



Deliverable D 9.1

Training analysis report

Date: September 2016



HORIZON 2020 - INFRADEV
Implementation and operation of cross-cutting services and solutions
for clusters of ESFRI

Grant agreement no.: 654008
Project acronym: EMBRIC
Project website: www.embric.eu
Project full title: European Marine Biological Research Infrastructure cluster to promote the Bioeconomy

Project start date: June 2015 (48 months)
Submission due date : June 2016
First submission date: July 2016
Actual submission date: September 2016

Work Package: WP 9 - Training and exchange of best practice
Lead Beneficiary: Universiteit Gent (UGent 16)
Version: 2.0
Authors: Dr. Thibaud Mascart
Prof. Dr. Ann Vanreusel
Dr. Tim Deprez

| | | |
|---|---|----------|
| Project funded by the European Union's Horizon 2020 research and innovation programme (2015-2019) | | |
| Dissemination Level | | |
| PU | Public | X |
| PP | Restricted to other programme participants (including the Commission Services) | |
| RE | Restricted to a group specified by the consortium (including the Commission Services) | |
| CO | Confidential, only for members of the consortium (including the Commission Services) | |

Abstract

The discovery, development and exploitation of marine derived products for research and commercial development requires a skilled workforce to 1) select, harvest and manipulate resources, 2) to treat the generated data and foster new technologies, 3) to retrieve the economic potential, and 4) to overcome current and future interconnectivity barriers. Therefore, the European Marine Biological Resource Infrastructure Cluster (EMBRIC) brings together and creates innovative training to meet the workforce requirements to foster innovation in marine biotechnology.

This report presents an overview of existing trainings in the fields of discovery and development of marine natural products and marker-assisted selection in aquaculture within and outside the clusters' Research Infrastructures. Additionally, recommendations and SWOT-analysis on trainings and education will enhance the pace of scientific discovery and innovation from marine bioresources.



Table of Contents

| | | |
|----------|---|-----------|
| 1 | Introduction..... | 3 |
| 2 | EMBRIC’s training rationale..... | 6 |
| 3 | Methodology | 8 |
| 4 | Outcome..... | 9 |
| 4.1 | Recent complementary networks, projects, platforms & infrastructures | 9 |
| 4.2 | Existing EMBRIC cluster training initiatives | 22 |
| 5 | EMBRIC training framework..... | 31 |
| 5.1 | SWOT-analysis | 31 |
| 5.2 | An overarching joint EMBRIC training platform..... | 33 |
| 6 | Recommendations for future EMBRIC trainings | 34 |
| 6.1 | RI specific bottlenecks..... | 34 |
| 6.2 | Transversal opportunities..... | 34 |
| 6.3 | EMBRIC training structure..... | 35 |
| 6.4 | Assessment of EMBRIC knowledge transfer..... | 36 |
| 7 | Conclusion | 37 |



Glossary and abbreviations

| | |
|----------|--|
| BMS RIs: | Biological and medical research infrastructures |
| BSc: | Bachelor of Science |
| CPD: | Continuing Professional Development |
| EMBRC: | European Marine Biological Resource Centre |
| EMBRIC: | European Marine Biological Research Infrastructure Cluster |
| EMTRAIN: | European Medicines Research Training Network |
| ESFRI: | European Strategy Forum on Research Infrastructures |
| ERA-NET: | European Research Area Network |
| EU: | European Union |
| EC: | European Commission |
| FP7: | Seventh Framework Programme |
| HCB: | Human Capacity Building |
| IAP: | Integrating Activity Project |
| IMI: | Innovative Medicines Initiative |
| JDA: | Joint Development Activity |
| MOOC | Massive Online Open Course |
| MSc: | Master of Science |
| PhD: | Doctor of Philosophy |
| SWOT: | Strengths, weaknesses, opportunities, and threats matrix, a structured evaluation and planning method |
| RDI: | Research Development and Innovation |
| RI: | Research Infrastructure, a site-specific cluster of research groups and tools that provide essential services for basic or applied research. |
| WP: | Work package |



1 Introduction

EMBRIC work package (WP) 9 Training and exchange of best practice has the objective to build a supporting framework to assist in the organization and dissemination of training initiatives from participating Research Infrastructure (RI) and associated centres of excellence for EMBRIC staff and end users. This involves identifying the ongoing training initiatives related to the exploration and exploitation of marine bioresources; facilitating dissemination of information about training opportunities to the entire community of end-users; and supporting the establishment of new innovative training offers.

Task 9.1 Mapping and matching training offer and needs is led by the Ghent University (UGent), partner no. 16. All partners involved in EMBRIC run different ongoing training initiatives for staff and users involved in the exploration and exploitation of marine bioresources. To harmonize and more efficiently exploit this potential, this task will produce an inventory of existing training offers related to the objective of EMBRIC. WPs 2-8 were consulted to clearly identify the needs for specific training along the whole chain of exploration and exploitation of marine bioresources. A gap analysis of training offer and needs will then be undertaken.

Mapping of existing training offer was done based on information received from partners and acquired from strategic documents of associated centre of excellence and participating RIs in order to cover all EMBRIC partners. The partners training and education offer covers a broad range of qualification levels such as second (MSc), and third (PhD) cycle education as well as Continuing Professional Development (CPD). Setting up MSc and PhD programmes within the EMBRIC framework would consume considerable time and resources and is outside the scope of this project. Therefore, it has been decided to focus solely on CPD or short courses as these are more accessible to established professionals and are more flexible to the incorporation of state of art content.

Deliverable 9.1 Training analysis report is a first output of EMBRIC WP 9 and is the main outcome of task 9.1. The objective is to generate an overview of what the EMBRIC consortium partners and individual RI partners offer as short courses that fall under the EMBRIC scope. Consequently, key bottlenecks and gaps in training provision will be identified in order to optimize and increase end-users skills.

WP9 undertook to map the specific CPD 'biotechnology and mariculture' training within the participating RIs and partner institutions of EMBRIC during year one. The content was matched to the opportunities present in the marine bioresources development chain from exploration to exploitation and recommendations were formulated to encourage and enable the establishment of new EMBRIC training opportunities or link existing capacity building initiatives.



To ensure that information on training initiatives reaches targeted end-users, a publicly accessible integrated EMBRIC training information portal (part of deliverable 9.2 & 9.3) has been setup and made available through the project website: <http://www.embric.eu/training>

This interactive and user friendly knowledge transfer dissemination platform (Figure 1) displays a non-exhaustive overview of existing training in the fields of EMBRIC's value chain of discovery and development of marine natural products and marker-assisted selection in aquaculture from within and outside the participating Research Infrastructure (RI) and associated centres of excellence.

