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Funding Schemes and Mapping of Marine Biotechnology Financing

Work Package 3

Intaractions with industry

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LIST OF ABBRIVIATIONS

DoW - Description of work

DG MARE - The Directorate-General for Maritime Affairs and Fisheries

DG RDI - The Directorate-General for Research and Innovation

EC - European Commission

EIT - European institute of technology

EAFRD - European Agricultural Fund for Rural Development

EMFF - European Maritime and Fisheries Fund

ERDF - European regional development fund

ESIF – European structural and investment funds

FP6 – 6th framework program

FP7 – 7th framework program

FTI – Fast track to innovation

H2020 – Horizon 2020

JPI – Joint programing initiative

JTI BBI – Joint technology initiative for bio-based industries

KIC – Knowledge and innovation community

MBT – Marine biotechnology

OECD - Organization for Economic Co-operation and Development

R&D – Research and development

RDI – Research, development and innovation

RTO – Research and technology organization

SMEs – Small and medium-sized enterprises

EXECUTIVE SUMMARY

The report examines publically accessible literature on public and private funding schemes for Marine Biotechnology research, development and innovation (RDI) in the light of challenges faced by the Marine Biotechnology sector today. The report is based on the findings of the comprehensive *Study in support of the impact assessment work on Blue Biotechnology* commanded by DG MARE and published in July 2014, taking into account the results of the *ERA-MBT Open Stakeholder Consultation* conducted in July-August 2014, with a section on funding schemes and marine biotechnology specific funding issues, and the outcomes of the discussions in the *First ERA-MBT Stakeholders meeting*, with a funding breakout session, taking place in Lisbon in October 2014.

The report analyses the **specific characteristics of the Marine Biotechnology sector** and their **implications for the sector's funding**. Taking a deeper look into the specifics of the Marine Biotechnology value chain, identifying the Marine Biotechnology stakeholders and their role in attracting investment, the report portrays a picture of the environment in which Marine Biotechnology is being funded.

This information serves as the basis for discussing funding of **Marine Biotechnology RDI**, first looking into the **barriers of funding** as identified in discussions at various Marine Biotechnology related events, the DG MARE Study, the First ERA-MBT Open Stakeholder Consultation and the ERA-MBT Stakeholders meeting in Lisbon.

The report lists proposed **ways to overcome the identified bottlenecks** and makes an attempt to question the need for sector specific solutions in the light of **existing opportunities for funding** that might not all be Marine Biotechnology specific, but are being utilized with different success rates, by different stakeholders.

The report concludes the envisioned **Workshop for identified public/private funding organizations and industry representatives**, for which the report is providing background information, should aim at finding complementarities and synergies with existing partnerships, exploring reasons for the success of some and failure of other funding mechanisms, with the final goal of identifying solutions that can support Marine Biotechnology RDI and ultimately ease bringing promising technologies to the market.

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PLACING DELIVERABLE 3.5 INTO THE CONTEXT OF ERA-MBT

The Marine Biotechnology ERA-NET (ERA-MBT) is funded by the European Commission (EC) under the 7th Framework Program and aims at better coordination of relevant national and regional RDI programs in Europe and beyond, with the goal of reducing fragmentation and duplication and paving the way for common research programs and cooperation.

ERA-MBT recognizes "a strong **need to work with its stakeholders from industry to identify the needs and gaps in the value chain from research to development, through optimizing research results from proof of concept to industrial uptake and valorization** (ERA-MBT, 2013: 3)".

For this reason Work Package 3 (WP3) "*Interactions with industry*" aims at "exploring and identifying challenges on the road to develop marine biotechnology (MBT) into a sustainable and strong driver supporting industrial development in Europe (ERA-MBT, 2013a: 22)".

Task 3.2 of WP3 explores Industry Policy interactions and aims to:

a) investigate public and private funding schemes for the industrial development of results/technologies resulting from MBT, identify funding gaps and propose ways to mitigate them;

b) Analyze European policy documents and documents from other relevant activities to identify policy expectations for the industrial development of MBT.

Deliverable 3.5 "*Funding schemes and mapping of MBT financing*" is to be based on a **desk study identifying capital sources in the light of challenges faced due to the nature of the MBT sector**. The findings of the desk study are to serve as the starting point of discussion between relevant stakeholders in a workshop on creating innovative, complementary and synergistic public-private partnerships to bring promising technologies to the market (ERA-MBT, 2013a: 22-23).

