the Headquarters for running the coordination activities, the EMBRC investment plans comprise upgrades and new infrastructure at the National level, for almost €40M, during the period 2017-2022 (Tables 15, 16 and 18). Major investments are planned in aquaria and culture facilities, research vessels, imaging and microscopy facilities, molecular platforms, long-term monitoring efforts, e-infrastructure development and accommodation facilities (Figure 12). In addition, large-scale investments are planned in special facilities including a biodiversity and genomics observation platform, a bioacoustics test facility, and dedicated outreach facilities. In addition, operational and staff costs of €15M are expected for the same period.

Table 15 - Planned developments of the RI during the start-up phase

Location / Country	Description	In Operation / Planned
SPAIN	• Biosecurity labs	In Operation
	• Visitors labs	In Operation
	• 7,5 m inboard vessel	In Operation
	• New RHIB, zodiac	2017
	• Upgrade of mesocosms facilities	2017-2018
	• Temperature regulation incomming sea water, oxygen measurement…	2018
GREECE	• Construction of a new microbiology lab	In Operation
	• Upgrade of the infrastructure (genetic labs, aqualabs, eco-labs, diving equipment)	2017
	• Construction of a pilot net-pen cage farm and experimental aquaria	In Operation
ISRAEL	• Research Vessels	In Operation
	• New building and upgrade of facilities	In Operation
	• Equipment	In Operation
	• Special Facilities (includes aquaria)	In Operation
NORWAY	• New water supply facilities, new filter systems for salt water supply.	2018
	• Expansion or upgrade of existing facilities (like hatchery for sea lice, genotyping platform)	2018
PORTUGAL	• New building and upgrade of facilities	2018
	• Equipment (lab and marine)	2017-2018
	• Special Facilities (includes aquaria)	2017-2018
FRANCE	• Update of OMICS platforms	In Operation
	• Improvement of the facilities of the Biological Resource Centers and wet labs at Station Biologique de Banyuls sur Mer, Roscoff and VilleFranche sur Mer	In Operation
	• New sweater pumping, treatment, storage and distribution installations for securing the provision of sea water.	2018

Table 16 - Planned developments of the RI at full regime

Location / Country	Description	In Operation / Planned
SPAIN	• Upgrade of wet labs and administration building	2019-2020
GREECE	• Reconstruction of R/V Philia	2020
ITALY	• New vessel for R/D • Marine farm for the production of marine organisms and biotechnology hub for R/D • Equipment for the biotechnology hub and for the marine farm	2019 2019 2019
NORWAY	• Construction of Nematostella labs, fish reproduction facility, Calanus culture facility	2020

5.8 Financial Sustainability

The EMBRC-ERIC operations at the Headquarters will be ensured by the Members' commitment, to contribute to the **Core Budget** during renewable 5-year periods or budgetary cycles. This provides the EMBRC-ERIC with medium-term funding continuity to support the operations planned for each budgetary cycle. A significant Host Premium, partly in cash and partly in-kind, is also an important and fixed dimension of the Core Budget.

From the EIB discussions, all countries appear committed to fund the EMBRC-ERIC until 2022 (Table 17). Norway is the only country with an important decision still pending, which will make or break their possibility to join the EMBRC-ERIC as a founding Member. All other countries at the time of writing this document are in the process of preparing their support letters, or have already submitted them. The Final ERIC application is imminent.

Table 17 - Secured funding from EMBRC-ERIC partners with explanatory note

COUNTRY	Five-year Funding committment	Explanatory notes	Expected Participation In the EMBRC-ERIC
FRANCE	445.640	Contribution from France	Yes
BELGIUM	321.990	Contribution from Belgium	Yes
GREECE	262.615	Contribution from Greece	Yes
ISRAEL	299.340	Contribution from Israel	Yes
ITALY	393.935	Contribution from Italy	Yes
NORWAY	403.050	Contribution from Norway	Decision Pending, Until 30th of June 2017.
PORTUGAL	262960	Contribution from Portugal	Yes
SPAIN	341375	Contribution from Spain	Yes
UK	460680	Contribution from UK	Yes
SubTotal	**3.191.585**	**Sum of Members Contribution and Host Premium over a five year period.**	
Host Premium by France	2.800.000		
Total	**5.991.585**	**Sum of Members Contribution and Host Premium over a five year period.**	

All countries further receive or are expecting national and regional investments to support their Node Development, according to their National RI Roadmap or Smart Specialisation strategies. In Table 18 a summary is available of the investment projections at the Node level. From a comparison with the previous activity period, 2013-2017 (Fig. 12), it is evident how EMBRC-ERIC is increasing the infrastructure development investment. While the large majority of the investments are planned to be deployed between 2017 and 2020, it is reasonable to expect, based on the current experience, that the infrastructure funding streams will reach new heights during the full regime phase, to be at a similar level than those already confirmed for the first three years of operation. For example, some countries will only be able to draw funds towards their infrastructural needs once the ERIC is established.

Table 18 - Investment projections for EMBRC-ERIC regional Nodes (€)

COUNTRY	2018	2019	2020	2021	2022	Total
(BE) BELGIUM	450 000	450 000	200 000	200 000	200 000	1 500 000
(ES) SPAIN	535 000	800 000	1 760 000	650 000	470 000	4 215 000
(FR) FRANCE	1 417 015	1 400 000	750 000	350 000	350 000	4 267 015
(GR) GREECE	1 982 000	1 700 000	415 000	-	-	4 097 000
(IL) ISRAEL	-	-	-	-	-	-
(IT) ITALY	-	8 500 000	-	-	-	8 500 000
(NO) NORWAY	2 176 100	1 884 200	1 311 400	409 500	387 700	6 168 900
(PT) PORTUGAL	-	5 122 674	4 094 162	-	-	9 216 836
(UK) UNITED KINGDOM	107 540	655 680	653 480	153 480	103 480	1 673 660
TOTAL	6 667 655	20 512 554	9 184 042	1 762 980	1 511 180	39 638 410