The screenshot displays a training portal interface with the following components:

- Year Filter:** 2015 (2), 2016 (10), 2017 (2)
- Filter by venue country:**
 - Belgium (3)
 - Italy (2)
 - Portugal (2)
 - Czech Republic (1)
 - Denmark (1)
 - France (1)
 - Germany (1)
 - Ireland (1)
 - Switzerland (1)
 - United Kingdom (1)
- Filter by venue city:**
 - Faro (2)
 - Vaalbeek (1)
 - Copenhagen (1)
 - Galway (1)
 - Geneva (1)
 - Ghent (1)
 - Helgoland (1)
 - Napoli (1)
 - Oban (1)
 - Ostend (1)
 - Pavia (1)
 - Roscoff (1)
- Filter by provider:**
 - Universiteit Gent (Ghent University) (3)
 - Centro de Ciências do Mar (CCMAR) (2)
 - EuroMarine (2)
 - Galway Mayo Institute of Technology (1)
 - GreenBridge (1)
 - International Council for the

Training Courses:

- Social Science Methods for Natural Scientists**
 - Language: English
 - Venue: Copenhagen, Denmark
 - Start date: 13 Oct 2016
 - Provider: International Council for the Exploration of the Sea (ICES)
- Workshop in Marine Genomics**
 - Language: English
 - Venue: Faro, Portugal
 - Start date: 14 Sep 2016
 - Provider: Centro de Ciências do Mar (CCMAR)
- UGent Blue Growth Summerschool**
 - Language: English
 - Venue: Ostend, Belgium
 - Start date: 12 Sep 2016
 - Provider: Universiteit Gent (Ghent University), GreenBridge, TUA West
- Molecular and physiological regulation of medical and environmental microbial biofilms**
 - Language: English
 - Venue: Vaalbeek, Belgium
 - Start date: 12 Sep 2016
 - Provider: Universiteit Antwerpen (University of Antwerp), Universiteit Gent (Ghent University), KU Leuven
- Workshop on statistical genetics**
 - Language: English
 - Venue: Faro, Portugal
 - Start date: 8 Sep 2016
 - Provider: Centro de Ciências do Mar (CCMAR)
- Molecular Microbial Ecology**
 - Language: English
 - Venue: Helgoland, Germany
 - Start date: 5 Sep 2016
 - Provider: Universität Bremen (Bremen University)
- Summer School: Marine Ecological & Environmental Genomics (MEEG, 12th edition)**

Figure 1. Screen shot of the training page on the EMBRIC webpage

The screenshot taken at the beginning of July 2016 (Figure 1) represents a random selection of CPD short courses on potential topics in relation to EMBRIC. This dynamic



page will remain online during the lifetime of the EMBRIC website and will be on regular base updated with new opportunities from EMBRIC partners and external partners related to the RIs. In order to enhance the role and supporting framework capacity of EMBRIC, every partner of the consortium and every partner of the individual RIs and excellence centres are invited to share available CPD training with the EMBRIC's knowledge transfer dissemination platform.

EMBRIC will train potential users and in-house professionals of service providers as an integral part of the activity of each EMBRIC RI. EMBRIC will identify gaps in training provision, interconnect existing training programs, if feasible, and foster new training initiatives specifically to the requirements of the biotechnology and mariculture domain and direct staff and users of EMBRIC with solutions for an improved access to relevant training.



2 EMBRIC's training rationale

The high economic potential of (marine) biotechnologies¹ (i.e. the application of science and technology to living organisms, as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services) remains today largely underexploited. The development of the marine biotechnology sector is hindered by operational issues preventing the scientific community from fully exploring marine biological resources; by practical and cultural difficulties in connecting science with industry and by high fragmentation of regional innovation ecosystems in marine biotechnology throughout Europe. To overcome these barriers, increased connectivity is needed between RIs and their communities of users, between science and industry, as well as between the RIs and the Research Development and Innovation (RDI) policies in the European maritime regions.

Consequently, EMBRIC will link biological and social science research infrastructures. These united RIs provide access to the full spectrum of diversity of marine organisms (EMBRIC) or are specialized in the provision of specific groups of organisms (MIRRI: prokaryotes and fungi; AQUAEXCEL: finfish). Using these biological resources as raw materials, the cluster will develop service-oriented workflows for natural products discovery and for genetic selection in aquaculture. EU-OPENSOURCE contributes its services and expertise in the area of natural product discovery, while AQUAEXCEL does likewise in the aquaculture domain. ELIXIR provides cross-cutting expertise on data services and management. The cluster also includes the coordinator of the social sciences Integrating Activity project RISIS, specialized in the analysis of innovation ecosystems across Europe, which will be involved in establishing the technology transfer identity of EMBRIC. Case studies are designed to help testing and refining these workflows through Joint Development Activities (JDAs). This internal testing will be complemented by providing access of EMBRIC services to external user communities. Furthermore, with this strategy EMBRIC complies with the European Commission (EC) strategic goal to become “the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion². Moreover, the EC positioned education and training as long-term strategic objectives to enhance creativity and innovation, including entrepreneurship and highlighted that only through the creation

¹ Definition provided by the Organisation of Economic Co-operation and Development (OECD)

² Presidency conclusions. Lisbon European Council. 23-24 March 2000

http://www.europarl.europa.eu/summits/lis1_en.htm



of a suitably qualified and skilled workforce the European economic potential to deliver new jobs and growth in the coming years will occur^{3, 4}.

It is in this framework that EMBRIC will provide skills to a larger community of users than any single participating RI. It will enable more precise and complete matching of user demands with service supply than could be achieved within the constraints of partnerships between individual RIs, let alone between individual partner facilities within given RIs. In collaboration with other European initiatives linked to marine biotechnology and mariculture, a coherent body of knowledge management activities and tools for staff and users will be developed. Knowledge will be disseminated through targeted training, generic communication activities, and capacity building.

³ European Council conclusions on a strategic framework for European cooperation in education and training ('ET 2020'). 12 May 2009.

<http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2009:119:0002:0010:EN:PDF>

⁴ COM (2014) 254 Innovation in the Blue economy: realizing the potential of our seas and oceans for jobs and growth. <http://cor.europa.eu/en/activities/stakeholders/Documents/COM%282014%29254%20final.pdf>



3 Methodology

The EMBRIC consortium comprises 27 partners of four different sectors (academia, research institutes, non-for-profit association and industry) from four ESFRI Research Infrastructures (EMBRIC, MIRRI, EU-OPENSCREEN, ELIXIR) and two Integrating Activity projects (AQUAEXCEL and RISIS). The six RIs and integrating activities are at different stages of implementation and several of them already answered extensive surveys tackling future training needs. Consequently, mapping of existing training offers was done based on information received from partners and acquired from strategic documents of associated centre of excellence and participating RIs.