METHODOLOGY

First **an Open Stakeholder Consultation using an online survey**[1] was performed by WP3 in summer 2014 to identify the needs for further investigation. A section on funding MBT RDI was included in the survey to identify the sources of funding, the funding portfolios of stakeholders and the bottlenecks of funding with an option for stakeholders to identify additional issues and propose solutions.

[1] For results see the *Report on the ERA-MBT Open Stakeholder Consultation*, available at: http://www.marinebiotech.eu/sites/marinebiotech.eu/files/public/D.3.1-3.5%20Report%20on%20ERA-MBT%20Open%20Stakeholder%20consultation.pdf.

Second **outcomes of the presentations and discussions** in the **MBT funding breakout sessions** at the "Waves of innovation" ERA-MBT Stakeholder Forum (Lisbon, October 2014), have been considered and used as guidance for further desk research on innovative ways to attract funding.

Finally, as envisioned in the DoW, **a desk study** scrutinizing relevant documents, seminar proceedings and other publications was performed to:

a) understand the specific nature of the MBT sector and the challenges it faces in its funding;
b) to identify relevant capital resources and to critically assess them in the light of funding gaps
c) to assess the proposed ways to mitigate the gaps and suggest further options for funding (as part of the envisioned WS conclusions and recommendations)

The present report takes into consideration the changing and evolving landscape of MBT in Europe. Since the preparation of the ERA-MBT project proposal, significant policy efforts on EU level have been made to advance the field. DG MARE conducted a public consultation on MBT which was supported by the comprehensive "*Study in support of Impact Assessment Work on Blue Biotechnology*" published in July 2014. The document provides much valuable information on MBT as a sector and the barriers it has to overcome. The information in the study serves as the foundation of the present document, building on it in exploring ways to mitigate funding gaps.

UNDERSTANDING THE MARINE BIOTECHNOLOGY SECTOR

CHARACTERISTICS OF THE SECTOR

Understanding the specific characteristics of the MBT sector is important as these characteristics have profound implications for its funding. The Revised Final Report FWC MARE72012/06 – SC C1/2013/03: Study in support of Impact Assessment Work on Blue Biotechnology (hereinafter referred to as the DG MARE study) identifies those characteristics, which are summarized in Table 1 bellow, together with certain implications of these characteristics for relevant stakeholders, especially in terms of funding.

CHARACTERISTICS	IMPLICATIONS
NOT CLEARLY DEFINED: A lack of an official definition of MBT[2] and the MBT sector.	Lack of a unique entity in statistics which results in different interpretation of its boundaries and overall size of the sector. This has a direct effect on defining MBT sector **attractiveness for investors.**

[2] The DG MARE study refers to Marine Biotechnology as Blue Biotechnology; we use Marine Biotechnology (MBT) for consistency reasons.

ONLY PART OF THE VALUE CHAIN IS BLUE: the MBT value chain is specific and common only until the product development stage where the cross-over to other biotechnology/industry sectors occurs.	The MBT sector does **not encompass the whole biotechnology value chain** (it aligns itself with elements and activities specific to marine components of marine biotechnology).
DIVERSE: Many subsectors with sector specific characteristics not related to MBT[3].	Overlap of the MBT sector with other well established biotechnology sectors, which have their own established funding sources (and **sector specific funding gaps**).
In the EU R&D performance EXCEEDS performance in COMMERCIALIZATION: EU publications account for 30% of global publications vs. EU representing only 13% of global patents.	The disconnection between R&D and commercialization of MBT products and services is evident, resulting in a **lack of collaboration with industry and investors.**
SMEs HIGH CONTRIBUTION in R&D, but limited presence in industrial production, due to cash limitations.	**High risk assumed by SMEs**, for which the value chain presents a cost chain, with cash burn being a common problem.
RISKS HINDER ATTRACTIVENESS OF THE SECTOR: The pure "blue components" of the value chain, namely discovery, bio-prospecting and R&D, involve many cumulative risks[4], this hindering the attractiveness for end user investment.	**Addressing the risks to enhance the attractiveness for end-user involvement** is vital, especially by SMEs.
YOUNG SECTOR: few MBT products on the market.	**Lack of success stories** make the **sector** "invisible" and **poorly understood by investors**, who lack knowledge and expertise.
DIFFERENT RATES OF DEVELOPEMNT AND GROWTH: Subsectors are at different stages of development and have encountered different stages of growth to date.	The greatest users of MBT products in **commercialization** are the **health, cosmetics** and **food** sub-sectors.
EXPENSIVE INFRASTRUCTURE: MRIs (Marine Research Infrastructures), e.g. research vessel use, underwater vehicles, in situ data acquisition systems and platforms are very expensive, especially for deeper water explorations.	Infrastructure that is privately owned is more expensive than the publically owned; many stakeholders involved in MBT, including SMEs, have strict cash limitations - **marine laboratories mostly publicly owned** (especially in the EU).
STRENGHTS: The strength of European MBT is in R&D activities, access to marine resources, and development of infrastructure and support for companies developing research activities.	The importance of research and technology organizations (RTOs), SMEs and biotechnology clusters / networks as the main stakeholders of MBT.

