

## EMB Member Organization Consultation on Marine Research Infrastructures in ESFRI: Collated results and analysis

*Annex I: EMB Member Survey on ESFRI MRI Priorities, Gaps and Future Investments*

### 1. Rationale and context

Marine Research Infrastructures remain a strategic area of interest for EMB and its 35 Member Organizations. In early 2016 the European Strategy Forum on Research Infrastructures (ESFRI) will publish an updated roadmap of ESFRI projects. In view of the ESFRI activities taking place in 2014-2016, the EMB Secretariat launched a consultation of its 35 EMB Member Organizations from 18 countries to seek perspectives on the status, gaps and future investment in the marine component of ESFRI Research Infrastructures (RIs and e-RIs) and wider Marine Research Infrastructures (MRIs). In parallel, the EMB Secretariat has initiated contact with the ESFRI Secretariat and Strategic Working Groups (SWGs) to inform EMB MOs of the latest developments in ESFRI and potential opportunities for EMB MO, particularly with respect to Marine Research Infrastructures (MRIs). Further background on ESFRI and European MRIs is available in a short analysis of marine MRIs in ESFRI, prepared by the EMB Secretariat and tabled as Document 11 at the EMB Autumn Plenary 2014 in Rome, Italy.

### 2. Overview of Consultation

This report presents the collated responses of EMB Member Organization views and perceptions on European Marine Research Infrastructures following a 6 week consultation by the EMB Secretariat from 28 October to 16 December 2014. The survey assessed EMB MO engagement in the ESFRI process, seek perspectives on priorities and gaps in MRIs and to inform discussions on the ESFRI Roadmap Updates including planned in 2016 and the ongoing wider Landscape and Gap analysis of Research Infrastructures. It should be noted that responses to the Consultation are perspectives from EMB MOs rather than official positions. However, many responses included additional information on national or organization engagement in ESFRI. This is included unless requested otherwise. The consultation aims to provide EMB Member Organizations (MOs) with initial perspectives on:

- **EMB Member Organization involvement in European Marine Research Infrastructures:** Collated results provide EMB MOs with perspectives on National Roadmaps for Research Infrastructures, expected time-scales for National commitments to ESFRI MRI projects and ongoing MO engagement in existing MRIs (including ESFRI and wider European MRIs).
- **Existing engagement of EMB MOs in the ESFRI Roadmap update process:** EMB MO engagement in ESFRI roadmap development and prioritization is predominantly conducted at a National level. However, some EMB MOs have National experts engaged in the ESFRI Strategic Working Groups, particularly SWG Environment, set up to support the ESFRI Roadmap Update process including a Landscape and Gap analysis of RIs across Europe. Since Marine Research Infrastructures span

multiple thematic areas, the consultation responses highlighted the gap and potential opportunity to enhance the marine expertise across the 5 SWG thematic areas including Health and Food (including Life Sciences) and Physical Sciences and Engineering.

- **Influencing the ESFRI Landscape and Gap analysis (2014-2015)** : During 2014 to early 2015 ESFRI SWGs conducted a landscape and gap analysis of European Research Infrastructures<sup>1</sup>. With this in mind, the EMB Secretariat initiated correspondence with ESFRI SWGs and informally submitted preliminary feedback from the EMB consultation to ESFRI SWG Environment in November 2014 (presented in Section D).
- **Informing horizon scanning and strategic planning for Marine Research Infrastructures:** Perspectives from this consultation provide initial insight into the existing landscape of Marine Research Infrastructures, potential enhancements that could be made to existing MRIs e.g. geographical, thematic and perceived gaps in the landscape. This information can be used to inform future discussions and strategic planning at National, Regional and European level with a view to further updates to the ESFRI Roadmap planned in 2018 and 2020.

### 3. Summary of EMB Member Organization response

Responses were received from 16 EMB MOs (some joint responses) spanning 11 countries (see Table 1). This represents a 45% response rate of EMB MOs and a 61% response rate from EMB countries.

<b>Country (in alphabetical order)</b> 10 EMB countries that responded.	<b>EMB Member Organization</b> (Research Performing Organizations, Research Funding Organizations and University consortia).
Belgium	VLIZ
France	CNRS, Ifremer
Germany	DFG
Greece	HCMR
Ireland	MI
Italy	CoNISMa
Netherlands	NIOZ
Norway	RCN, IMR (Joint response)
Poland	IOPAN
Portugal	CIMAR (including dialogue with FCT)
U.K.	NOC, NERC, MASTS (Joint U.K. response)

**Table 1:** EMB MOs responding to the EMB ESFRI consultation

<sup>1</sup> The landscape and gap analysis will be published alongside ESFRI Roadmap update in early 2016 (SWG Environment expert, *personal communication*)

## 4. Collated Results

Collated results are presented from the three main sections of the survey, namely:

- National prioritization for ESFRI MRIs (section 4.1)
- Marine science engagement in the ESFRI projects, Roadmap developments and wider MRIs (section 4.2)
- Landscape and gap analysis of Marine ESFRI projects and the wider MRIs (section 4.3)

### 4.1 National prioritization for ESFRI MRIs (Section B: Questions 6-8)

*Q6. Has your country produced a national roadmap for ESFRI and/or wider research infrastructures?*

All EMB MO countries who responded identified a national roadmap for ESFRI and/or wider research infrastructures. The collated responses are listed in Table 2 below. Four EMB MO countries noted their roadmaps are currently under further development. Many MOs reported ongoing parallel assessments at national level of gaps 1) to revise and update the national roadmap, 2) to provide to ESFRI SWG in a second step a consolidated advice on RIs. A full list of available National Roadmaps for Research Infrastructures is available on the EC website<sup>2</sup>.