As mentioned previously, a broad range of qualification levels such as second (MSc), and third (PhD) cycle education as well as Continuing Professional Development (CPD) are covered in already existing programmes and training schemes. For example, see www.marinetraining.eu for an overview of marine specific courses and programmes. Consequently, in order to stay within the scope of this deliverable, solely CPD or short courses will be listed.

As to the CPD, a general survey was conducted to identify similar training activities from complementary project frameworks, platforms and infrastructures. Here, are presented the recommendations from those projects. Needs formulated in Biological and Medical Science Research Infrastructures already yield specific skills gaps and emerging training opportunities, shaping the potential spectrum of emerging educational needs in marine biotechnology.

Finally, the tables under Point 6 show the availability of training of the EMBRIC associated 'complementary' European networks (Table 1) and Research Infrastructures and Integrating Activity Projects (Table 2).



4 Outcome

4.1 Recent complementary networks, projects, platforms & infrastructures

The following table 1 presents the recent complementary European networks, projects, platforms and infrastructures that generated training activities or that generated recommendation towards the future for Marine Biotechnology and Mariculture CPD training. The results are ordered chronologically per end of project year.

| EMTRAIN | |
|---------|--|
| What | European Medicines Research Training Network |
| Funding | FP7, 2007-2013 |
| Website | www.emtrain.eu |
| Goal | EMTRAIN is an umbrella organisation for the Innovative Medicines Initiative (IMI) Education & Training programs, for instance, Eu2P, PharmaTrain, SafeSciMET and EUPATI, that established a pan-European platform for education and training. Together with the biomedical industry, EMTRAIN created a network that responds to existing and emerging training and education needs within disciplines related to medicines research and development. EMTRAIN purpose is to boost biopharmaceutical innovation in Europe and facilitate cross-border education needs. Therefore EMTRAIN has developed on-course [®] (www.on-course.eu), a comprehensive biomedical and medicines research course portal. It integrates a large number of courses from universities, research institutes with a training mission and private-sector training companies. EMTRAIN commits to and promotes defined quality standards for courses and programs, builds a repository of learning tools and methodologies, and engages professional/scientific bodies, employers and course providers to find agreement on a |



| | |
|---|---|
| | European framework for Continuous Professional Development (CPD) in the context of life-long learning. |
| Recommendations and added value for EMBRIC training | <ul style="list-style-type: none"> ● The current organisation of universities facilitates building ‘silos’ where each scientific area has its own life without much interaction with other areas. This is contributing to the fragmentation of European research ● In most European countries, the interaction between scientists in academia, industry, and regulatory authorities is minimal and often the movement of intellect is uni-directional towards the industry. However scientists from academia and regulatory agencies need to be involved and have access to knowledge and technology transfer ● European education needs to strive for excellence and competitive systems need to be put in place for continuous improvement of the scientific level in Europe. ● Consultations with stakeholders to further analyse the gaps within education and training has to be performed in parallel to the creation of a pan-European platform for research training and technology development supporting the medical and biotechnological development and approval process. |
| MG4U | |
| What | Marine Genomics for Users |
| Funding | FP7, 2011-2013 |
| Website | www.mg4u.eu |
| Goal | Marine genomics has enormous potential to improve our lifestyles and prosperity, and to assist with governance and sustainable management of the marine environment. Today, marine genomics knowledge is a vital part of “blue |



| | |
|--|--|
| | <p>biotechnology”, and leads to applications in the management of natural and cultured resources, and preserving marine environments. However, many business leaders and legislators are not yet aware of how marine genomics hold great potential for problem solving and industrial commercial advantage. Valuable knowledge needs to be made accessible and disseminated in user-friendly contexts. In this context, the EU support action Marine Genomics for Users (MG4U) will facilitate knowledge transfer, technology transfer, and technology translation between high-throughput marine genomics, industry and society.</p> |
| <p>Recommendations and added value for EMBRIC training</p> | <p>Training modules offered by MG4U partners were customized to the needs of the specific target community, e.g. junior academic researchers, industry researchers, and policy representatives. Two principal approaches were used, either modifying existing and well-established courses to fit the MG4U purpose, or designing completely new training modules for the MG4U purpose. Training was typically provided in the format of workshops and courses, and the content was documented in form of short course reports. Immediate (i.e. short-term) feedback was collected from the attendees at the end of each training program. The course reports were used to document and compare the training programs, while the feedback reports were used to improve the course format and contents for the next training events. MG4U developed a methodology to measure the impact of the training activity in the stakeholder community. Impact assessments were conducted through short questionnaires or interviews with participants, approximately six months after the training. In addition, all follow-up activities and correspondence arising from the original training events were documented. Questionnaires and short interviews were appropriate to follow up courses with young academic researchers, while direct and individual correspondence was more appropriate to follow up training events with senior representatives from policy and industry bodies. MG4U recommended applying the developed methodology for efficient Knowledge Transfer in other research programs and research infrastructures.</p> |



| | |
|--|--|
| | <p>In addition, knowledge transfer to the industry was tackled by MG4U. The results led the consortium to agree that the Knowledge Transfer activity should focus on facilitating direct contacts to industry, more than organising training sessions, and having dedicated sessions on MG topics at industrial events. To focus on facilitating direct contacts, marine genomics scientists were motivated to attend partnering talks and put more effort into making the knowledge outputs selected for industrial application accessible, i.e. via fact sheets.</p> |
| <p>Aqua-tnet</p> | |
| <p>What</p> | <p>European Thematic Network in the field of aquaculture, fisheries and aquatic resources management</p> |
| <p>Funding</p> | <p>Lifelong Learning Programme, 2011-2014</p> |
| <p>Website</p> | <p>www.aquatnet.com</p> |
| <p>Goal</p> | <p>Aqua-tnet is the largest multidisciplinary European Education Network in the field of aquaculture, fisheries and aquatic resources management. Aqua-tnet continues its leading cooperative role between higher education institutions and other partners such as academic organisations, research institutions and industry, aiming to enhance quality and to define and develop a European dimension within its academic disciplines. Its multi-faceted approach has enabled Aqua-tnet to make a real contribution to uniting academic and vocational aspects of the Bologna reforms, aiming for greater compatibility and comparability of the systems of higher education in Europe.</p> |
| <p>Recommendations and added value for EMBRIC training</p> | <p>Consultation meeting with Aqua-tnet agreed that a combination of traditional training and e-learning (on-line or part face-to-face and part online) should be delivered, budget and time permitting. Priority could be given to transversal topics, for instance: Project management; Time management; Scientific communicating in general; Data</p> |