Table 1: MBT characteristics and their implications

[3] The subsectors include: energy, pharmaceuticals, cosmetics, aquaculture, food and nutrition, environmental protection and depollution.

[4] Too many novel organisms create bottle necks in screening, selecting, identifying bioactivity; molecules too complex for chemical synthesis; lab culture, expression of genes on transfer to a common industrial system and replication at scale-up questionable

DEFINING THE MARINE BIOTECHNOLOGY SECTOR

Taking into consideration the characteristics of MBT and their implications is crucial in defining MBT as a sector, its value chain and stakeholders and serves as a foundation for further discussion on funding, as it is important to understand the environment in which MBT is being funded.

The Marine Biotechnology value chain

The DG MARE study provides a comprehensive diagram identifying the MBT value chain and the stakeholders active in its different parts.

As can be seen from Figure 1 t**he MBT sector only encompasses the first three steps in the value chain**, with higher stages becoming sub-sector specific, the "blue" component being significantly reduced and the stakeholders being more part of other biotechnology or industry sectors (Ecorys et al., 2014: 5). It is important to underline this in the discussions on funding MBT as it has many implications for the definition of funding gaps in the MBT sector, especially when discussing industrial development of results, and thus also solutions to overcome those gaps.

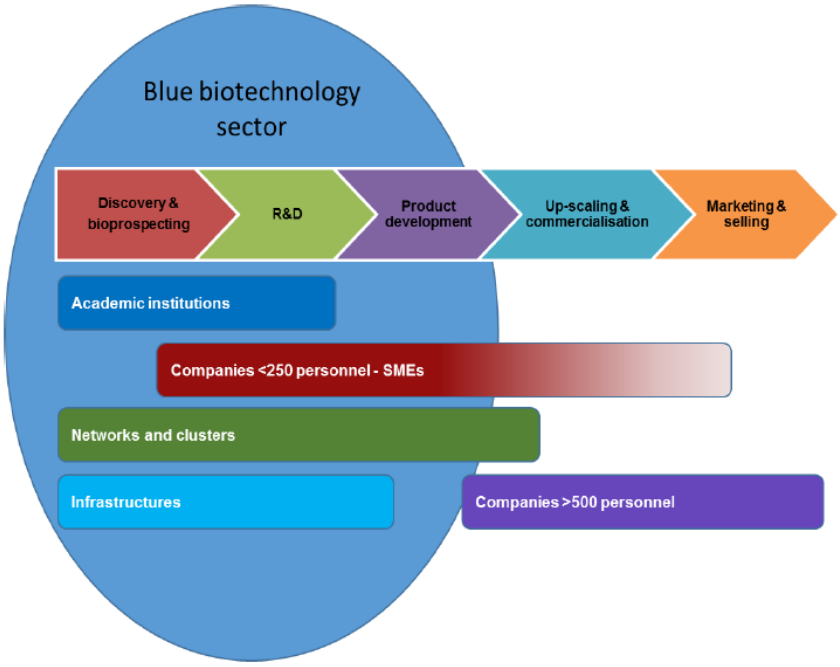

Figure 1: Value chain stakeholder composition in the marine biotechnology process (Ecorys et al., 2014: ii).