Country	Information on National Roadmap / Strategy on ESFRI and wider Research Infrastructures
Belgium	Roadmap under preparation
France	Research infrastructures national strategy : <a href="http://www.enseignementsup-recherche.gouv.fr/cid70554/strategie-nationale-infrastructures-de-recherche-2012-2020.html">http://www.enseignementsup-recherche.gouv.fr/cid70554/strategie-nationale-infrastructures-de-recherche-2012-2020.html</a> Road map 2012-2020 : <a href="http://cache.media.enseignementsup-recherche.gouv.fr/file/TGIR/29/8/infrasUK_mcgs2_243298.pdf">http://cache.media.enseignementsup-recherche.gouv.fr/file/TGIR/29/8/infrasUK_mcgs2_243298.pdf</a>
Germany	yes (no weblink provided)
Greece	Roadmap updated in 2014: <a href="http://ec.europa.eu/research/infrastructures/pdf/gr_roadmap-web_version_final2014.pdf">http://ec.europa.eu/research/infrastructures/pdf/gr_roadmap-web_version_final2014.pdf</a>
Ireland	Under development in 2014-2015 for 2016 update. National Irish ESFRI delegates have launched a call for expressions of interest to identify existing or new projects for the updated Roadmap
Italy	Published 2011 (Update under preparation)
Netherlands	<a href="http://www.nwo.nl/en/research-and-results/programmes/National+Roadmap+For+Large-Scale+Research+Facilities/background">http://www.nwo.nl/en/research-and-results/programmes/National+Roadmap+For+Large-Scale+Research+Facilities/background</a>
Norway	<a href="http://www.forskningsradet.no/servlet/Satellite?c=Page&amp;pagename=infrastruktur%2FHovedside&amp;cid=1224697900450">http://www.forskningsradet.no/servlet/Satellite?c=Page&amp;pagename=infrastruktur%2FHovedside&amp;cid=1224697900450</a>
Poland	<a href="http://www.nauka.gov.pl/dokumenty-str%20ategiczne/polska-mapa-drogowa-infrastruktury-badawcej.html">http://www.nauka.gov.pl/dokumenty-str%20ategiczne/polska-mapa-drogowa-infrastruktury-badawcej.html</a>

<sup>2</sup> [http://ec.europa.eu/research/infrastructures/index\\_en.cfm?pg=esfri-national-roadmaps](http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri-national-roadmaps)

Portugal	<a href="http://www.fct.pt/apoios/equipamento/index.phtml.en">http://www.fct.pt/apoios/equipamento/index.phtml.en</a>
UK	<a href="http://www.rcuk.ac.uk/international/funding/eurofunding/esfri/">http://www.rcuk.ac.uk/international/funding/eurofunding/esfri/</a> Under process of open consultation by end Jan 2015 see also: <a href="http://www.nerc.ac.uk/latest/news/nerc/esfri-roadmap/">http://www.nerc.ac.uk/latest/news/nerc/esfri-roadmap/</a>

**Table 2:** National roadmaps for ESFRI and wider research infrastructures (based on responses to EMB MO survey)

*Q7. What priorities does your country give to MRIs already existing in the ESFRI Roadmap?*

This question assessed national prioritization to the 7 existing ESFRI projects with specific marine research components, namely LIFEWATCH, ICOS, EMSO, KM3Net, SIOS and EMBRC. The prioritization of Euro-Argo ERIC was not assessed as it was the first ESFRI MRI to reach the implementation phase, becoming operational on 12<sup>th</sup> May 2014.

Table 3 lists the EMB MO responses with an indication of the level of prioritization given to ESFRI MRIs across Europe. This also includes further updates, where provided, on the status of these MRIs and their progress towards becoming operational. It should be noted these are perspectives rather than National commitments. In many cases the national position and roadmap updates are under active development.

ESFRI MRI (on ESFRI Roadmap 2010)	High National priority: ERIC signature is expected by 2016	Medium-term Priority: ERIC signature is under discussion (expected by 2018)	Longer-term priority: Financial commitment is at early stage of discussion	Low priority: no funding commitment is foreseen by 2020
<b>LIFEWATCH</b>	III	0	II	IIII
	<p>The <u>Netherlands</u> is one of the leading partners and has signed the MoU but so far no large-scale funding has been allocated to Lifewatch. Lifewatch is listed on the National Roadmap but was not prioritized for funding in 2014. Decision on possible future commitment is expected. For <u>Norway</u>, decision on possible future commitment is expected during 2017 during 2017. <u>Belgium</u> has secured National funding for Lifewatch.</p>			
<b>ICOS</b>	V	0	III	I
	<p><u>Belgium</u> has secured National funding for ICOS. The <u>UK</u> and <u>Norway</u> intend to lead the ocean component of ICOS and the UK will host the Ocean Thematic Portal / project office. Norway participates in ICOS ERIC as observer. Decision on possible future investment is expected during 2015. ICOS is listed on the <u>Netherlands</u> National Roadmap but was not prioritized for funding in 2014 Dutch subprojects associated with ICOS have been funded July 2013 and September 2014. Not clear who is the sponsoring agency on ICOS in <u>Ireland</u>. The Mace Head Observatory is a key infrastructure in the ICOS RI.</p>			

<b>EMSO</b>	V	II	0	II
	The MI are planning at least Observer status of EMSO ERIC but may increase this to full membership in line with the Atlantic Strategy. The <u>Netherlands</u> has in an earlier stage committed to the creation of the EMSO-ERIC. However, EMSO is not listed on the National Roadmap and no funding is foreseen. The national funding agency has suggested that NIOZ participates as an observer.			
<b>KM3Net</b>	0	II	III	IIII
	KM3net has been on the <u>Netherlands</u> National Roadmap and was prioritized for funding in 2008, with funding received for the period 2009-2014. At the moment requests for follow-up funding are being prepared.			
<b>SIOS</b>	II	0	IIII	IIII
	<u>Norway</u> coordination envisage for SIOS a Norway civil society (not an ERIC), they sent a letter of intention to other partners (like IPEV for France) for their contribution either in-kind or in cash. SIOS is not listed on the National Roadmap in the <u>Netherlands</u> .			
<b>EMBRC</b>	VI	I	II	II
	EMBRC is now in implantation phase with 9 subscribers of MoU: PT, FR, UK, BE, GR, IL, SP, IT, NO. An ERIC application will be submitted during the 1st quarter of 2015. The EMBRC MoU was signed by the <u>Netherlands</u> and EMBRC is listed on the National Roadmap but has not been prioritized for funding in 2014. EMBRC has National funding in <u>Belgium</u> . <u>Norway</u> participates in preparatory phase. Decision on possible future commitment is expected during 2015. The <u>UK</u> has joined the Implementation Phase of EMBRC sponsored by the Scottish Government which signed the MoU. ERIC signature is foreseen in 2016 although to date NERC have not supported. <u>France</u> has recently been selected to host EMBRC, acknowledging Roscoff's Marine biology station important role in this European research infrastructure.			