| | |
|---|--|
| | management and statistics: data collection, experimental design, survey design, data storage, data exploration and data analysis. |
| InTerAct | |
| What | Industry-Academia Interaction in the Marine Sector |
| Funding | Nordic Marine Innovation Programme 2012-2014 |
| Website | http://nordicinnovation.org/projects/marine-innovation-projects/interact-industry-academia-interaction-in-the-marine-sector/ |
| Goal | <p>The InTerAct project “Industry - Academia Interaction in the Marine sector”, was initiated to explore the education needs of the aquatic food industry and to identify the interest areas of students that qualify for higher education programmes such as the international master programme AQFood Aquatic Food Production - Safety and Quality (www.aqfood.org). The main activities of the InTerAct project were aimed at positioning the higher education programme and creating new ways to recruit students. The InTerAct project was a collaboration between social scientists, communication experts and the AQFood consortium from Nordic universities. The disciplines in the consortium were food science/technology, biology, chemistry, engineering and aquaculture with experts who were focusing their research on aquatic food production and processing and challenges of the aquatic food value chain.</p> |
| Recommendations and added value for EMBRIC training | <ul style="list-style-type: none"> ● Information about the various activities and the dynamic and innovative characteristics of the marine industry should be disseminated much more effectively to the public. ● Despite the diversity of the seafood sector in the Nordic countries all participants believed that the educational level of the industry should be improved. |



| | |
|--|---|
| | <p>They expressed a great need for people with higher education dedicated to the marine industry and were interested in a closer collaboration between the academia and the industry sector as an effective approach to enhance the education level in companies and boost innovation.</p> <ul style="list-style-type: none"> • Industry and higher education need to communicate to students the value of academic skills for the industry and demonstrate that job opportunities within the seafood business include working on innovative technologies, innovation, research, quality and environmental issues linked to sustainable development of the seafood sector. • Collaboration of industry and academia has been identified as one of the key drivers to enhance innovation in companies as well as preparing students for future carriers. Communication barriers between industry and academia may however arise because of different expectations towards higher education, the qualification of students may not fit to the need of the industry, and competitive business issues may hinder collaboration. There are various established forms of collaboration i.e. visits to companies, collaboration in R&D projects, short term study visits in companies, and various internship practices, which enhance the employability of students after graduation. |
|--|---|

Micro B3

| | |
|---------|---|
| What | Marine microbial biodiversity, bioinformatics and biotechnology |
| Funding | FP7, 2011-2015 |
| Website | www.microb3.eu |



| | |
|--|--|
| <p>Goal</p> | <p>Micro B3 (Marine Microbial Biodiversity, Bioinformatics, Biotechnology) develops innovative bioinformatics approaches and a legal framework to make large-scale data on marine viral, bacterial, archaeal and protists genomes and metagenomes accessible for marine ecosystems biology and to define new targets for biotechnological applications. Micro B3 builds upon a highly interdisciplinary consortium of academic and industrial partners comprising world-leading experts in bioinformatics, computer science, biology, ecology, oceanography, bioprospecting and biotechnology, as well as legal aspects.</p> |
| <p>Recommendations and added value for EMBRIC training</p> | <p>Six specific short-term training courses focused on bioinformatics were held during the duration of the project (2012-2016).</p> <ul style="list-style-type: none"> ● Bioinformatics for Beginners (2012, Bremen, DE, 11 trainees) ● Biodiversity Statistics (June 2013, Bremen, DE, 21 trainees) ● Marine Metagenomics Bioinformatics (Spring 2014, EBI Training Centre, UK, 24 trainees) ● Multi-disciplinary Summer School (May/June 2014, Crete, GR, 21 trainees, four local tutors) ● Micro B3 OSD Analysis Workshop/Jamboree (March 2015 at EBI Training Centre, UK, 30 trainees) ● KyroBio Masterclass (Spring 2015, Univ. Groningen, NL, 28 trainees) <p>The specificity here was the mid-term evaluation of the first courses to redirect and enhance the following courses to match the specific needs of the trainees.</p> |
| <p>Marine Board WG</p> | |
| <p>What</p> | <p>European Marine Board Expert Working group on Marine Graduate Training (Training the 21st Century Ocean Scientists)</p> |



| | |
|--|---|
| Funding | N/A, 2014-2016 |
| Website | http://marineboard.eu/marine-graduate-training |
| Goal | <p>The European Marine Board develops common positions on research priorities and strategies for European marine science, facilitating enhanced cooperation between stakeholders involved in supporting, delivering and using marine research and technology.</p> |
| <p>Recommendations and added value for EMBRIC training</p> | <p>The Marine Board expert working groups are composed of high-level European scientists and experts and the graduate training group examined the very complex educational landscape that currently produces our professional marine experts, identified some of the key issues and challenges faced by educators, and made recommendations on how to improve marine higher educational training in Europe. Amongst others:</p> <ul style="list-style-type: none"> ● Include transferable skills in marine training programmes ● Promote best practice exchanges and co-design of training programmes between sectors e.g. internships, work experience, practical training, invited lectures ● Include policy and industrial components through science-industry cooperation ● Enhance the visibility of marine courses and careers ● Attract more students in marine courses, emphasising the multidisciplinary approach and the needs analysis for blue careers (i.e. aquaculture & blue biotech) ● Earmark funding to marine training (e.g. as part of research oriented / technological programmes) <p>The European Marine Board publishes on a regular basis pan-European summaries of the current state of marine research. The next 'Navigating the Future V (Marine Board Position Paper 21): Training the marine professionals of the future – A new vision for marine graduate programmes in Europe is expected in 2016.</p> |



| | |
|---|--|
| ERA-MBT | |
| What | ERA-NET Marine Biotechnology |
| Funding | FP7 ERA-NET, 2013-2017 |
| Website | www.marinebiotech.eu |
| Goal | <p>The vision of the ERA-MBT project is to support Europe's marine biotechnology community to participate in a lasting enterprise-driven network that adds value to marine biological resources in ways that nurture and sustain the lives of European citizens. The ERA-MBT is therefore designed to deliver better coordination of relevant national and regional Research, Technology, Development and Innovation (RTDI) programmes in Europe, reducing fragmentation and duplication, and paving the way for common programmes and cooperation in the provision and use of research infrastructures. A necessity to make sustainable use of this unique resource. Additionally, at least three transnational calls will address these challenges, and cooperation with complementing activities will be explored to add value and power to enable the development of a horizontally applicable technology like marine biotechnology.</p> |
| Recommendations and added value for EMBRIC training | <p>ERA-MBT surveyed the existing education or training programs within a marine biotechnology context (including fundamental knowledge and education on integrative biology of marine organisms and biotechnology exploitation). The results can be visualised here http://www.marinebiotech.eu/marine-training. Several recommendations were summarized as follow: Various topics including acquisition of 'soft' skills in management, business, economics and entrepreneurship, and insight into legal and IP/ABS issues, including Nagoya protocol status</p> |