Marine Biotechnology stakeholders

When discussing funding instruments, understanding who the main stakeholders in the European MBT sector are is important as **funding options and mechanisms are very different for each**.

The DG MARE study identifies 5 main stakeholders[5] in the MBT value chain:

- **Academic institutions** (universities and research institutes) as the main drivers of demand to develop the MBT pipeline[6].

  For the purpose of discussing funding we propose to separate **universities** from institutes and include as a stakeholder **research and technology organizations** – RTOs (including, but not limited to research institutes), which as non-profit organizations "occupy nodal positions within innovation eco-systems and bring together key players across the whole innovation chain" with the mission to "harness science and technology in the service of innovation" (EARTO, 2015[7]).

- **Companies with less than 250 employees**, i.e. SMEs as the main drivers of innovation in terms of product development, who play "a key role bridging the gap between public sector R&D activities and commercialization of products, mainly by large private, often multinational, companies" (Ecorys et al., 2014: iii). SMEs play an important role in identifying, validating and de-risking industrial opportunities from marine bioresources. Being placed at the initial product development stage of the value chain, they are at a high risk of entering the 'cash-burn' phase in which "financing – often but not always from venture capital – is unpredictable and fickle". As a consequence these SMEs are very vulnerable and the **interface between the SMEs and the commercial is one of the weakest links in the chain** (Ecorys et al., 2014: iii).

- **MBT networks/clusters** as important players in research coordination and infrastructures

- **Companies with more than 500 employees** as important players in up-scaling and commercialization of products

- **Infrastructure related institutions**

Having defined the stakeholders, one has to keep in mind, the lack of a unique entity in national and international statistics due to a lack of common definition leads to different interpretations of the size, structure and socio-economic performance of the sector. Up to now the valuation of the MBT sector has mostly been attempted through the prism of biotechnology in general and only recently attempts to define the value of the MBT sector specifically have been made by the Global Industry Analysts[8] and the OECD, the OECD being more conservative and cautious in market value estimates. Based on available information and before mentioned estimates the DG MARE study suggests the European MBT sector makes up 2-5% of European biotechnology in terms of revenue. Applying this to the total number of biotechnology companies in Europe, DG MARE study (Ecorys et al., 2014:18) estimated that between 36 and 90 private companies could be active in MBT. Acknowledging the number potentially being higher considering the industry is still in development

[5] Companies with 250 to 500 employees are also a stakeholder, but their number is limited.
[6] The DG MARE study (Ecorys et. al., 2014: 50) identifies Fraunhofer Research Institution for Marine Biotechnology, Consejo Superior de Investigaciones Cientificas, CNRS, University of Madrid and University of Hull as top EU research institutions in aquatic product, with CNRS and Consejo Superior de Investigaciones Cientificas also being top research institutions in high value products, together with Imperial College and Royal Holloway.
[7] http://www.earto.eu/about-rtos.html
8 For the latest version of the document "Marine Biotechnology: A Global Strategic Business Report" see http://www.strategyr.com/Marine_Biotechnology_Market_Report.asp

(number of start-ups and spin-off is higher); the DG MARE study stakeholder database actually holds 97 enterprises (71 of which are SME's and 26 are large companies) (ibid.).

RTOs and SMEs play an important role in making the MBT sector more attractive for investment, especially in the so called "valley of death" stage, where there continues to be a lack of funding (as opposed to seed capital and funding for closer to market activities). As argued by EARTO (2014: 8) bridging the "valley of death" requires a joint effort from research and industry, with the role of RTOs being key in "supporting the development of dedicated research and development infrastructures" for SMEs and large industry. In addition to translating basic research into applicable solutions, RTOs house various research infrastructures and support SMEs by offering them industry relevant/operational environment in the form of shared facility, operate as new business incubators and produce spin-offs, and have a specific contribution also in higher stages of the value chain (EARTO, 2014: 12-13).