**Table 3:** EMB MO views on national prioritization level of existing ESFRI MRIs. It must be noted that some EMB MOs did not assign a priority level for each MRI and some MOs responded as a joint National response. Grey shaded cells indicate the most common priority level selected by EMB MOs who responded. Additional comments provided by EMB MOs are included below each ESFRI project.

*Q8. Can you provide details on your national prioritization of any other ESFRI projects with marine/MRI components?*

EMB MOs listed a number of projects in this section and provided updates on status:

**Euro-Argo ERIC** EMB member country involvement ranges from signatory to observer, although many countries have invested in stage one.

**EPOS** (European Plate Observing System) PP: In May 2014, EU Council acknowledged EPOS as one of the three priority projects mature enough for short-term implementation (through next Infradev-3 call).

Norway participates in the preparatory phase. Decision on possible future commitment is expected during 2015.

**MARsite within EPOS and EMSO:** EPOS (European Plate Observing System) partners involved in 3 EC FP7 Supersites projects : MED-SUV, FUTUREVOLC and MARsite. The last one MARsite includes mostly the Marmara Sea issue itself, as the Anatolian seismic fault breaks through the sea in length, so includes sub-sea observatories jointly developed with EMSO partners : <http://marsite.eu/>

**DANUBIUS** project through its contribution to FP7-DANCERS. DANUBIUS is “Danube International Centre for Advanced Studies for River-Delta-Sea systems” led by Romania. DANUBIUS is preparing an application for the ESFRI roadmap 2016.

[http://ec.europa.eu/regional\\_policy/conferences/danube\\_forum2013/doc/ws3/01\\_danubius\\_adrian\\_stanica\\_viorel\\_vulturescu\\_manuela\\_sidoroff.pdf](http://ec.europa.eu/regional_policy/conferences/danube_forum2013/doc/ws3/01_danubius_adrian_stanica_viorel_vulturescu_manuela_sidoroff.pdf)

Other RIs mentioned were **ECCSEL** (European Carbon Dioxide Capture and Storage Laboratory Infrastructure) and **MIRRI** (Microbial Resource Research Infrastructure) – a high priority for the UK but not formally assessed by the UK government, strategic decision expected in 2016.

## ***4.2. Marine science engagement in the ESFRI projects, Roadmap developments and wider MRIs (Section C: Questions 9-10)***

### **Engagement with National ESFRI Delegations**

*Q9. How do you already engage with your National ESFRI Delegation?*

10/16 Member Organizations reported an active engagement and dialogue with their National ESFRI Delegation including:

- Interaction via national groups of representatives to identify national priority areas, developing the national roadmap, align European and national priorities and funding.
- Representation and interaction in the H2020 national thematic group on infrastructures which provides regular information to ESFRI delegates.
- Providing expert advice on request by National ESFRI Delegates
- National representation on ESFRI Strategic Working Groups (SWGs) e.g. Environment.
- It should be noted that EMB MOs may be involved in proposals for new ESFRI projects to enter the ESFRI Roadmap update in 2016. This Consultation is ongoing.

### **EMB MO participation in ESFRI and wider MRI projects**

10/16 EMB Member Organizations already engage in the ESFRI process as either Coordinators, partners or signatories to existing ESFRI MRIs (including FP7 I3, Preparatory Phase projects etc). EMB MOs reported involvement in the following projects:

ESFRI projects: EMSO, EPOS, IAGOS, ICOS, Euro-Argo ERIC, EMBRC, ELIXIR, SIOS, LIFEWATCH

Other RI projects: Involvement in other RIs (not on current ESFRI Roadmap) included ACTRIS, JERICO, FixO3, GROOM, ENVRI, GMES (Copernicus) Marine Service, EMODNET, Eurofleets and national oceanographic fleets. Marinet (Marine Renewables) was also reported by one EMB MO as having support but no direct partnership.

### **EMB MO participation in H2020 funding for ESFRI**

One EMB MO noted the EMSO<sup>3</sup> project had applied for Horizon 2020 funding under topic H2020 INFRADEV-3-20156, dedicated to support individual implementation and operation of ESFRI research infrastructures. In addition, one EMB MO reported being a partner of a deep-ocean drilling RI project, DEDI, within the H2020 call INFRA-IA (proposal submitted in 2 Sept. 2014). This is a follow-up of ECORD<sup>4</sup>, itself the European component of the International Ocean Drilling Project (IODP).

### **EMB MO participation in H2020 funding for wider MRIs**

In addition to ongoing projects, EMB MOs reported a Coordination and partner roles in the following MRI proposals:

**ENVRI+** including a Marine sub-domain (coordinated by Ifremer): Cluster of environmental related research infrastructure projects including ESFRI roadmap projects + other FP7-INFRA projects e.g. I3. This project includes 4 domains: Solid Earth, Atmosphere, Biodiversity/ecosystem, Marine. This project was submitted to the INFRADEV4 call in 02 September 2014 and has been accepted for funding. The Kick-Off meeting is expected in May 2015.

**JERICO NEXT:** Coastal observatory network) was submitted in 2014 and has been accepted for funding (Ifremer coordination). Follow-on project from JERICO. <http://www.jerico-fp7.eu/>

**Aquaexcel 2:** Aquaculture infrastructures. Awaiting outcome for Infra IA (expected soon). Follow-on project from Aquaexcel: <http://www.aquaexcel.eu/>

*Q10. Are you involved in ESFRI Strategic Working Groups as members or associated experts?*

### **ESFRI Strategic Working Groups**

During 2014 ESFRI established 5 Strategic Working Groups (SWGs) across RI thematic areas, namely Energy, Environment, Health and Food, Social and Cultural Innovation and Physical Sciences and Engineering. SWGs provide an advisory role to support the ESFRI Roadmap update process. A key activity for SWGs has been a wider landscape and gap analysis of European Research Infrastructures (RIs). This is ongoing and it is understood final reports will be published alongside the ESFRI Roadmap Update in 2016. ESFRI SWGs may also be involved in the assessment of the implementation of projects currently on the Roadmap and for the evaluation of new projects. Members of SWGs are typically appointed by ministries and represent countries (maximum of 1 representative per country). However they are not strictly national delegates but thematic experts. Further information on the SWGs mandate and membership are

<sup>3</sup> European Multidisciplinary Seafloor and Water Column Observatory).