Confirmed and expected investment in infrastructure development

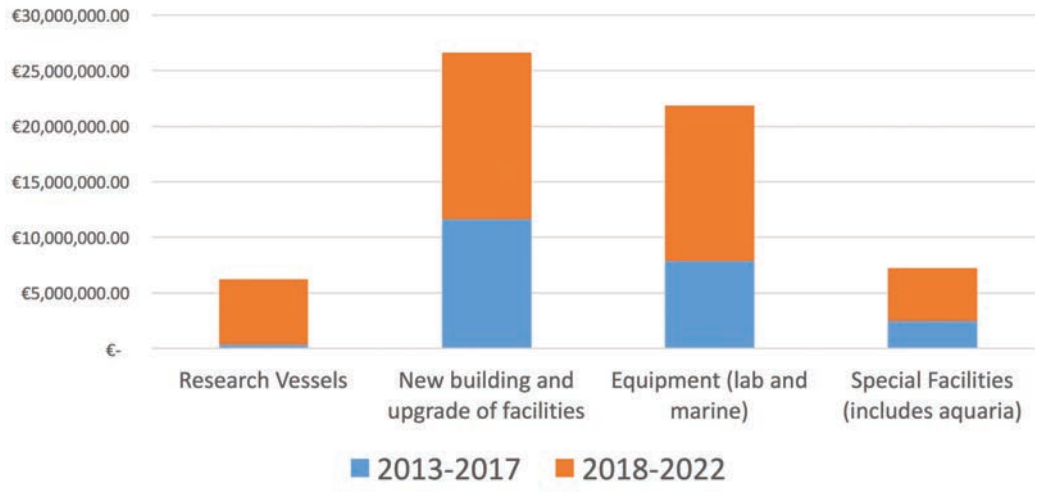
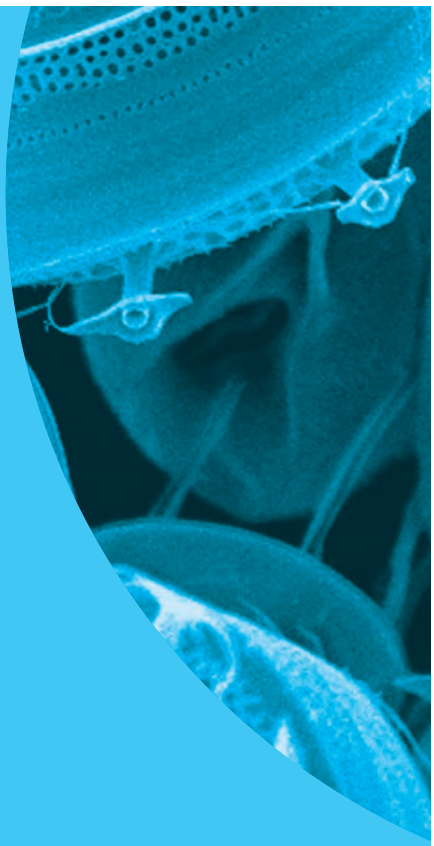
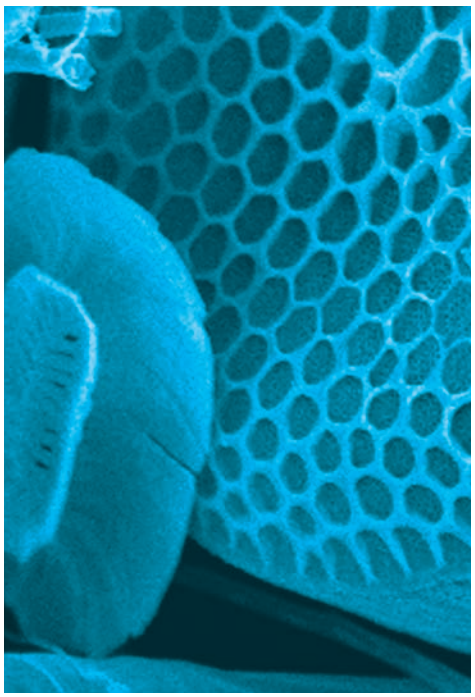


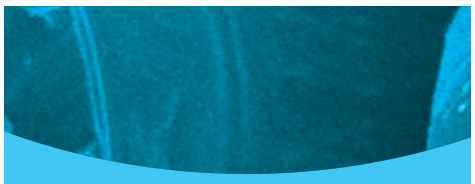
Figure 12. Comparison between the actual and planned investment in new infrastructure, at the Node Level, over two different periods: 2013-2017 and 2013-2022, with the latter being the sum of confirmed and expected investment.

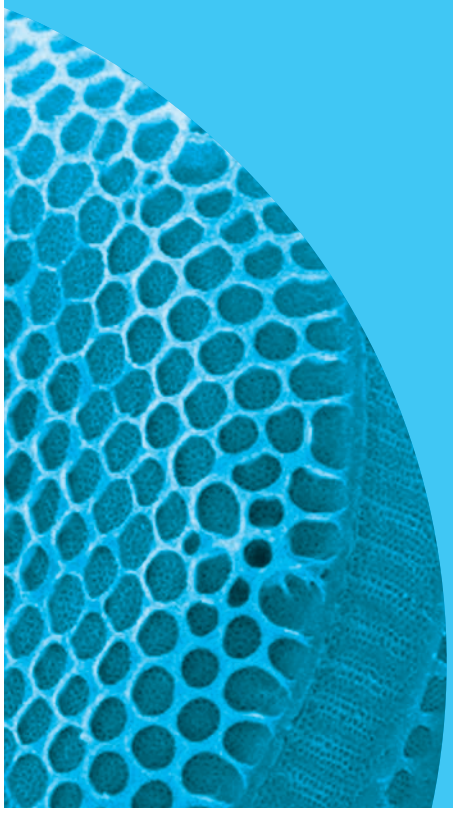
6

Implementation









Operational Priorities for the EMBRC Implementation Phase and forward look into the medium and long term

With reference to fig. 13, a summary description of the EMBRC-ERIC implementation timeline follows, below:

Short term 2016-2017 (Implementation Phase)

- Build attractive portfolio of services;
- Communication and Promotion Plan and Implementation;
- EU Funding or other forms of support;
- Information and Data Management Policy;
- Operational EMBRC portal;
- ERIC Status;
- ESFRI Landmark.