FUNDING MARINE BIOTECHNOLOGY

IDENTIFYING BARRIERS TO FUNDING

Being on the agenda of many events **discussions on funding MBT**, including the barriers to funding, have based on available information mostly ended with similar conclusions. The issues have been discussed in recent time in:

- Cascais: BioMarine Convention 2014, October 30-31, 2014[9]
- Lisbon: ERA-MBT Stakeholder Meeting, October 28-29, 2014[10]
- Concarneau: Rendez-Vous de Concarneau: Where Industry meets Science in Marine Biotechnology October 9-10, 2014[11]
- Reims: EFIB pre-conference workshop Building Blue Biotech Capacity in Europe, September 30, 2014[12]
- Genoa: IFIB BioEconomy Conference, September 25-26, 2014[13]

The DG MARE study (Ecorys et al., 2014:57-58) identifies three funding barriers common to all sub-sectors of MBT, namely:

- **Low investment in R&D** especially in "un-alluring" industry sectors (in comparison to the pharmaceuticals industry).

[9] http://www.biomarine.org/cascais-2014/
[10] http://www.marinebiotech.eu/stakeholder-meeting
[11] http://concarneau.mnhn.fr/node/429
[12] http://smithersevent-phosphorssummit.rdgwy.com/conference/workshop
[13] http://www.tecnobionet.it/websitecontent/uploads/IFIB2014_Final_Program.pdf

- **Problematic access to finance**, as few investors are keen to take risks in new technological developments, this resulting in few new technological developments

- **Lack of investment in SMEs**, leading to SMEs assuming risk and running out of funds before the completion of product development (especially second and third round).

In the search for specifics in funding MBT, ERA-MBT conducted its own open consultation among its stakeholders among others also on the topic of funding MBT RDI in Europe. Issues raised support the findings of the DG MARE study and go beyond those related to access to finance, touching upon the **problem of a lack of cooperation along the value chain**.

It must be noted however that **many of the identified bottlenecks of MBT funding**, as expressed in the ERA-MBT Open Stakeholder consultation and also during the MBT funding breakout sessions at the "Waves of innovation" ERA-MBT Stakeholder Forum (Lisbon, October 2014) **are not MBT specific**, including but not limited to:

- questions relating to patent costs,
- technology transfer mechanisms ,
- funding for capacity building programs,
- investments in basic science vs. investments in applied science,
- relationship between entrepreneurship and research,
- problem of collaboration between science and industry,
- administrative burdens of project management,
- etc.

PROPOSED SOLUTIONS

ERA-MBT stakeholders were not only asked to list the problems but also the solutions to the issues raised. These solutions include:

- More **technology transfer funding programs** in MBT are necessary to direct funding towards industrial/academic research cooperation
- More **calls for pilot and testing stages**, including innovation experimental testing
- Support to **cover the accompanied extra risk by public funding** to stimulate venture capitals to step in
- Creation of a **MBT venture capital fund**, creation of **government co-investment funds**, creation of **MBT incubators** with investment funds and business support with funding provided by the EU and private sector.
- **Specific marine biotechnology instrument** similar to the SME instrument or the Fast Track to Innovation action
- Programs that could **bridge the gap between R&D funding/seed capital and venture capital** investments

- Creation of a **platform connecting researchers to the end-users**, facilitating collaboration and communication, thus avoiding duplication of RDI and assuring future applicability (so-called strategic basic research involving industry from the very beginning).
- Creation of a "**European joint research lab**" in MBT bringing together universities, RTO's and the industry

It can be observed, that most discussions on funding focus on the specifics of funding MBT and do not take into account the fact that a **"one size fits all" approach to tackling issues related to MBT funding will probably not work**, as there are too many specific aspects of funding depending on the position on the value chain, sub-sector and stakeholder involved.

As the following presentation of MBT funding opportunities will show, many options for funding exist among the already available instruments. Perhaps more than actually requiring new instruments, the current ones need to be promoted and the possibilities they offer explored, this going hand in hand with the facilitation of the access to knowledge and its transfer from research to industry. This idea is underlined also by the conclusions of the DG MARE study, claiming there is **"a number of platforms and initiatives in Europe, which should be utilized, strengthened and supported before new measures are considered"** (Ecorys et al., 2014:41).

AN OVERVIEW OF MARINE BIOTECHNOLOGY FUNDING OPPORTUNITIES

An overview of who is investing in MBT has been made by Meredith Lloyd Evans, who presented his findings in the ERA-MBT Stakeholder Meeting in Lisbon (Lloyd Evans, 2014), the presentation building on his comment in the Chemistry and Industry magazine (Lloyd Evans, 2013). Lloyd Evans looks into public and private investments in MBT both on national and transnational level.