<sup>4</sup> <http://www.ecord.org/>

reported in the EMB report 'Short analysis of marine MRIs in ESFRI'<sup>5</sup>. It is noted that Marine Research Infrastructures are cross-cutting and will be assessed across multiple SWGs including Environment, Health and Food (including Life Sciences) and Physical Sciences and Engineering.

Only 3/16 EMB MOs that responded noted direct involvement in ESFRI SWGs, in particular appointing and providing members of SWG Environment. One EMB MO reported having quarterly meetings with the ESFRI delegates and SWG members to discuss any issues relevant nationally. In addition 2 further EMB MOs reported active dialogue with ESFRI to nominate experts from their organizations to support the Environment SWGs.

Only one EMB MO reported direct involvement or nomination of experts to other thematic SWGs (namely physical sciences and engineering and e-infrastructures). This is despite other thematic SWGs including marine components e.g. Health and Food (including Life Sciences).

#### **Nomination of external experts to the ESFRI Roadmap update process**

In correspondence with the ESFRI Secretariat and SWG Environment members, the EMB Secretariat were advised if a SWG does not sufficiently cover the scientific field, external experts may be sought. This process was initiated at the Forum meeting in Trieste (25 September 2014) where ESFRI national delegations were asked to suggest further names of external experts who could support SWGs in their work. In talking to representatives of SWG Environment, it is clear this SWG has some marine expert representation. However, these SWG members highlighted a gap in marine representation for other SWGs. These included SWG Health and Food (including Life Sciences) where it was indicated proposals may be reviewed by more than one SWG. In addition, SWG Physical sciences and engineering which is almost 100% physics in three subdomains and 0% engineering and also lacks marine representation.

It is understood that whilst the SWG membership has been fixed, ESFRI may accept nominations of external experts may to ensure a sufficient pool of expertise for the assessment of the implementation of projects currently on the Roadmap and for the evaluation of new projects. This is identified as a potential opportunity for EMB MOs to nominate external experts to support the ESFRI SWGs, through contacting the National ESFRI Delegation. This may be particularly relevant in the mid- to longer-term perspective of the 2018 and 2020 ESFRI updates.

#### ***4.3. Landscape and gap analysis of Marine ESFRI projects and the wider MRIs (Section D; Q11-13)***

This section of the survey was designed to assess perspectives on gaps in the Marine Research Infrastructure landscape, including existing ESFRI and other existing RIs. Perceived gaps in the existing ocean observing system could be spatial (geographical region, deep sea), temporal, or thematic (e.g. variable/parameter gaps or sectors such as Aquaculture, Marine Genomics, Marine Renewable Energy).

In the Consultation Q11-13, EMB MOs were also asked to indicate how gaps could be addressed according to three potential ways forward:

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<sup>5</sup> Document 11 at the EMB Autumn Plenary 2014 in Rome, Italy (see full report and Annexes therein).

1. By extending the marine component of existing ESFRI RIs/e-RIs (major upgrade/re-orientation)
2. Proposing an existing MRI (not already on ESFRI) as a candidate to enter the ESFRI Roadmap in 2016, 2018 or 2020. NB. ESFRI has noted a higher level of maturity of RIs is required to enter the Roadmap.
3. Proposing a new MRI/e-MRI to address a real gap in the existing landscape. NB. ESFRI consider this a long-term process and recommend that new RIs do not apply for the Roadmap Update in 2016 but rather develop their Concept and Design stages before applying to enter the Roadmap in 2018, 2020 and beyond.

A full collation of responses to Q11-13 is presented in tabular form on the following pages.

Perspectives input to ESFRI Landscape and Gap analysis, November 2014: It should also be noted that at the time of the survey, the ESFRI SWGs were conducting a landscape and gap analysis of European research infrastructures, with final reports due in Spring 2015. In talking with SWG Environment, the EMB Secretariat identified a window of opportunity to submit preliminary perspectives on MRI gaps from the EMB MO consultation to inform the ESFRI SWG analysis. EMB perspectives are summarized below and reflect EMB MO responses to section D of the consultation received by 21 November 2014:

- **Strengthening the Marine components of relevant existing ESFRI projects** e.g. ICOS, SIOS, EPOS
- **Expanding the scope of EMSO** to: a) fully address open ocean water column observation (currently 13 project FixO3) and b) Link with astrophysics community to incorporate ESFRI KM3Net project into EMSO nodes.
- **Research Vessels and their underwater vehicles:** => New ESFRI building on EUROFLEETS, with ERVO network & Eurocean
- **Gliders:** Following FP7 GROOM there is a mature community/network but no ESFRI with a glider component EuroARGO could be expanded to include a glider component, or incorporated in new ESFRI on RVs/UVs.
- **Coastal observatories + biodiversity monitoring:** JERICO, EMBOS, ... => New ESFRI on Coastal observatories, ecosystems/biodiversity monitoring (e.g. to meet data/knowledge requirements for MSFD)
- **Data management:** SEADATANET, MY OCEAN, EMODNET, I-Marine, ..... => New e-MRI/ESFRI on Data management and dissemination to create an operationally robust and state-of-the-art Pan-European infrastructure for providing up-to-date and high quality access to ocean and marine metadata, data and data products
- **Deep ocean drilling:** ECORD, DEDI => New ESFRI Deep-ocean drilling capacity for research purposes => We understand a bid for a new ESFRI is in preparation (led by BGS, UK) for Marine and Non-marine sub-surface sampling (drilling/coring etc).

Q11. In your view, are any thematic gaps that could be addressed by extending the scope of MRIs (or wider RIs/e-RIs) already on the ESFRI Roadmap?