Medium term 2018-2020 (first three years of Operational Phase)

- Improving user access
  - Refinement of the Access System;
  - Clear Pricing policies based on agreed principles;
  - Common standard quality practices;
  - Improvement of service offer based on user feedback;
  - Integrated workflows of specialized services (EMBRIC);
- JDAs
  - New enabling technologies and methodologies developed by and with EMBRC core facilities (ASSEMBLE+);
  - Creating pipelines for natural products development targeting aquaculture needs, also in collaboration with sister RIs (EMBRIC model);
  - Structuring the Global Marine Genomic Observatory;
  - Building up the EMBRC e-infrastructure;
- Strengthen the connection with users from industry, academia and policy
  - Knowledge and Technology Gap Forum;
  - Knowledge and Technology transfer services;
- Foster co-development strategies with cognate RIs (WGEI, EMBRIC);
- To integrate EMBRC in the regional/national/European strategies for socio-economic development and RD&I by engaging with CPMR, as well as competent national and European agencies;
- Education and Training; internal staff training; and education as a service;

Long Term Objectives (2025)

- Position EMBRC as the reference Research infrastructure for accessing marine bioresources and related services, functionally integrated with other RIs, in the ESFRI landscape, with worldwide connections as well as a recognised presence at the regional level;
- A unique portfolio of research platforms, biological resources, analytical services and data;
- To sustain TNA programmes in the long term.

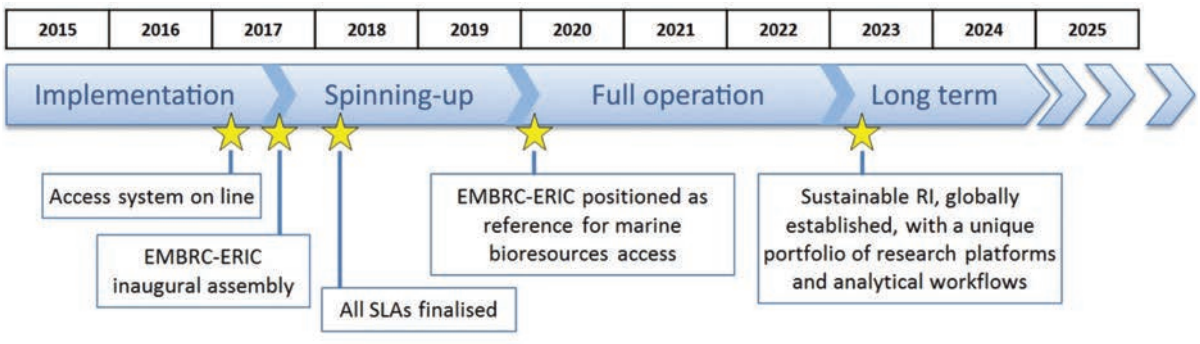


Figure 13. Timeline for EMBRC-ERIC implementation.

6.1 36-month Activity Plan

This work plan describes the activity of EMBRC over 36 months between October 2017 and September 2020, including the last months of the Implementation phase (2017), the first two years of the Operational Phase (Spinning-Up Phase, 2018-2020), and a good portion of the first year of the Full Operation phase (2021-onward). The work plan is articulated over six distinct Work Priority areas, and related specific actions. A summary of the envisaged milestones is provided in Section 6.3.

This workplan considers the priority areas of work, over the year 2017-2020, for the EMBRC Headquarters and broader EMBRC-ERIC operation.

This work plan considers the resources available to EMBRC-ERIC from:

i) **Core Budget** (monetary and in-kind resources);

ii) **Allocated EU H2020 projects**, in which EMBRC-ERIC is involved:

- **"Assemble Plus"** (H2020-INFRAIA-2016-17_I): Starting on 1st of October 2017, this project will activate important resources for EMBRC, including a central Access Officer and a Transnational Access (TA) programme.
- EMBRC is currently involved in three RI Cluster projects (**EMBRIC, CORBEL and ENVRIPlus**), with different remits. While the monetary contributions from these projects are allocated to the National Nodes, major benefits for the Headquarters pertain to compilation of harmonised access strategies with other RIs, joined-up thinking and policy influence.
- **"IMBRSea"** - The International Master in Marine Biological Resources was accepted in 2016, coordinated by University of Ghent, with various EMBRC partners as well as external ones. In this case, as well, the EMBRC-HQ had no direct funding allocated, but the project contributes to a major area of remit for EMBRC.

Some **recurrent activities may not be mapped**, such as Management and Administration, or Education and Training for Staff, and Communication, as they have been described before and/or are recurrent; some **extraordinary activities may ensue**.

WP1 – Joint Development Activities (JDAs)

Joint Development Activities form one of the key parts of EMBRC's mission as an RI. Whereas the majority of JDAs will be carried out through competitive grants, such as H2020, some smaller-scale activities can be carried out by allocating a part of EMBRC's core budget to JDAs. This way, we ensure that, regardless of grant success, we can support new developments, resources and tools for the EMBRC community. The Core Budget resources for JDAs will also function as seed money, to be possibly used in conjunction with other funding mechanisms, to support scientific foresight exercises and/or industry feasibility studies.

WP1.a: E-Infrastructure: planning, construction, operation and maintainance.

The E-Infrastructure will be instrumental to provide a unique entry point and data related services, for both the use and the administration of the EMBRC resources.

Specific Actions:

- **Working Group E-Infrastructure**: Establish a Working Group to support the analysis of the strategic development of the EMBRC E-Infrastructure, and assess the need for new development, co-development or use of existing components.;
- **Service Access System Improvement** to suit both the user interaction and the internal management of access requests;
- **Shared Administrative Tools** establishment;
- **Data and Knowledge Repositories** establishment;
- **Knowledge Transfer Platform** establishment;
- **Virtual Research Environment** establishment.