The overview builds on the mapping done by Lloyd Evans, analysis of the ERA-MBT Open Stakeholder Consultation and the DG MARE study, taking into account that **funding MBT activities is characterized by the complex nature of MBT and its applications, which results in RDI funding being available in a variety of different funding areas and measures** and most MBT stakeholders (with the exception of large industry) pooling resources to fund RDI from many different funding sources (ERA-MBT, 2014: 12).

PUBLIC FUNDING SCHEMES

National funding[14]

[14] ERA-MBT has built on the mapping exercise conducted in CSA Marine Biotech. For extensive and up-to-date information on the state of MBT in ERA-MBT partner countries please visit www.marinebiotech.eu.

Based on the ERA-MBT Open Stakeholder Consultation, the majority of MBT stakeholders depend heavily on national funds (ERA-MBT, 2014: 12). When it comes to specific stakeholders, national funds are the main source of funding for national organizations, including universities and research institutes, with a lower but still noticeable dependence on national funding by SMEs (ibid.). It is these stakeholders dependent on national funding, that see access too such funding as the main bottleneck of funding (ERA-MBT, 2014: 14).

According to the DG MARE study funding directed towards MBT on national level is highly correlated to MBT support in a given country, manifested as a dedicated plan, strategy, program or strong policy focus on MBT. The study identifies 3 countries with dedicated strategies/polices on MBT research, namely **Ireland, Norway and Denmark**, and countries including **France, the Netherlands, Poland, Portugal, Spain, Sweden and the UK**, which support MBT through more widespread instruments that result in strong MBT activities in one or more areas (Ecorys et al., 2014: 46-48). Lloyd Evans (2014) further puts **Finland** on the map via a joint program with India; while the DG MARE study acknowledges **Belgium, Germany and Italy** as countries where strong MBT support is present regionally, in their coastal regions.

Mostly the countries correspond to the country of origin of the stakeholders who answered the ERA-MBT Open Stakeholders Consultation in the highest numbers (with a discrepancy when it comes to Polish, Dutch, Swedish and Finish stakeholders).

European funding

The majority of MBT stakeholders pool resources to fund their RDI from many different funding sources, with 25-50% of funding coming from one funding source ((ERA-MBT, 2014: 13). Despite having diverse funding portfolios, national funding continues to be the main source for most stakeholders (especially universities and RTOs), but European funding closely follows or is becoming the main source of RDI funding, particularly for SMEs (ibid.). Due to the importance EU funding has in the funding portfolios of MBT stakeholders access to such funding is considered the main bottleneck for most marine biotechnology stakeholders (ERA-MBT, 2014: 14).

The results of the Open Stakeholder Consultation are not surprising, as there are many existent instruments on the European level that have been used to fund MBT RDI. Furthermore new instruments have been introduced with Horizon 2020 that can be used to address some of the challenges of funding MBT. As a result of stressing the importance of developing a European approach to marine RDI, including MBT[15], certain sector specific instruments are also being considered.

Framework program funding - RDI funding

Despite the fact that MBT could be included in a much broader range of programs, the DG MARE study (Ecorys et al., 2014: 41) has established **that projects have only been present in a small**

[15] For an overview of important events and policy documents relating to marine biotechnology in Europe see Annex 1 of the DG MARE study (Ecorys et. al., 2014: 85-86).

range of funding categories. Under **FP6** nine projects were affiliated to MBT, with very low industry involvement, while 31 projects (including support actions) had an MBT scope in **FP7**[16]. Together with an increase in number, industry involvement from FP6 to FP7 also increased, SME funding accounting for 25% of the total budget allocated to MBT related projects (Ecorys et al., 2014:42).

With **Horizon2020** (H2020), the current framework program, the EC is continuing its support for RDI in MBT, with a more strategic approach to RDI funding and a bigger focus on innovation. Given that **Blue Growth is a focus theme in H2020** and **MBT is one of the five focus areas of Blue Growth**, while as a biotechnology it is also a key enabling technology, boosting marine innovation through biotechnology-related activities will be supported through a variety of actions in Horizon2020 (Guiu Exterberria, 2013:28).