Name of existing ESFRI MRI	Thematic Area/Gap	Type of upgrade/reorientation/extension of scope required
<b>EMSO</b>	Arctic research	Extend to the entire Arctic ocean including all areas of research
	Deep ocean observing capacity to include seafloor and water column: towards advanced ocean observation applied to natural hazards, climate change, and marine ecosystems	Support for the development of an instrument package or generic sensor module to push the state-of-the-art, achieve full standardization, make data coherent and attractive for modelling community
	Idem, the perspective is also to provide homogeneous sensor setting between cabled and non-cabled EMSO nodes and promote water column instrumentation and new sites.	Towards incorporation of other kind of ocean fixed platforms, initiated by on-going FP7-I3 project FIXO3 which incorporate sea-floor stations and oceanic moorings. <a href="http://www.fixo3.eu/">http://www.fixo3.eu/</a>
<b>ICOS/EMSO</b>	Permanent monitoring at sea. In the present ICOS scope the focus is mainly on land stations with transect measured on ships of opportunity. Permanent measuring systems would provide more valuable information on actual processes.	Upgrade from ships of opportunity to deploying measuring systems on surface buoys. This could be connected to the EMSO network.
<b>Euro-Argo</b> (although Euro-Argo will be extracted from the list in 2016)	Euro-Argo floats are in a continuous upgrade process : deeper (< 2000m), under ice cover, with new sensors, electronic/energy performance, .... in line with E-AIMS development and follow-up.	Towards incorporation of other kind of ocean mobile platforms, like gliders' observational capacity (FP7 GROOM project)

**Table 4:** EMB MO perspectives on potential enhancements to existing ESFRI MRIs

One EMB MO noted the importance of keeping MRIs on the national roadmap in order to seek sustainable funding for membership fees and investment in capital equipment.

One EMB MO noted the actual marine component of most MRI on ESFRI roadmap appears rather limited and if there is a real marine component it is mainly a contribution towards the collection of data and not so much infrastructure that will be available to the research community for a prolonged period of time. Those projects on the ESFRI roadmap that do provide long-term availability of existing or new infrastructure (such as EMSO and SIOS) are not on our National Roadmap and will therefore not receive any major funding in the Netherlands. Other projects will use existing infrastructure (ships of

opportunity) or finance instrumentation but this will not contribute to the long-term availability of any new large research infrastructure for the use of the European science community.

One EMB MO noted it is not currently aware of any RIs seeking major upgrade/extension. We have had some discussion with EMSO and FixO3 regarding the retention of EMSO on the updated Roadmap.

Relatively early indications are that if EMSO has ERIC status, it is implemented and therefore does not need to be retained by ESFRI. At the same time, it is important to keep it on national roadmaps in order to seek sustainable funding for membership fees and investment in capital equipment.

### Other existing MRIs that could be candidates as future ESFRI projects (Q12)

*Q12. In your view, are there any existing MRIs not currently on the ESFRI Roadmap that should be proposed as a candidate project for future ESFRI Roadmap updates?*

Name of candidate MRI (not on ESFRI Roadmap)	Thematic Area/Gap it would address in ESFRI MRI Landscape	Current funding mechanism(s) for the MRI	Level of maturity of RI	Suggested date of application for entry onto ESFRI Roadmap
<b>AQUAEXEL / AQUAEXCEL-2</b>	Aquaculture was noted as a strategic area for Europe. The FP7 AQUAEXEL project was noted to be at concept and design phase with good facilities that would benefit from better integration, cooperation and interoperability. It was noted that work in this area has started by bringing Aquaexcel as a partner in a Cluster application (EMBRC) with ESFRI Infrastructures in H2020.	FP7 (submitted to H2020)	Concept and Design	2016
<b>Marinet</b>	MARINET, the Marine Renewables Infrastructure Network	FP7 (I3 project)	Implementation Phase	2016
<b>Copernicus</b>	An important facility for ocean-climate science	-	-	-
<b>Cryostat</b>	A critical earth observation platform for polar climate change, and provides the definitive observations of Arctic sea-ice decline. The platform instrument is also being developed for ocean observing.	-	-	-
<b>Eurofleets</b>	Research vessels  EMB MO indicated Research vessels as an important thematic area but the Eurofleets ruled out nomination to the ESFRI Roadmap as unnecessary since the I3 projects had worked well.	-	-	-

- (Name of project not provided)	Marine and sub-surface sampling  It was noted BGS are leading a bid (status unclear) to establish an ESFRI related to Marine and Non-marine sub-surface sampling (drilling/coring etc).	-	-	2016?
<b>WoRMS</b>	taxonomic infrastructure to couple databases on biodiversity research with taxonomic expertise	European Commission projects and service grants	MRI exist but needs coordination	Links: WoRMS: <a href="http://www.marinespecies.org/">http://www.marinespecies.org/</a> ; <a href="http://oceantrackingnetwork.org/">http://oceantrackingnetwork.org/</a> ; <a href="http://www.lternet.edu/">http://www.lternet.edu/</a>
<b>Ocean Tracking Network</b>	European component for tagging ocean animals	Government of Canada and partners	MRI exist but needs coordination	
<b>Long Term Ecological Research (LTER)</b>	European component for long term ecological research	National Science Foundation and other Federal agencies from the USA	MRI exist but needs coordination	
<b>JERICO I-II</b>	Coastal observation and forecasting	FP7/I3	Concept and Design/ Preparatory Phase	
<b>FixO3</b>	Integrated marine (open ocean) observation	FP7 / I3	Concept and Design/ Preparatory Phase	

**Table 5:** EMB MO perspectives on wider (existing) MRIs

In addition for one EMB MO, Marine Renewable Energy was seen as a National priority area.

One EMB MO noted an actual Marine RI is virtually absent on their National Roadmap. This may be partly due to the fact that development of Marine RI is extremely expensive, not only in construction but even more when exploitation is concerned.

Another EMB MO gave detailed perspectives on Marine Research Infrastructures spanning ESFRI to I3 identifying some blocks of similar skills and objectives which each could (ideally) become an European (ESFRI like) infrastructure when a certain degree of consensus and integration is demonstrated. Namely :

- EUROFLEETS, with ERVO network & Eurocean => Research vessels and their underwater vehicles
- JERICO, EMBOS, ... => Coastal observatories, ecosystems/biodiversity monitoring.
- SEADATANET, MY OCEAN, EMODNET, I-Marine, ..... => Data management and dissemination
- ECORD, DEDI => Deep-ocean drilling capacity for research purpose

With Euro Argo and EMSO, they can be the 6 RI pillars of the European Ocean Observing System (EOOS).