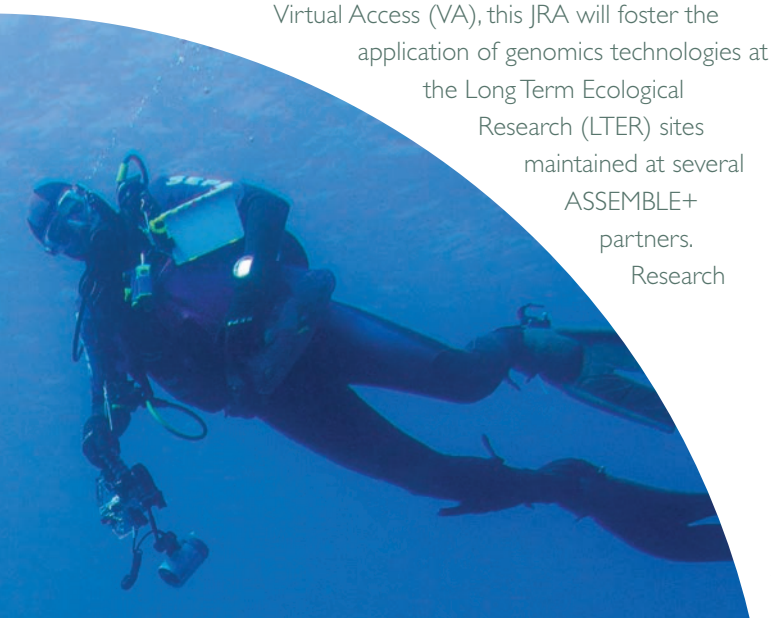
WP1.b: Joint Research Activities for Enabling Technologies.

A total of five strategic Joint Research Activities (JRAs) are currently planned, with the objective to

improve and increase the quality and quantity of both physical and virtual user access services, and to improve the interoperability of protocols and foster scientific integration, across the consortium.

Specific Actions:

- **JRA1 - Cryobanking of Marine Organisms**
  This JRA will develop robust, reproducible cryopreservation methodologies for various life-stages of a range of marine macro-organisms and currently cryo-recalcitrant microorganisms. will address a constraint in the exploitation of marine genetic and biological resources, namely current paucity of capability to conserve these resources ex situ with guaranteed genetic, phenotypic and functional stability. Cryopreservation has the potential to achieve this. Therefore, the results will improve and expand the availability of biological resources, and reduce the service costs.
- **JRA2 - Functional Genomics**
  This JRA will develop small-scale functional genomic approaches for several marine models to generate specific protocols for generation of Genetically Modified marine Organisms (GMOs), a reference set of phenotyped - genotyped GMOs, and phenotypic or genotypic data for the functional description of the GMOs, all of which will be available for TA. This activity will address demands to establish links between genomic information and phenotypes of marine model species.
- **JRA3 - Genomics Observatory**
  With the final objective to establish a distributed Genomics Observatory across the partnership, and beyond, of which the data are available for Virtual Access (VA), this JRA will foster the application of genomics technologies at the Long Term Ecological Research (LTER) sites maintained at several ASSEMBLE+ partners. Research encompasses populating and verifying databases of taxonomic reference barcodes, harmonization of SOPs across the consortium so that the resulting data can be compared across the partnership, and inter-calibration of classical biodiversity data and genomics data (meta-barcoding, meta-transcriptomics, etc.).
- **JRA4 - Development and standardization of infrastructures for on-site experimental marine biology and ecology**
  Contributing to the interoperability of research protocols and data, this JRA will produce technical benchmarks for cross-consortium implementation of standardized experimental maintenance and rearing systems for marine organisms.
- **JRA5 - Emerging technologies to improve diving-based science delivery**
  This activity will enhance diving-based science delivery by refining and testing emerging underwater scientific technologies at various partner sites. A standard protocol will be elaborated to be adopted across the consortium and beyond, to be the new reference for a wide and diverse user-group.



WP2 Improve User Access

Once in operation, EMBRC-ERIC will provide high quality services for the marine research community from 24 locations involving close to 20 institutions in nine different countries. A common system to operate and manage service requests has been designed and developed during the implementation phase.

A series of actions will be implemented to improve the user experience on one hand, and the management of the access request on the internal, administration side. Among those:

Specific Actions:

- **Setting up the procedures/rules for managing user requests to access the portfolio of services**
  - Design and test the EMBRC´s Access Platform, with the support of expert consultants and participation of the Executive Team in the preparation and testing of the information system;

- A series of workshops will bring together Node representatives, members of the secretariat and external consultants to define, design and refine the service provision platform.

- **Review and update the portfolio of services**
  - Implement a user's access monitoring and feedback mechanism, as part of a quality assurance system for continuous improvement of access and services

- **Support for TransNational Access**
  Support for transnational access in the implementation phase is achieved through the project submitted to "EU-H2020-INFRAIA-01-2016", **Assemble Plus**. This funding will enable EMBRC to entice a new user community and utilise common data standards and standard operational procedures, bringing about the culture-change required in the research community to enable the long-term sustainability of these facilities and widen its user base. EMBRC will devote significant efforts to ensure a continuous and support system to TNA, through collaborations with Member States, Regions, industry and relevant stakeholders.
  - Writing proposals/lobbying/partnerships to obtain access funding.

- Implementation of the Convention on Biological Diversity's (CBD) **Nagoya Protocol for Access and Benefit Sharing** for the use of genetic resources that entered into force in Europe in 2014. EMBRC will work to offer guidelines and collections of biological material included in the EU Registry of Culture Collections, ensuring that users accessing EMBRC resources have exercised "due diligence" as regards the seeking of all necessary information, greatly facilitating access to marine resources. Combined with expert support, best practices and guidelines, EMBRC will become the focus for access to marine biological resources, setting high standards for traceability and ethical sourcing, and positioning itself globally as a broker for accessing marine bioresources between users and supplying countries. It will put into practice mechanisms for harmonized approaches to organism access and use in compliance with the new EU regulation on Access and Benefit Sharing to genetic resources.
  - External consultancy to help setup all legal and administrative procedures.

WP3 Engagement of Stakeholders, New Members and Cognate RIs

Engagement of stakeholders and new members, as well as exchanges with cognate RIs will be vital to the EMBRC-ERIC.