| | |
|---|---|
| | and implications should be supported. The survey yielded the existence of 29 Blue Biotechnology programmes (22 MSc, 7 PhD) and 4 CPD short courses amongst the ERA-MBT members. |
| COFASP | |
| What | Cooperation in Fisheries, Aquaculture and Sea food Processing' |
| Funding | FP7 ERA-NET 2013-2017 |
| Website | www.cofasp.eu |
| Goal | <p>COFASP is an ERA-NET based on the earlier ERA-NET MariFish and the ERA-NET SEAS-ERA, directly addressing actions envisaged within fisheries, aquaculture and seafood. The main objectives of COFASP are:</p> <ul style="list-style-type: none"> ● To lay the basis for exploitation according to the precautionary principles and to enhance innovation in and competitiveness of the primary sectors fisheries and aquaculture as well as subsequent seafood processing and distribution to the consumer. ● To define the science, information and data necessary to underpin the revision of the CFP and to ensure its successful implementation by designing complementary national research programmes and outlining monitoring and information/data sharing systems needed. |
| Recommendations and added value for EMBRIC training | <p>The COFASP analysis and report on contents of common programmes points to the following priorities in the field of aquaculture training:</p> <ul style="list-style-type: none"> ● Development of decision-making tools to appraise the economic, social and environmental costs and benefits of different uses of resources |



| | |
|---|---|
| | <ul style="list-style-type: none"> • In assessment of quality of harvested fish production, in order to increase its value also through the release of Protected Designation of Origin (PDO) brands • Develop methods to manage diseases affecting aquaculture to improve productivity and reduce risks to wild populations • Investigate the potential for genetic improvements in production efficiency traits in domestic fish strains such as improving feed conversion efficiency and reducing the quantity of waste to reduce the environmental footprint and increase competitiveness of the aquaculture industry |
| CORBEL | |
| What | Coordinated Research Infrastructures Building Enduring Life-science Services |
| Funding | H2020, 2015-2019 |
| Website | http://www.corbel-project.eu/ |
| Goal | CORBEL is an initiative of eleven new biological and medical research infrastructures (BMS RIs), which together will create a platform for harmonised user access to biological and medical technologies, biological samples and data services required by cutting-edge biomedical research. CORBEL will boost the efficiency, productivity and impact of European biomedical research. |
| Recommendations and added value for EMBRIC training | In CORBEL 11 BMS RIs, join forces to establish innovation pipelines. The 4 RIs of EMBRIC (Elixir, EMBRC, EU-OPENSOURCE and MIRRI) are participating in CORBEL. Regarding training, CORBEL's main target audience is technical operators of RIs in BMS RI hubs and nodes. Four Cluster areas will be focussed on data management and integration, physical access, ethics and innovation. Training |



| | |
|----------------|---|
| | <p>for RI managers is not included in its scope and will be provided through the project RItrain. The improvements and professionalization of the staff training will directly be applicable to national or regional networks of infrastructures. The human capital of CORBEL RIs will be strengthened, contacts between RIs will be established, and best practice will be shared.</p> |
| RITrain | |
| <p>What</p> | <p>Research Infrastructure Training Programme (driving leadership for research infrastructures)</p> |
| <p>Funding</p> | <p>H2020, 2015-2019</p> |
| <p>Website</p> | <p>http://ritrain.eu</p> |
| <p>Goal</p> | <p>RITrain will improve and professionalize the training of managerial and leadership staff in research infrastructures (RIs). This is vital for the future success of Europe since access to excellent RIs underpins the success of today's research and innovation. The successful management and leadership of research infrastructure requires a complex collection of competencies, especially for those working across national borders. We will develop a flexible, modular executive master's degree for RI managers and leaders, including executive directors of RIs, heads of finance and administration, heads of HR and communication. RITrain want to strengthen the human capital of RIs, stimulate their efficient management and promote their development and competitiveness at national, European and international level. The vision is to develop a new generation of executives of national and international RIs who understand the necessity to undergo professional training to acquire state-of-the-art managerial and leadership skill tailored to scientific service providers and can move easily from one RI to another. In the longer run, RItrain's competency profiles and training programmes will provide guidance to and serve</p> |



| | |
|--|--|
| | <p>potential future RI managers and leaders from external to develop the required competencies before applying for a job with RIs. This will make RIs appealing employers that attract top-skilled candidates.</p> |
| <p>Recommendations and added value for EMBRIC training</p> | <p>In February 2016, RITrain organised two workshops on addressing skills gaps for managers and technical operators of research infrastructures in cooperation with CORBEL. The first Addressing the skills gaps in research infrastructure management and leadership aimed at current leadership of emerging and existing Research Infrastructures in all disciplines. The workshop will provide input on training needs for the management and leadership of research infrastructures, to inform the design of a new training programme aimed at the managers and leaders of European Research Infrastructures. The second Addressing the skills gaps in technical operation of biomedical research infrastructures aimed at the technical operators of Biomedical Science Research Infrastructures and will provide opportunity to add input into CORBEL's training plans. Consequently, ensuring that they will meet the needs of technical operators in research infrastructure, especially with regards to data management, user access, ethical, legal and social implications, and innovation.</p> |

Table 1 List of European networks, projects, platforms and infrastructures that generated training activities or that generated recommendation towards the future for Marine Biotechnology and Mariculture CPD training



4.2 Existing EMBRIC cluster training initiatives



Figure 2. Graphical representation of the EMBRIC infrastructure cluster. The central blue circle represents EMBRIC bridging and linking the six Research Infrastructures and Integrating Activity Projects represented by orange circles.

Hereunder, a table (table 2) overviewing how the EMBRIC cluster infrastructures (see figure 2 for a representation) deal with knowledge transfer. Several repository-training platforms are put forward, while other infrastructures organise specific CPD trainings focussed on HCB enhancement in the fields of the project's scope.

| EMBRIC | |
|---------|--|
| What | European Marine Biological Resource Centre (Access to Marine Bioresources) |
| Funding | ESFRI Roadmap |
| Website | www.embrc.eu |
| Goal | The European Marine Biological Resource Centre (EMBRIC) is a distributed research infrastructure that aims to provide a strategic delivery mechanism for excellent and large-scale |