Add to that, 3 other blocks of Marine RI :

- MARINET, HYDRALAB/marine component => Ocean engineering, ocean energy testing facilities
- AQUAEXCEL, MESOAQUA, .. => Aquaculture research and its marine environment
- EMBRC (ESFRI), ASSEMBLE, ... => marine biology stations, from gene to species (instruments for fundamental research on marine life)

All these 9 “blocks” really cover quite all aspects of Marine RI directly in support of marine sciences :

- Already 3 “blocks” (Euro Argo, EMSO, EMBRC) are ESFRI infrastructures which are now (or will be at short term 2015-2016) operational EU infrastructure under ERIC statute.
- 4 “blocks” (EUROFLEETS, JERICO , MARINET, AQUAEXCEL ) are not that mature in terms of integration and they still need I3-like support for the coming years, their entry on ESFRI roadmap cannot be envisaged before 2018.
- ECORD and the I3 proposal DEDI (Distributed European Drilling Infrastructure) submitted to H2020 call INFRA-IA in Sept. 2014 is a very specific case, a new I3 but in the context of a well established international programme IODP : an entry on the ESFRI roadmap at term is a question which could be discussed at the end of this DEDI project, so for an entry not before 2020.

Marine data management was noted to be a more complex and multiform “block” with already well established initiatives : here, the challenge is more a sustainable harmonization of the initiatives to cover all the needs from data storage to data dissemination without gaps or overlaps, including relations with other environmental RI (through ENVRI+) and with the international partners and organization (through ODIP, ...). Here after in the need for new e-MRI, we actually stresses on SeaDataNet future as the core European infrastructure to network regional/national marine databanks with common standards, and data exchange and data access processes, for which a new I3 or exactly e-I3 is necessary.

*Q13. In your view, are there any thematic gaps that require a new MRI/e-MRI to be designed and constructed to add to the existing landscape that could in the future apply for ESFRI status?*

<b>Area/Gap</b>	<b>Does this require a MRI or e-MRI</b>	<b>Brief description of why a brand new MRI / e-MRI is required</b>	<b>Would this be pan-European or with possible international localization beyond Europe</b>
<b>Trans-Atlantic cooperation on ocean observation</b>	Yes, both	At this point the existing MRI are focusing on European waters but Europe should also take a leading role in observing the Atlantic Ocean	Pan European with international collaboration
<b>Long-term worldwide monitoring of ocean currents and atmosphere via fixed stations (moorings/buoys)</b>	Yes because it will involve major funding	Ocean currents are important for monitoring climate effects but also for social and economic reasons, such as natural resources and fisheries. At present, all monitoring is funded via 3 year projects, too short to see actual changes before the program finishes.	Yes, other major players like NSF (US) are funding large scales multi-year monitoring projects (the Ocean Observatories Initiative, OOI)
<b>Marine and Non-marine sub-surface sampling</b>	?	-	BGS are leading a bid to establish an ESFRI related to drilling/coring
<b>Marine stations</b>	?	Such marine stations offer key infrastructure for marine science. There are also issues training and maintaining the skilled personnel needed to develop and maintain marine stations and MRIs.	
<b>Data management</b>	Yes, e-MRI	Such e-MRI will upgrade and sustain the present e-infrastructure into an operationally robust and state-of-the-art Pan-European infrastructure for providing up-to-date and high quality access to ocean and marine metadata, data and data products by: <ul style="list-style-type: none"> <li>- setting, adopting and promoting common data management standards</li> <li>- realizing technical and semantic interoperability with other relevant data management systems and initiatives on behalf of science, environmental management, policy</li> </ul>	Links are already established with international players (US, Australia) to act towards protocol harmonization and data standardization (FP7 ODIP project)

		making, and economy At present, Seadatanet is the core European infrastructure to network regional/national marine databanks with common standards, and data exchange and data access processes.	
<b>European Ocean Observing System (EOOS)</b> (3 EMB MOs)	Yes, MRI		Yes for Baltic, Atlantic, Mediterranean, Black Sea. See NFIV for well-presented case for sustained European ocean observing system.  It is important to note that there are already a large number of Infrastructures either approved or in the pipeline. The funds to support these Infrastructures is limited and rather than creating new ones, the focus should be on clustering those that exist to fill gaps.
			There is a need for a really integrated marine European observing system (of systems) as declared in the Ostend and Rome Declaration (EOOS). This overarching initiative should at least coordinate all the existing observing systems like EuroArgo, EMSO, IAOOS, Arctic observing systems, JERICO, FixO3, Eurosites etc.
<b>Blue Biotechnology</b>	Suggested MRI	Suggested a European network of research/technical centers	
<b>TI concept: Fast developing IT, Communication, Robotics</b>	Future MRI e.g. for Marine Geosciences ?	Providing advanced, key technologies for present and future world-class European Research Infrastructures <sup>6</sup>	

**Table 6:** EMB MO perspectives on gaps in the existing MRI landscape (horizon scanning)

<sup>6</sup> <http://irfu.cea.fr/Phocea/Page/index.php?id=625>

One EMB MO noted that at present limited mooring initiatives are funded through national funding or European projects but this is always restricted to periods of only a few years instead of the long-term commitment that would be much more productive. If long-term financial support would be available this type of research could be truly multi-disciplinary because it would be of interest to biologists, physical oceanographers and chemists and it could also be of additional value to existing ESFRI Roadmap initiatives such as ICOS or EMSO but could also be the European counterpart of initiatives such as OOI.

One EMB MO noted that synergies between EMSO, FixO3, Marine wave energy and offshore aquaculture facilities have been discussed in general, rather than as a concrete strategy or focus.

#### 4. ESFRI activities time-line

Publication of the new Roadmap is anticipated in January 2016, with a target size of about 25 active projects. A time-table of activities is listed in Table below.