Specific Actions:

- Establishment of annual meetings of the Science and Technology Gap Forum, with science, industry and policy stakeholders (Triple Helix model);
- Organize the co-development and coordinate policy engagement with cognate RIs;
- Negotiate alliances with national and European stakeholders, as well as with the maritime regions;
- Ensure EMBRC corporate representation in scientific meetings and Infrastructure conferences;
- Positioning EMBRC globally as an intermediator for accessing marine bioresources between users and supply-countries;

- Serve and support relevant policy actions by the EU Commission;
- Proactive engagement of potential new members and collaborators:
  - EU: Finland, Poland, Slovenia, Iceland, Ireland and others;
  - Non-EU: Canada (Quebec), USA, India, Chile, Brazil, Africa (Madagascar, South Africa), China (Quindao).

WP4 Knowledge for Innovation

As a research infrastructure, EMBRC will raise the profile and exposure of marine research, facilitating the up-take of new discoveries by providing a sound platform for disseminating relevant research outputs to the private sector.

An important task for EMBRC-ERIC will be to foster original, sometimes unconventional, collaborations that lead to new products and technologies. Sectors of application of marine biological and biotechnology research will be identified; collaborations between academic marine biology institutes and enterprises, at the regional, national, transnational and international levels will be fostered; the Technology Readiness Level (TRL) of EMBRC-ERIC generated knowledge and discoveries will be promoted and raised; and the establishment of Blue Regional Innovation Centres (BRICS) at the EMBRC facilities will be encouraged.

Specific Actions:

- Training the Liaison Officers for technology brokering;
- Brokerage Meetings organized from 2018 onwards;
- Preparation of industry targeted promotional and marketing materials;
- Stimulate a more open Technology Transfer culture among the Operators.

WP5 Education and Training

Teaching and training will be a core activity of EMBRC. Currently, offers for marine training in Europe are spread among hundreds of websites of different providers (universities, marine stations, etc.), making it difficult to identify users and organisers of marine training. EMBRC will explore the user community training needs and provide a single access point to the marine training opportunities through the **Marine Training Portal**, identify training gaps and update and develop new trainings accordingly.

EMBRC-ERIC will seek to provide training for its staff including facility and data managers, technical and scientific staff. It will build on the large existing offer of marine training at its nodes, including by staff exchange.

Specific actions:

- Strengthen the Training Portal: MarineTraining.eu
- Monitor needs and provide support for staff exchange initiatives;
- Promote the organization of courses in EMBRC facilities and their management and promotion through the marinetraining.eu portal;
- Establish Flagship initiatives, such as: EMBRC summer schools, open days in coincidence with recurrences (World Ocean Day, World sampling day, etc..; EU Marine Day).

WP6 Communication

EMBRC developed its branding and internet presence during the EMBRC Preparatory Phase project, with relevant functionalities. However, some basic elements of corporate communication and back-office administration are still underdeveloped. The structure and content of the website will also need to be adapted to reflect the transition of EMBRC to the operational phase. The monitoring of the EMBRC communication channels clearly show that our impact is higher than similar initiatives but a higher engagement of our community on social media is desirable.

Specific actions:

- Design, deploy and adopt appropriate external communication tools to foster functional relationships with the external community
  - A fully refurbished and engaging web portal, inclusive of an operational access system;
  - Social media channel activation, animation and monitoring;
  - Mapping and participating in community-reference events;
  - Establish periodic community-reference events;
  - Establish and follow an editorial line for all communication channels.

6.2 Milestones (years 1 to 3)

Table 19 - Deliverables and milestones for the Operational Phase of EMBRC-ERIC, 2018-2020

Tasks	1 2	3	4 5	6	7 8	9	10 11	12	13 14	15 16	17	18 19	20	21 22	23 24	25	26 27	28 29	30	31 32	33	34 35	36 37	38	39 40	41 42	43	44 45	46	47 48
WP1 – Joint Development Activities																														
WP1.a: E-Infrastructure																														
Working Group for strategy development of e-infrastructure	D																													
Improve the Service Access System		D																												
Data and Knowledge Repositories				D																										
Virtual Research Environments								D							D								D						
Shared Administrative Tools		D						D				D			D														
WP1.b: Enabling Technologies																														
JRA1 - Cryobanking of Marine Organisms		D													D															
JRA2 - Functional Genomics															D								D				D			
JRA3 - Genomics Observatory								D				D															D			
JRA4 - Development and standardization of infrastructures for on-site experimental marine biology and ecology																							D							
JRA5 - Emerging technologies to improve diving-based science delivery															D		D													
WP2 Improve User Access																														
Procedures/rules for managing user's requests																														
Review and update the portfolio of services																														
Transfer Clearance																														
Trans National Access				D				D				D			D			D					D			D				
WP3 Engagement of Stakeholders																														
WP3.a. New members and cognate RIs																														
Coordinating relationships with EMBRC stakeholders																														
Engagement of potential new members																														
Industry Engagement																														
Strategy on the collaboration with other Research Infrastructures																														
WP3.b. Policy Interface																														
Serve and support relevant JPIs and related ERA-NETs																														
Positioning EMBRC as a broker for accessing marine bioresources								D							D								D							D
Lobbying, advocating, representation																														
WP4 Knowledge for Innovation																														
EMBRC´s Knowledge Transfer Platform				D																										
Annual meetings and seminars				D								D							D							D				
Forming the Liaison Officers to be technology brokers				D								D							D							D				
Brokerage Meetings								D							D								D							D
Promotional and Marketing Materials		D								D							D							D						
WP5 Education and training																														
Support to training initiatives organized at the nodes		D								D							D							D						
Organization of courses in EMBRC facilities and their management and promotion through marinetraining.eu portal					D								D							D							D			
Personnel exchanges																														
WP6 Communication																														
Tools for internal communication		D								D							D							D						
Tools for external communication		D								D							D							D						