| | |
|--|---|
| | <p>marine science in Europe. With its services, EMBRC will support both fundamental and applied research based on marine bioresources and marine ecosystems. In particular, EMBRC aims to drive forward the development of blue biotechnologies. EMBRC will provide the suitable research environment for users from academia, industry, technology and additional sectors.</p> |
| <p>Recommendations and added value for EMBRIC training</p> | <p>The EMBRC has placed training as one of its objectives. In 2013, it initiated the Marine Training Platform (www.marinetraining.eu) to facilitate and centralize access to Marine human capacity building opportunities in Europe. The platform has been designed and is developed to help European scientists, technicians and other stakeholders to navigate in the jungle of courses and training opportunities. The Marine Training Platform offers a variety of services to both training organizers and trainees. A growing number of projects and organizations supports the initiative. From extensive search queries on the website, we can conclude that biotechnology and aquaculture are underrepresented in the European training landscape. Amongst other, the hypothesis of lack of knowledge of the existence of the Marine Training Platform in these sectors could be the reason of the underrepresentation. Therefore more outreach in these sectors should be done. At MSc level, several aquaculture courses are held in Europe and fulfil the needs of higher educated aquaculture professionals. However, at the vocational level, no information is readily available. Regarding marine biotechnology, few purely marine biotech branded courses are available. This is due to the wide overarching of the biotechnology terminology and the “terrestrial” background for mainstream biotechnology. Some of the recommendations are:</p> <ul style="list-style-type: none"> ● More frequent short-term training courses are necessary to continuously update scientists to the state of the art ● Active partnership between academia, policy and industry should be promoted ● A higher input frequency is necessary to enhance the visibility of marine biotechnology courses ● The current content is too ‘biology’ based. Hence, more content from a broader ‘sea’ spectrum should be added. |



| | |
|--|--|
| | <p>The Marine Training Platform aims to become the one-stop-shop for marine CPD and programmes (MSc & PhD). For the moment, since 2014, 926 training initiatives (299 Courses and 627 Programmes) from 44 countries are represented. Besides offering an extensive overview of the marine courses in Europe through its marine training platform, EMBRC hosts trainings and specific workshops mainly focused on infrastructure management and resource accessing, including support to blue biotechnology value chains and providing marine genetic resources.</p> |
| AQUAEXCEL (& AQUAEXCEL2020) | |
| <p>What</p> | <p>Aquaculture infrastructures for excellence in European fish research (Access to aquaculture resources)</p> |
| <p>Funding</p> | <p>FP7, 2011-2015 (& H2020, 2015-2020)</p> |
| <p>Website</p> | <p>www.aquaexcel.eu</p> |
| <p>Goal</p> | <p>AQUAEXCEL aims to integrate key aquaculture research infrastructures across Europe, in order to promote their coordinated use and development. AQUAEXCEL will provide the European aquaculture research community with a platform of top class research infrastructures, integrating on a European scale key aquaculture research infrastructures. The platform will encompass a wide range of production systems including recirculation, flow-through, hatchery, cage, and pond systems. Fish research will be spread across several species including sea bass, sea bream, salmon, cod, trout and common carp. Freshwater, marine, cold, and warm water environments will be represented, as will small, medium and industrial scale settings.</p> |
| <p>Recommendations and added value for EMBRIC training</p> | <p>During the duration of the AQUAEXCEL project, four short intensive courses were held on genetic manipulation of fish. The short term intensive courses were received</p> |



| | |
|--------------|--|
| | <p>enthusiastically by the trainees mainly due to the hands-on training and knowledge transfer from aquaculture specialists</p> <ul style="list-style-type: none"> ● Recirculating Aquaculture Systems (RAS) Technology ● Contribution of Genomic Approaches to the Development of Sustainable Aquaculture for Temperate and Mediterranean Fish ● Application of Chromosome Set Manipulations and the Importance of Gamete Collection and Management in Aquaculture ● Efficient Utilisation of New Monitoring and Control Systems in Fish Experiments) <p>The follow-up project AQUAEXCEL2020 will also provide training for transnational access users, aquaculture researchers, technical staff and industry stakeholders. A series of face-to-face and distance learning courses on aquaculture technology and fish biology will be offered over the five year duration of the project. In April and October 2016, the first online courses on best practice experimental data management were held</p> <ul style="list-style-type: none"> ● Experimental data management from generating protocols to sharing data ● Recirculating Aquaculture System (RAS) Technology |
| RISIS | |
| What | Research infrastructure for research and innovation policy studies (Research and Innovation dynamics) |
| Funding | FP7, 2014-2017 |
| Website | www.risis.eu |
| Goal | The RISIS project aims at creating a distributed research infrastructure to support and advance science and innovation studies. This will give the field a strong scientific push forward, and at the same time, provide a radically improved evidence |



| | |
|---|---|
| | base for research and innovation policies, for research evaluation, and for the quality of policy relevant indicators. |
| Recommendations and added value for EMBRIC training | RISIS training activities http://risis.eu/training/ are addressed to all potential users of RISIS datasets. Several course, mainly one or two day short CPD courses, have already been given since the start in 2014. The main aim is to raise the research skills that are needed for using large data sets and to develop indicators, to offer a general introduction to the features of RISIS facilities and to focus on indicators and data handling. Additionally RISIS training will highlight the opportunities for the end-users, displaying several modes of exploitation of the RISIS datasets (for instance, application of statistical and econometric analysis and use of scientometric tools). Finally, RISIS training will be generally associated with the use of one or more datasets, which is shared by RISIS partners and will focus on mobilization of data and indicators for policy analysis and research policy purposes. Since 2014, 14 courses were held or are planned in the near future. |
| MIRRI | |
| What | Microbial Resource Research Infrastructure (Access to microbial resources, associated services and data) |
| Funding | ESFRI Roadmap |
| Website | www.mirri.org |
| Goal | MIRRI is a pan-European distributed RI providing microbiological services, thus facilitating access to high quality microorganisms, their derivatives and associated data for research, development and application. It will connect resource holders with researchers and policy makers to deliver the resources and services more effectively and efficiently to meet the needs of innovation in biotechnology. The RI builds upon 60 microbial domain biological resource centres (BRCs) |



| | |
|--|--|
| | <p>in 26 European countries; collectively they provide access to more than 350,000 strains of microorganisms.</p> |
| <p>Recommendations and added value for EMBRIC training</p> | <p>One of MIRRI's work packages (WP7), is focused on capacity building, education and training. The internal survey (partners and collaborating parties) done to assess the current panorama of education and training, offer within MIRRI stated the following:</p> <ul style="list-style-type: none"> ● Results show that there is a much wider market for education and training within our customer base than the one currently being covered by MIRRI's mBRCs and culture collections. ● Further efforts are clearly required in adjusting the MIRRI offer, adapting contents and content delivery and focusing on cost-efficiency and proper advertising to increase visibility. ● The pooling of common resources within MIRRI, and a central coordination of content production, courses offered, and advertising would be highly beneficial, and decrease current costs and duration of the theoretical face-to-face components. ● Consolidating the current education and training offer from individual resource centres and sharing it via MIRRI would increase the reach of the target-audience. ● Cooperation with MIRRI scientists and training experts would increase quality and efficiency of training, hence becoming be more in-tune with the needs of end-users. <p>A solid education and training offer would strengthen MIRRI's brand recognition, and could become an important source of additional revenue. Additionally, MIRRI works closely with the Lifetrain project and as soon as it has its legal entity will present its coordinated courses; currently, individual partners present their offers through Lifetrain. The training offer from MIRRI is found at http://www.mirri.org/user-service/service-offers.html.</p> |
| <p>ELIXIR</p> | |