SWGs first meetings for Roadmap	Summer 2014
Proposals are transferred from ESFRI Executive Board to SWGs to be analyzed	Up to December 2014
ESFRI decides on final Drafting Group	November 2014
SWGs report to ESFRI EB and Forum at its regular meetings	On-going
ESFRI assessment of SWG draft reports	March-May 2015
ESFRI Drafting Group meetings	Ongoing 2015
First draft of the NEW ESFRI Roadmap	June 2015
Second draft of the NEW ESFRI Roadmap	August 2015
Final draft of the NEW ESFRI Roadmap + Finalization process	October 2015
Agreement of ESFRI	November 2015
Publication and press conference	January 2016

## Annex I

### Marine Research Infrastructures in ESFRI: EMB Member Survey on Priorities, Gaps and Future Investments

#### Aim of survey

In early 2016 the European Strategy Forum on Research Infrastructures (ESFRI) will publish an updated Roadmap of ESFRI projects. In parallel, Strategic Working Groups are conducting a wider landscape and gap analysis of European RIs. In view of these activities taking place in 2014-2016, the Secretariat is conducting this survey of EMB member organizations to compile information on national and institutional perspectives on status, gaps and future investment in the marine component of ESFRI Research Infrastructures (RIs and e-RIs) and wider Marine Research Infrastructures (MRIs). There are 4 sections to the survey:

- A. Organization and Contact Information
- B. National prioritization for ESFRI MRIs (this asks for the national position if available)
- C. Marine science engagement in the ESFRI Roadmap update process (EMB member organization perspective)
- D. Landscape and Gap analysis of Marine ESFRI projects and wider MRIs (EMB member organization perspective)

This information will be collated by the EMB Secretariat to:

- Provide EMB Member Organizations with a strategic overview of perceived gaps and priorities for MRIs.
- Inform ESFRI National Delegations and Strategic Working Groups of EMB perspectives on MRIs to feed into the Landscape and Gap analysis being conducted in 2014-2015.
- Assess existing engagement of the EMB community in the ESFRI Roadmap update process and ways for future involvement e.g. nominating experts to support the work of the ESFRI Strategic Working Groups 2014-2015 (through National ESFRI delegations).
- Facilitate EMB advocacy for existing MRIs to enter the ESFRI process and/or for new MRIs that fill a particular gap (Longer-term process for ESFRI Roadmap Updates 2018 and 2020).

**We invite EMB Member Organizations to complete this survey and submit your responses by 20 November 2014 to Kate Larkin ([klarkin@esf.org](mailto:klarkin@esf.org)) at the EMB Secretariat.**

#### Context: The ESFRI Roadmap update process 2014-2016 and beyond

On 24 September 2014, ESFRI launched the 2015-2016 Roadmap Update process at a workshop was held in Trieste, Italy<sup>7</sup>. **ESFRI have since opened a call for proposals (deadline March 2015) for RI/e-RI projects to enter the Roadmap in 2016.** Further updates to the ESFRI Roadmap are planned in 2018 and 2020. The Updated Roadmap 2016 will be smaller (25 projects) and new projects will now require a higher maturity of implementation to enter the Roadmap (e.g. an existing network, some concept, design and feasibility achieved). ESFRI have introduced a 10 year rule so that projects have 10 years from the time of entry onto the ESFRI Roadmap to become an operational RI. The 2016 Roadmap update will include 10-15 existing ESFRI projects and 8-10 new projects. ESFRI will assess new RI/e-RI projects based on scientific excellence, pan-European spread and implementation (management/governance) aspects. Existing projects have already had scientific excellence assessed and will be reviewed in terms of progress towards implementation<sup>8</sup>.

<sup>7</sup> <http://www.copori.eu/1392.php>

<sup>8</sup> Focusing on the maturity levels of financial and management aspects e.g. Cost and Financial Structure, Governance and Legal Structure, Stakeholder Engagement, Financial Commitments, Human Resources, Project Management

## A. Organization and Contact Information

1. Country .....

2. Organization Name .....

3. Organization type *Tick the relevant option(s) below*

Research Performing Organization	
Research Funding Organization	
National Network of universities conducting marine research	
Other (please explain)	

4. Contact Person .....

5. Email/other contact .....

## B. Assessing views on National prioritization for ESFRI MRIs

ESFRI has undertaken prioritization exercises during 2014<sup>9</sup>. In addition, in many countries National Roadmaps have also been produced for RIs and ESFRI. It would be useful to have an indication of the perceived priority at National level for MRIs on the existing ESFRI Roadmap and to assess the level of current engagement of the marine scientific community in the ESFRI process.

6. **Has your country produced a national roadmap for ESFRI and/or wider research infrastructures?**

*Tick yes/no. If possible provide a weblink and/or a contact person to the report*

Yes	
Further Comments	
No	

7. **What priorities does your country give to MRIs already existing in the ESFRI Roadmap?**

<sup>9</sup> [http://ec.europa.eu/research/infrastructures/pdf/ESFRI\\_projects\\_for\\_impl\\_7\\_april\\_2014.pdf](http://ec.europa.eu/research/infrastructures/pdf/ESFRI_projects_for_impl_7_april_2014.pdf)

There are 7 ESFRI projects on the 2010 Roadmap with specific Marine Research components (see summary table below)<sup>10</sup>. These are listed below and are at different stages of Implementation. The first MRI to become operational was Euro-Argo ERIC, the EU infrastructure contribution to Argo ocean observation programme<sup>11</sup>. For this reason, Euro-Argo is not included in this survey for questions on the level of prioritization/maturity. However, the thematic areas it addresses should be included in discussions on gaps in Section D.

ESFRI MRI	Description	Date entered ESFRI Roadmap
<b>LIFEWATCH</b>	e-Science EU Infrastructure for Biodiversity and Ecosystem research	Joined Roadmap in 2006; ERIC in preparation
<b>ICOS</b>	Integrated Carbon Observation system (atmospheric, terrestrial + marine)	Joined Roadmap in 2006; ERIC in preparation
<b>EMSO</b>	European Multidisciplinary Seafloor and Water Column Observatory	Joined Roadmap in 2006; ERIC in preparation (Candidate project for H2020 INFRADEV-3)
<b>KM3Net</b>	Astroparticle physics - underwater neutrino detectors	Joined Roadmap in 2006; Implementation of first phase since January 2013
<b>SIOS</b>	Upgrade of the Svalbard Integrated Arctic Earth Observing System	Joined Roadmap in 2008; Preparatory Phase
<b>EMBRC</b>	European Marine Biological Resource Centre	Joined Roadmap in 2008; Preparatory Phase

*For each project provide, to the best of your knowledge, an assessment on the national view in your country on the level of maturity of each project and when an ERIC signature is foreseen.*

*(Please tick as appropriate. You may provide additional information in the space allocated)*

*To aid your response, a summary of MRI ESFRI projects is also provided below.*

ESFRI MRI (on ESFRI Roadmap 2010)	High National priority: ERIC signature is expected by 2016	Medium-term Priority: ERIC signature is under discussion (expected by 2018)	Longer-term priority: Financial commitment is at early stage of discussion	Low priority: no funding commitment is foreseen by 2020
<b>LIFEWATCH</b>				
<b>Additional information:</b>				
<b>ICOS</b>				

<sup>10</sup> ESFRI assess RI/e-RI projects based on Scientific Excellence, pan-European spread and Implementation (management/governance) aspects.