6.3 Key Performance Indicators

Table 20 - KPIs for EMBRC-ERIC for the first three years

Indicator	Target
A. Development of EMBRC	
1. Number of European and associated countries participating in the infrastructure	Increase number of ERIC signatories by 2 countries by the end of Year 3
2. Diversity & complementarity of high quality services: coverage of workflows (pipelines)	Increase number of completed workflows by 5 by Year 3
3. Number of new marine research platforms in EMBRC	Increase number by 5 platforms by Year 3
4. Participation in European and international projects	Year 1: 3 projects; Year 2: +2 projects; Year 3: 5 projects total
5. Number of collaborations with third countries	Increase number of third countries, outside of Europe by 2 countries
B. User Access to EMBRC	
1. Number of user access requests	200 proposals in year 1; 400 proposals in year 2; 800 proposals in Year 3
2. Number of accepted users	100 users in year 1; 200 users in year 2; 300 users in Year 3
3. Number of users from outside core-marine biological community (user community diversification)	Year 1: 5% of total access requests; Year 2: 10% of requests; Year 3: 15% of requests
4. Quality index (is the quality of your services as high as your users are expecting?)	Number of return users per year
5. Number of service contract	
C. Financial Indicators	
1. Monetary value of European and international projects	
2. Monetary value of offered access	Year 1: Year 2: Year 3:
3. Number of user access contracts funded by non-EMBRC-ERIC-led access programmes (i.e. H2020, MSCA, national funding agency grants)	Year 1: 10% of total access requests; Year 2: 20% of requests; Year 3: 40% of requests
4. Access Cost Variance (are visits coming in without going over budget?)	
D. Training & Education Indicators	
1. Growth of training/course/education on the European Marine Training Portal (base-line: 76 courses)	Year 1: 15 new courses; Year 2: 35 new courses; Year 3: new 65 courses
2. Growth of usage of European Marine Training Portal	Increase number of visits to the online portal by 100% per annum
3. Number of users of EMBRC-ERIC-led training courses	Year 1: 25; Year 2: 40; Year 3: 40
4. Number of staff training exchanges (exchange of good practice)	Year 1: 10 exchanges; Year 2: 20 exchanges; Year 3: 25 exchanges

Indicator	Target
E. Scientific and Technological Indicators	
1. Number of scientific events organised by EMBRC-ERIC & participation (conferences/workshops)	20 per annum
2. Number of joint development activities	Year 1: 1 JDA; Year 2: 3 JDAs; Year 3: 5 JDAs
3. Number of publications, patents, IPRs or products acknowledging EMBRC-ERIC	50 by Year 3
4. Number of publications, patents, IPRs or products citing EMBRC-ERIC DOIs (e.g. methodologies, techniques, standards, procedures, metadata, instruments)	20 by Year 3
F. Impact on Industry Indicators	
1. Percentage of users coming from industry	Year 1: 5% of users from industry; Year 2: 10%; Year 3: 15%
2. Number of regional R&D networks in which EMBRC-ERIC participates	By Year 3: +5 networks
3. Number of EMBRC-ERIC R&D collaborations with industry	Year 1: 5 projects; Year 2: 10 projects; Year 3: 20 projects
4. Number of industrial contracts with EMBRC	Year 1: 5 contracts; Year 2: 10 contracts; Year 3: 15 contracts
G. Influence on Society at Large	
1. Participation of EMBRC-ERIC in policy panels and forums	Year 1: 2; Year 2: 5; Year 3: 10
2. Internet hits (Google, social networks)	Year 1: 20% increase from launch of operations; Year 2: 50% increase; Year 3: 100% increase
3. Number of public engagement events	
H. Communication & Marketing Indicators	
1. Number of social media subscribers	Year 1: 800; Year 2: 1500; Year 3: 2300
2. Number of open-days organised per user group (industry & academia)	10 events per annum
3. Number of events participated in by EMBRC-ERIC (not organised by EMBRC)	Year 1: 5; Year 2: 10; Year 3: 12
I. Knowledge Transfer Indicators	
1. Number of knowledge portfolios lodged in KT platform	Year 1: 5; Year 2: 10; Year 3: 12
2. Knowledge Outputs (advisory services)	Year 1: 5 ; Year 2: 10; Year 3: 12
3. Knowledge requests from KTT platform	Year 1: 20; Year 2: 50; Year 3: 100
4. Policy Actions (e.g. working groups, recommendation Reports, foresight studies)	Year 1: 3 ; Year 2: 6; Year 3: 8
L. Technology Transfer Indicators	
5. Creation of Spinoffs;	Year 1: 1; Year 2: 1; Year 3: 2
6. Industry Co-authorship of publications	Year 1: 3; Year 2: 6; Year 3: 9
7. Industry Partnerships	Year 1: 0; Year 2: 0; Year 3: 1
8. Advice and expert role to Industry	Year 1: 3; Year 2: 5; Year 3: 10

6.4 Risk Management Plan

Audit, risk management and quality assurance

Risk Assessment is the quantification of risks associated to a project in the face of recognized threats that can damage the project. Quantitative risk assessment requires estimation of the probability (p) that damage will happen and the severity (L) of that damage (loss because of the damage) when it happens. Acceptable risk is risk that is tolerated because p*L is far smaller than the cost of measures to mitigate the risk. An unacceptable risk requires actions to mitigate it.

Like any other enterprise, EMBRC will be confronted with some risks, which can be particularly significant at the interface between implementation and operational phase. In the following list, we point to the relevant issues identified, also incorporating the point raised by ESFRI in their "Decision on status and recommendations to move towards full implementation" (12/06/2015):

Financial Risks

- **Risks related to stakeholder commitment at the European level**

  The principal risk is related to insufficient funding from the participating member states of the core activities because that would jeopardize the EMBRC operations. To mitigate this risk, a contingency fund was established, which will progressively build up to provide a substantial reservoir to buffer those risks. Also, the membership commitment is requested over five years with the possibility to present a two-year advance-notice withdrawal request. This is expected to provide the EMBRC with sufficient manoeuvring time to adjust the operation budget, or attract new users. These mitigation measures reduce this risk to very low from a financial point of view. However, the status of EMBRC would be affected if the number of Members was to fall significantly. In order to benefit from an ample geographic and ecosystem representation, EMBRC actively seeks to expand its partnership, which will in turn minimize the possible risk of significant reductions in its member base.

  On the positive side, despite Brexit, the UK remains committed to EMBRC. In addition, scientific communities in Finland and Ireland have engaged with their governments to explore possibilities of becoming a member of the EMBRC-ERIC.