| | |
|--|---|
| <p>What</p> | <p>A distributed infrastructure for life-science information (Biological data safeguard)</p> |
| <p>Funding</p> | <p>ESFRI Roadmap</p> |
| <p>Website</p> | <p>www.elixir-europe.org</p> |
| <p>Goal</p> | <p>The goal of ELIXIR is to orchestrate the collection, quality control and archiving of large amounts of biological data produced by life science experiments. Some of these datasets are highly specialised and would previously only have been available to researchers within the country in which they were generated</p> |
| <p>Recommendations and added value for EMBRIC training</p> | <p>ELIXIR states that although a lot of bioinformatics training is available in Europe, there is a lack of coordination, especially at the international level. ELIXIR works in partnership with other organisations to solve this by coordinating training internationally. This training fills a critical gap because medicine and the biological life sciences increasingly involve generating, analysing and interpreting big data. Most life science professionals will need the skills to exploit growing amount of bioinformatics tools and data, and ELIXIR training gives them these skills. ELIXIR Training is organised through its dedicated Training Platform. The Training Platform is a European network of trainers - experts in their scientific domains and in CPD.</p> <p>Furthermore, ELIXIR developed its own Training e-Support System TeSS https://tess.elixir-uk.org/. TeSS is an aggregator of metadata of ELIXIR-relevant training information and resources, harvested from individual ELIXIR nodes and from 3rd-party content providers. TeSS is a repository of metadata for training materials and events (i.e. a registry of training materials and events It does not store original training resources, just the metadata and links to them. Since September 2011, 820 short courses worldwide (https://tess.elixiruk.org/events?category=course&include_expired=true) were disseminated through TeSS</p> |



| | |
|---|--|
| | <p>In addition, the GOBLET Training Portal was brought to life as a repository of materials and courses to acts as a centralised repository of open-source training materials, to help bioinformatics trainers to share, adapt, develop and make available a wide range of resources to the community (http://mygoblet.org/training-portal).</p> <p>To conclude, the primary focus of TeSS is on ELIXIR resources and nodes; the principal focus of GOBLET is on the training resources and events of its worldwide members.</p> |
| EU-OPENSREEN | |
| What | Chemical tools for Life Sciences |
| Funding | ESFRI Roadmap |
| Website | www.eu-openscreen.eu |
| Goal | <p>The aim of EU-OPENSREEN is building a sustainable European infrastructure for Chemical Biology, supporting life science research and its translation to medicine, agriculture, bio industries and society. The current bottleneck preventing the wider use of chemical tools is the fact that the development of such tools requires significant resources and investment. EU-OPENSREEN is a large-scale Research Infrastructure (RI) with an ‘open’ pre-competitive character that makes all generated tools and data publicly accessible. This approach is ideally suited to generate the critical mass to cost-effectively overcome the described limitation to the maximal benefit of the broad scientific community and to generate a high return-on-investment.</p> |
| Recommendations and added value for EMBRIC training | <p>Since EU-OPENSREEN was established as an external network partner in the European Medicines Research Training Network (EMTRAIN). A survey was conducted regarding training and education amongst EU-OPENSREEN members</p> |



| | |
|--|---|
| | <p>and following conclusion was made: The results from the surveys indicate that the number of courses in Chemical Biology and screening offered by existing screening platforms are few and overlapping. The low response rate to the follow-up survey makes it difficult to draw any general conclusions of the content and availability of the courses. In addition, the number of screening platforms responding to the initial survey was relatively low. On the other hand, interest organizations and professional bodies offer a substantial assortment of courses that are of interest to a future EU-OPENSREEN training package. The training package will likely be composed of a mixture of existing and newly developed courses.</p> |
|--|---|

Table 2 Overview on how EMBRIC's Research Infrastructures and Integrating Activity Projects deal with knowledge transfer within their consortium.



5 EMBRIC training framework

5.1 SWOT-analysis

The EMBRIC cluster and complementary European programmes yielded several approaches to knowledge transfer and training approaches. The internal EMBRIC strengths and weaknesses, next to the external opportunities and threats are summarised in the table hereunder.

| Strengths | Weaknesses |
|--|---|
| <ul style="list-style-type: none"> ● Each RI has state of art training initiatives ● Training repository platforms and trainer assistance is provided ● Participation of multiple consortium partners and external trainees could open opportunities for long-term collaboration ● Courses are offered everywhere in Europe ● Courses are open to all career stage researchers ● All training courses are offered in English and are open to international communities ● For members of the RI, financial support to attend courses is often provided ● Joint training and common CPD are easy to organise within the existing framework | <ul style="list-style-type: none"> ● RIs training initiatives are occurring only once ● The marine content is often ‘hidden’ since the taught techniques are applicable in the ‘terrestrial’ sector ● Insufficient presence or absence of non-academic sectors ● Most courses are technical/research based and lack policy awareness ● Promotion of external courses to the cluster partners could be enhanced ● Dissemination of consortium courses to the exterior is often limited to the RI’s website ● Not all stages from discovery to final product development are covered ● Lack of transferable skills and business management courses ● Lack of policy courses on Access and Benefit Sharing (ABS) ● Without correct and thorough evaluation and feedback, a loss of impact and efficiency of future courses is expected |



| Opportunities | Threats |
|---|---|
| <ul style="list-style-type: none"> ● Initiatives like the Marine Training Platform and on-course[®] can play a more important role in dissemination and support of CPD courses ● Establish the place to come for marine biotechnology focused training ● Novel content taught during CPD should find a faster way into MSc and PhD programmes to ensure an acceleration in the pace of discovery of novel derived natural products in the long-term ● Increased involvement of industries in academic study programmes to enlarge employment rates of graduates ● A huge potential for e-learning is present and would increase the reach of the marine biotech know-how ● Joint programming (i.e. cross-disciplinary courses held by partners of different sectors) would offer a solution to facilitate exchange of best practices amongst different fields within marine biotech and mariculture ● Facilitate more academia-industry teaching cooperation in order to increase the knowledge sharing on complementary topics and soft skills | <ul style="list-style-type: none"> ● No long-term funding for training beyond the RI ● Academia-industry polarization will remain in the absence of industry participating in the organization of trainings ● Lack of transferable/soft skills in the RI courses content only makes it attractive to users already in that specific field, narrowing the potential trainee pool ● Underrepresentation of external users slows down the knowledge and best practice transfer speed |

Table 3 Training SWOT analysis



5.2 An overarching joint EMBRIC training platform

Today, every cluster partner tackles knowledge transfer in a more or less extensive way depending on the work package definitions and priority given to it. Mostly, contents related to the core activity of RIs reach the programmes of training course and most participants come from within the RI. Consequently, the first part of the development pipeline of a value chain is covered. For instance, in the AQUAEXCEL project the course topics were genomic approaches and experimental setup. In the EU-OPENSREEN trainings, topics related to Chemical Biology and screening were given. MIRRI training focus mainly on strain cultures. Finally, RISIS and EMBRC mainly offer topics such as database modelling and biodiversity, respectively. Subsequently, the training aspects of the RIs are working well and core best practice and knowledge transfer is present.