<sup>11</sup> On 12th May 2014, Euro-Argo ERIC was officially awarded the Community legal framework for a European Research Infrastructure Consortium (ERIC) with 9 countries. An official inauguration took place on 17 July 2014 in Brussels.

<b>Additional information:</b>				
<b>EMSO</b>				
<b>Additional information:</b>				
<b>KM3Net</b>				
<b>Additional information:</b>				
<b>SIOS</b>				
<b>Additional information:</b>				
<b>EMBRC</b>				
<b>Additional information:</b>				

**8. Can you provide details on your national prioritization of any other ESFRI projects with marine / MRI components?**

<b>ESFRI project with marine component (on ESFRI Roadmap 2010)</b>	<b>High National priority:</b> ERIC signature is expected by 2016	<b>Medium-term Priority:</b> ERIC signature is under discussion (expected by 2018)	<b>Longer-term priority:</b> Financial commitment is at early stage of discussion	<b>Low priority:</b> no funding commitment is foreseen by 2020

***C. Assessing views on marine science engagement in the ESFRI Roadmap***

Please answer the following questions from your institutional perspective.

9. How do you already engage with your National ESFRI Delegation? *Tick all that apply.*

	Tick all that apply	Further explanation
For setting national priorities/ Roadmap development		
As members of the ESFRI Strategic Working Groups		
To nominate experts to support the Strategic Working Groups		
As a Coordinator or partner of a RI already on the ESFRI Roadmap (state name(s))		
As a Coordinator or partner for a RI not currently on the ESFRI Roadmap (state name(s))		
Other (provide further details)		
No current interaction with National ESFRI Delegation		

10. Are you involved in ESFRI Strategic Working Groups as members or associated experts?

*Tick all that apply.*

Members of SWGs are appointed by ministries and represent countries (maximum of 1 representative per country<sup>12</sup>). There is an opportunity for external experts to be nominated to support SWGs in the assessment of the implementation of projects currently on the Roadmap and for the evaluation of new projects.

Strategic Working Group (as defined by ESFRI)	Member of SWG	Expert(s) already nominated to support SWGs	Not involved
Energy			
Environment			
Health and Food (NB. includes some Life			

<sup>12</sup> See presentations online at <http://www.copori.eu/1392.php>

<b>Sciences)</b>			
<b>Social and Cultural Innovation</b>			
<b>Physical Sciences and Engineering</b>			
<b>e-Infrastructure</b>			
<b>Other (please specify)</b>			

**Additional comments:**

## **D. Assessing views on the Marine ESFRI projects and the wider MRI landscape**

In parallel to the call for new ESFRI projects, the ESFRI Strategic Working Groups are currently undergoing a Landscape and Gap analysis of Research Infrastructures. This will include existing ESFRI and other existing RIs. EMB would like to assess your views and perspectives on gaps in the MRI landscape and how these could be addressed. Perceived gaps in the existing ocean observing system could be spatial (geographical region, deep sea), temporal, or thematic (e.g. variable/parameter gaps or sectors such as Aquaculture, Marine Genomics, Marine Renewable Energy).

There are 3 potential ways to address gaps in Marine Research Infrastructures:

5. By extending the marine component of existing ESFRI RIs/e-RIs (major upgrade/re-orientation)
6. Proposing an existing MRI (not already on ESFRI) as a candidate to enter the ESFRI Roadmap in 2016, 2018 or 2020. NB. ESFRI has noted a higher level of maturity of RIs is required to enter the Roadmap.
7. Proposing a new MRI/e-MRI to address a real gap in the existing landscape. NB. ESFRI consider this a long-term process and recommend that new RIs do not apply for the Roadmap Update in 2016 but rather develop their Concept and Design stages before applying to enter the Roadmap in 2018, 2020 and beyond.

## Enhancing the marine component of existing ESFRI RIs/e-RIs

**11. In your view, are there any thematic gaps that could be addressed by extending the scope of MRIs (or wider RIs / e-RIs) already on the ESFRI Roadmap? E.g. through a major Upgrade/Reorientation of existing RI (or e-infrastructure)**

Name of existing ESFRI MRI suggested for major upgrade/reorientation	Thematic Area/Gap it should address	Type of upgrade/reorientation/extension of scope required

**Additional comments:**

## Proposing existing MRIs as candidates for future ESFRI Roadmap Updates (2016, 2018, 2020)

**12. In your view, are there any existing MRIs not currently on the ESFRI Roadmap that should be proposed as a candidate project for future ESFRI Roadmap updates?**

Name of candidate MRI (not on ESFRI Roadmap)	Thematic Area/Gap it would address in ESFRI MRI Landscape	Current funding mechanism(s) for the MRI e.g. EU (FP7, H2020) e.g. National capability	Level of maturity of RI e.g. - Concept and Design - Preparatory Phase - Implementation Phase - MRIs exist but need coordination	Suggested date of application for entry onto ESFRI Roadmap Choose from 2016, 2018, 2020

Additional comments:

**Gaps that require a new MRI/e-MRI**

**13. In your view, are there any thematic gaps that require a new MRI / e-MRI to be designed and constructed to add to the existing landscape. that could in the future apply for ESFRI status?**

Area/Gap	Does this require a MRI or e-MRI ?	Brief description of why a brand new MRI / e-MRI is required	Would this be pan-European or with possible international localization beyond Europe?

Additional comments:

*Thank you for completing this survey ! Please submit to Kate Larkin ([klarkin@esf.org](mailto:klarkin@esf.org)) by 20 November 2014.*