- **Risks related to user engagement**

  EMBRC-ERIC will serve several user categories; including in-house users and external users from the public and industrial sectors. The risks of failure to attract these user communities are small but not negligible. To mitigate this risk, EMBRC will engage with several user categories. Marine biologists were engaged through the I3 project ASSEMBLE. We engage with fundamental biological and biomedical users through participation in the BioMedical Sciences group (formerly: "Biomed Bridges"), also jointly working on the INFRADEV-4 projects "CORBEL" and "EMBRIC". We engage with potential users in the blue-biotechnology sector through the

INFRADEV-4 project EMBRIC and comparable initiatives by making marine biological resources available for industrial applications. EMBRC further engages with the Environment RI community, through the INFRADEV-4 project "ENVRIPlus". In addition, "ASSEMBLE-PLUS", with its TNA program, allows engagement with the broad user community across the ERA, and exploration of user categories and access modes outside the traditional ones.

However, a risk that can jeopardize external user access across the distributed RI is insufficient national funds to run access programs on a European scale. Only EMBRC-France operates a national access program. To mitigate this risk, we need commitment from national and regional funding stakeholders, industrial stakeholders, as well as the EU to support transnational user access. Suggested EU instruments are funding of access to Research Infrastructures, either directly to EMBRC-ERIC or via targeted funding of RI-access within research grants (e.g., H2020, Marie Curie fellowships). This risk is completely under control until 2021, as EMBRC has secured INFRAIA projects with substantial TNA funds, starting in 2017.

User access can easily be discouraged by bureaucracy, complexity of access procedures or different procedures in different RIs, and lack of user access pipelines through multiple RIs. To mitigate these hindrances, EMBRC will streamline all procedures for user access to its distributed facilities by means of a "unique entry point" access system. The RI will also collaborate with cognate RIs to homogenize access procedures and enable users to streamline their research projects hassle-free through multiple RIs. Experience will be shared across cognate RIs through beta-test-runs with research projects of different user categories through the INFRADEV-4 projects CORBEL, EMBRIC and ENVRI+, in all of which EMBRC is partner. EMBRC adopts the recommendation of ESFRI to monitor the number of users, type of users, distribution of users among national nodes, etc., as an on-going activity within EMBRC-ERIC in order to be able to meet renewed scientific and technological developments and needs.

Strategic and organisational factors

- **Risks related to governance and management**

  Following the preparatory phase, nascent Research Infrastructures run the risk of losing forward momentum in pre-implementation "valley of death" because of lack of financial and human resources. To overcome this risk, the EMBRC placed significant efforts on selecting the statutory seat (UPMC, France) and appointing an Executive Director who took over the direction of the nascent RI and currently manages the ERIC application process. The establishment of the legal entity will allow – as recommended by ESFRI – extensive executive powers and adequate resources. The positioning of the Executive Director as the Chair of the Committee of the Nodes, and with legally binding relationships to be established, through Service Level Agreements, between EMBRC-ERIC and National Nodes or Operators will ensure a balanced governance of the RI, further supported by the carefully crafted Statutes and Rules of Operations of the EMBRC-ERIC. Appropriate resources shall be allocated to support the Executive Director in delivering the various tasks, such as an adequately staffed Secretariat and external support services, e.g. legal and accounting advice. Governance continuity, including the Executive level, between the Implementation and Operational phases, will be beneficial to the effective realisation of this business plan.

  EMBRC will implement a system of Key Performance Indicators (KPIs) to measure the performances of EMBRC-ERIC. The KPIs will be updated with the result of a comprehensive Exercise carried out in 2017 as part of an OECD activity. The close monitoring of the KPIs will support the core management of the Research Infrastructure. Governance continuity, between the Implementation and Operational phases, will be beneficial to the effective realisation of this business plan.

- **Risks related to human resource policies**

  A typical risk for ESFRI RIs is to run into difficulty performing effectively when managing human resources which are provided in-kind by

Members, or working on a voluntary basis. Sharing experiences with other RI managers can be helpful in understanding the issues at hand, and clarifying how to formalize the relationships between EMBRC-ERIC and the HR contributed by the various Members. Full time positions shall be preferred, especially for the employed personnel, in order to avoid fragmentation of Human Resources. A Performance Management and Development Plan will apply to the EMBRC-ERIC staff, to ensure motivation and upskilling. An external HR management advice service shall be adopted to avoid conflict of interests.

- **Risks related to competition for resources and users**

  EMBRC has secured funding in its Member states and commitment by the regions in which its facilities operate, to place the blue bio-economy on their smart specialization agendas. Joining forces with the Conference of Peripheral Maritime regions (CPMR) is a key factor to this success, and this is being secured by a MoU.

  In addition, a programme to structure the reference communities around EMBRC in a co-development strategy will be delivered by the Assemble Plus project, which envisages colloquia with the following key organisations:

  - EuroMarine: A European marine science network launched in 2014 whose primary goals are to support the identification and initial development of important emerging scientific topics or issues and associated methodologies in marine sciences, as well as to foster new services relevant to the marine scientific community, becoming therefore a priority stakeholder to the EMBRC.
  - Oceanographic institutes: Oceanography is expensive and a strong competitor for funding. However, oceanographic and marine biological sciences are complementary. Synergies with programmes such as Eurofleet or RIs like EMSO and EuroArgo will be established.
  - MARS: This organization is fundamental to harness the wealth of information collected by the marine stations outside the EMBRC-ERIC and also external to the Assemble Plus project, also acting as a bridge for the adoption of data interoperability principles throughout this relevant scientific community.

All in all, the EMBRC philosophy relies on a strategy of collaboration, harmonization, and integration of services to avoid competition.

Technical and Technological factors

- Regarding the **e-infrastructure plan**, the change of the EMBRC partnership composition resulted in a loss of expertise on matters of e-infrastructure hardware and software. EMBRC has established a Work Group on E-Infrastructure (WGEI) engaging key external expertise from relevant initiatives (Elixir, EMBL, EGI).
- The access system is being tested to ensure it allows adequate communication between the core office and the Nodes, supporting the attractiveness of our service offer through a single-entry point. Improvement to the system is currently ongoing and will be finalised through the ASSEMBLE-PLUS activities.