Besides the specific focus of every RI and IAP, EMBRIC addresses a recognized gap: creating an integrated multidisciplinary value chain of services for the exploration of marine bioresources and their sustainable exploitation as sources of biomolecules and/or as whole organisms for food. Within this pipeline, as mentioned before, knowledge exchange on discovery, screening, development, processing and safeguarding is secured by the separate RIs and IAPs. However, transversal initiatives dealing with for instance business management, access and benefit sharing, project development, entrepreneurial finance and infrastructure management are not covered. This conclusion corresponds to the recommendation of other European programmes, such as ERA-MBT. Therefore, on top of the existing 'RI thematic courses', overarching transversal courses should see the light of day.



6 Recommendations for future EMBRIC trainings

6.1 RI specific bottlenecks

The problems associated with sourcing and exploiting bioresources from the environment are numerous, from difficulties in growing or maintaining some of the organisms in the laboratory up to delivering a pre-finished product to business developers. A vast amount of training opportunities lies ahead EMBRIC consortium partners. Future EMBRIC thematic workshops/trainings could tackle the following topics, currently absent or underrepresented in the EMBRIC sphere: best practice methods for harnessing the biochemical potential of marine prokaryotes

- best practice methods for harnessing the biochemical potential of marine prokaryotes
- best practice for the production of valuable secondary metabolites
- genetic engineering of microalgal strains
- Technology Transfer practices
- data standards for the marine domain
- novel techniques for protistan strains cultivation, metabolic profiling, bioassays, and chemical characterization
- progress in nutritional genomics
- commercial implementation of selective breeding technologies to promote knowledge exchange and adoption of best practices
- selective breeding in mariculture for higher yields and disease resistance
- access to and use of marine genetic resources
- transnational access regulation
- access and benefit sharing
- Intellectual property (IP), governance and policy
- Human capacity building and transferable skills
- Methods and developments in computational resources
- ...

6.2 Transversal opportunities

As mentioned previously, not all stages from discovery to final product development are covered by the existing training offer within EMBRIC. Therefore, next to the RI specific training programmes improving the continuous professional development (CPD), novel transferable skills should be incorporated in the training offer. These should include soft skills for the human capacity building (HCB) and of EMBRIC researchers in their professional development. Offering soft skills in for example project development, data management, legislation and regulation, business improvement, technology transfer, and access and benefit sharing will facilitate exchange of best



practice amongst different fields within marine biotech and mariculture, and between academia and industry.

In addition to the above-mentioned internal transversal HCB agenda, training external users of EMBRIC should be taken into account. Under the EMBRIC training portal umbrella, courses for external academia and industry end-users given by the EMBRIC consortium and other related infrastructures and projects will be accessible. Even though the focus of the training portal is knowledge transfer in the EMBRIC domain, knowledge transfer in transversal skills are not excluded. By improving the end-users background knowledge, it will indirectly facilitate EMBRIC to reach its goals in developing marine derived products in a professional and efficient way.

Hence, human capacity building transversal training to internal EMBRIC partners are key to support the core developments within EMBRIC. Opening some of those opportunities to external academic and industry users will for sure be beneficial to the cluster even though knowledge and technology transfer to external users are focussed on EMBRIC's core competences.

6.3 EMBRIC integrated training programme and training platform

Development of new training opportunities will require support of existing training platforms, such as initiatives like the Marine Training Platform and on-course[®]. These can assist the data input in the EMBRIC training portal and can play an important role in dissemination and support of CPD and HCB courses. The EMBRIC integrated training programme, offering for instance financial assistance and support for internal opportunities (see deliverable 9.2) should promote its initiatives through the EMBRIC training portal.

The force of the EMBRIC training platform is its flexibility towards the type and format of offered training. Therefore, next to classical training schemes, alternative formats could be envisioned. Novel training schemes such as online training, MOOC's could be useful to promote standards and best practices to a broader audience then the audience present at a classical CPD short course. Of course, the use of a certain format will strongly depend on the content of the course; nevertheless looking for alternatives formats should be encouraged, since the audience reach is potential higher. In addition, a reduction in travel and venue costs favours this type of course. It could also be an answer to the low participation of industry in classical CPD and HCB trainings. By lowering the accessibility threshold, an increased involvement of industries in EMBRIC training opportunities will be beneficial to the pipeline development speed and best practice exchange.



6.4 Assessment of EMBRIC knowledge transfer

One of the threats to EMBRIC's knowledge transfer is the lack of correct and thorough evaluation and feedback, which will result in a loss of impact and efficiency from future courses. In addition, novel techniques and new regulations arise continuously and should be incorporated in the newest CPD and HCB courses. Therefore, it would be advised to put in place a group of experts in a training steering group, comparable to the Training Coordinators Group (TrCG) of ELIXIR. They will give advice on the latest advances from partnering RI, projects, business developments and EC regulations. The best fitting group should have access to all research infrastructures and work packages within EMBRIC. Within the EMBRIC consortium, such a group already exists and is represented by all the WP leaders, the Executive Board (EB). As such, training will be put on the foreground during the EB bi-annual meetings and it will allow to (re)direct courses to fit emerging topics and stay up-to-date with the state of art in the marine biotechnology, mariculture and product development sector.



7 Conclusion

This deliverable (D 9.1) maps the gaps and needs in expertise within the participating RIs and partner institutions of EMBRIC. Bottlenecks and weaknesses of existing trainings are identified and opportunities are put forward. Where possible, at the early stage, it develops opportunities and strategies to overcome the gaps and needs identified. To complete the task of sharing knowledge and best practice throughout the whole value chain in all its aspects will require time and involvement from all the partners and end-user community.

In order to support EMBRIC specific and transversal knowledge transfer a strong cross-cutting training and knowledge transfer is necessary through CPD and HCB opportunities. It will allow the EMBRIC consortium partners and external end-users to follow specific trainings tailored to the needs of the EMBRIC key activities. A supporting framework (see D 9.2) has been set-up under the form of the EMBRIC integrated training programme and the EMBRIC training portal on the EMBRIC website. Both will facilitate organisation and dissemination of training opportunities, promoting exchange of new knowledge arising from research. At the end, a more efficient technology and knowledge transfer will take place, improving best practice and human capacity building development within the wide sphere of EMBRIC end-users.