Towards an effective Risk Management and Quality Assurance System for EMBRC-ERIC

A relatively simple risk management system will be implemented, checked regularly and kept up to date at the HQ. Each identified risk should have a risk owner, located anywhere across the RI, who is responsible for monitoring the development of the risk, estimating the probability of the risk and the severity of the effects in case the risk materializes. The risk owner updates the risk assessment system whenever needed and alerts the Executive Director, or the staff member responsible for the risk management at the core office, in case probability (p) multiplied by severity (L) passes a critical threshold (n=6), and proposes mitigating actions. A Risk Audit Committee will be appointed from experts within the RI (not the risk owners) whose tasks include regular audits of the risk register and flagging problems to the Executive Director, and in case of severe problems also to the General Assembly. In Table 21 an outline of the Risk Register is presented. Fuller explanations are provided in the following paragraphs.

Table 21 - EMBRC-ERIC risk registry and contingency plan

Critical Factors		Risk Owner	Probability	Impact	Mitigation Actions	Status
ECONOMIC FACTORS	Insufficient budget	ED	Moderate	Moderate	Contingency budget = 20% of total budget	
	Losing Members	ED	Medium	High	Keep an attractive profile and pursue new members	Norway may be unable to join
STRATEGIC - ORGANISATIONAL FACTORS	Delays in the ERIC application	Host Country, MS	Low	Low	Support the process with all available resources	Advanced
	Failing the ESFRI report	EIB/GA	Low	High	Prioritize activities towards the submission of a successful report	Report in preparation
	Discontinuity of governance at the transition between Implementation and Operational Phase of the EMBRC-ERIC	EIB/GA	Low	High	Support governance continuity. Transfer the current staff contracts to the ERIC.	
	Dysfunctional Governance	GA Chair	Low	Medium	Ensure Rules of Operations are suited to guarantee the functionality of the EIB; avoid that GA representatives have other EMBRC mandates (CoN, Liaison Officers); Ensure sufficient communication with ED during and in between meetings; avoid discussing operational matters	Rules of Operations drafted, a first review in April 2017
	Unstable national nodes	Node Directors, MS	Low	Low	Adopt form of coordination with legally binding frameworks	Around ¾ of the EMBRC Nodes are ideally organised
	Insufficient resources assigned at node level	Node Director, MS	Low	Moderate	Monitor the process, anticipate needs and agree on medium term development plans: for HR, ensure a minimum of permanent positions to guarantee continuity of services	1/3 of Liaison Officers appointed; Node Directors are acting in lieu, until the ERIC is established
	Insufficient responsiveness of the Nodes	Node Directors	Low	Moderate	Review practices and address with the CoN; Robust SLAs	SLA draft agreements are in preparation (2nd review)
	Dysfunctional Secretariat	Director	Low	Medium	Review practices and report to the EIB if more resources are required; budget permitting, outsource some work, as a temporary mitigation measure; use a Performance Management and Development Plan system	External services are being procured to accompany the ERIC during its operations phase: legal services, accounting services, payroll services, etc.
	Competition from other RIs and other international consortia	Director	Low	Low	Collaboration, harmonization, and integration of services	A number of RI cluster projects are underway providing the necessary connectivity among cognate RIs.
TECHNICAL/ TECHNOLOGICAL FACTORS	E-Infrastructure and Access system underdevelopment	Director	Low	Low	Establish a roadmap, provide adequate resources, follow the process closely	A working group is established, resources allocated from core budget and from Assemble Plus Project

7

ANNEX
Figures, Tables and Glossary

7.1 Figures

7.2 Tables

7.3 Glossary

Budgetary Cycle means a five-year budgetary plan, which is approved by the General Assembly under Article 15.9.

Committee of Nodes (CoN) means a non-executive body representing the Nodes as provided by Article 17 of the Statutes.

Contribution(s) means monetary and in-kind contributions to the EMBRC-ERIC as decided by the General Assembly in conformity with Article 15.9.

Executive Director (ED) means the director of EMBRC-ERIC as provided for under Article 16 of the Statutes.

EMBRC Implementation Board (EIB) (to be continued as GA): means the governing body of the EMBRC Implementation Phase, composed of one scientific and one administrative delegate representatives, per each Member and Observer.

Ethical Board means the Subsidiary Body focusing on ethical issues associated with EMBRC-ERIC's activities, including the monitoring of research involving marine organisms or parts thereof.

General Assembly (GA) means the assembly of Members of EMBRC-ERIC, as provided for under Article 15 of the Statutes.

Headquarters (HQ) means the Executive Director and Secretariat located in the Host Member.

Host Member means the Member in which the EMBRC-ERIC statutory seat is located, as provided for under Article 2(2) of the Statutes.

Host Premium means the yearly support, provided by the Host Member, partly cash and partly In-Kind, for the functioning of the EMBRC Headquarters.

Liaison Officer(s) The Liaison Officers are part of the operative structure of EMBRC-ERIC and will ensure the effective operability and provision of the Nodes' services, constituting a functional link between Headquarters and the Nodes and/or Operators, as provided for under Article 17 of the Statutes.

Member(s) means the member(s) of EMBRC-ERIC, as provided for under Article 5 of the Statutes.

Node(s) means the research facilities, resources and services organised nationally, not necessarily as an entity with legal capacity, in a Member and operated by legal entities referred to as "Operators", at which EMBRC-ERIC related activities are carried out.

Observer(s) means a non-Member of EMBRC-ERIC that participate and contribute to EMBRC-ERIC activities as provided for under Article 10 of the Statutes.

Operators means legal entities, i.e.: Universities and research performing organisations, comprising the Node(s).

Rules of Operation means the rules voted by the General Assembly to implement the provisions of the Statutes.

Science & Innovation Advisory Board means the Subsidiary Body for scientific matters and strategic planning, including Intellectual Property management and technology transfer matters, as provided for in Article 19.

Subsidiary Bodies means the advisory bodies established by the General Assembly to advise EMBRC-ERIC, as set out in Article 19 of these Statutes.

Secretariat means the operational secretariat of EMBRC-ERIC as provided for under Article 18 of the Statutes.

Service Level Agreement(s) (SLAs) means agreements between EMBRC-ERIC and the legal entities operating the Nodes, regulating the provision of services and resources to support the high-level ambitions of the Research Infrastructure.