Taking the above into consideration, funding opportunities for MBT research often have a crosscutting nature across all H2020 priorities and can be included in several Societal Challenges as well as in Industrial Leadership and Excellent Science pillars.

The **2014/2015 Work Program** directly included MBT RDI funding under the **Blue growth focus area, focusing on topics in Societal Challenge 2** (under themes Unlocking the potential of aquatic living resources, Sustainable and competitive bio-based industries and supporting the development of a European bioeconomy and Cross-cutting marine and maritime research) and through the dedicated **SME instrument**: Supporting SMEs efforts for the development –deployment and market replication of innovative solutions for Blue Growth (see below for more detail).

Framework program funding – ERA-NETs and JPIs

Funding opportunities are also available through ERA-MBT, funded under FP7, which provides opportunities for RDI funding through transnational calls. As in all ERA-NETs the funding is national and is directed towards national partners in transnational consortia. From the three calls planned throughout the duration of the ERA-MBT, the first one was launched in 2014. The calls aim to address the challenges MBT is facing and encourage SME participation.

ERA-MBT is further seeking synergies with other related ERA-NETs and Joint Programing Initiatives (JPIs) in order to launch common thematic calls, thus expanding funding possibilities and generating joint European R&D activities. Relevant ERA-NETs include ERA-IB, ERA-Bioenergy, SUSFOOD, COFASP, ERASynBio, ERASysAPP, ERA-SME and relevant JPIs include JPI Oceans, JPI Water and JPI FACCE.

Framework program funding – Innovation in SMEs: the SME instrument

The SME instrument has been designed to help **fill the funding gap for business innovators with international ambitions**, providing full-cycle business innovation support from the stage of **business idea conception and planning** (phase I) over **business plan execution and**

[16] The DG MARE study identifies 21 projects with MBT scope, but acknowledges MBT being a smaller part in other projects with a wider scope as well. The EC presentation in the first ERA-MBT Stakeholder event (Fuchs, 2014) included those as well. The total budget of the 14 identified MBT research projects was 82 million EUR, while Lloyd Evans suggests the total value of FP7 projects related to MBT surpasses 130 million EUR (Lloyd-Evans, 2014)

demonstration (phase II) to **commercialization** (phase III). The support is both financial and practical, in the form of business coaching. The SME instrument focusing on societal challenges and key enabling technologies includes a specific Blue growth topic in the 2014/2015 Work Program, as "access to finance for SMEs is considered "one of the most important barriers for the development of innovative maritime economic activities (DG MARE study, 2012 in EC, 2014). The call topic *Supporting SMEs efforts for development – deployment and market replication of innovative solutions for blue growth* recognizes the potential of Europe's Oceans, seas and coasts as significant for job and growth creation, further emphasizing SME contribution, in particular in marine biotechnology, its applications, tools and technologies[17].

The estimated number of projects supported under the instrument before the call launch was 6 in Phase I and 1 in Phase II in 2014, with 10 projects supported in Phase I and 3 in Phase II in 2015. Finally there were 8 beneficiaries under the topic, with 1 project in the MBT area[18]. The project supported in Phase II was not in the area of MBT[19]. 1 additional project related to MBT was supported in Phase I under societal challenge 5.

Framework program funding – further possibilities for SME funding: Access to risk finance - InnovFin[20]

InnovFin – EU Finance for Innovators is the name under which the EU promotes a range of **debt and equity products and advisory services** in order to effectively give a boost to the availability of finance for RDI activities in Europe. The concrete goal is to support and facilitate access to sources of debt and equity financing by innovative companies of all sizes and also by research centers and universities, public-private partnerships, special-purpose companies or projects, and joint ventures. InnovFin consists of a range of tailored products – from guarantees for intermediaries that lend to SMEs to direct loans to enterprises - helping support the smallest to the largest RDI projects in the EU and countries associated to H2020.

Particular support is envisioned for innovative SMEs especially in the **start-up phase** or after **diversifying into new markets**, innovative firms through the availability of **early-stage, growth-stage equity finance**, and better access to finance for the **concept and proof-of-concept stage** of the innovation process, with a more predictable and stable supply of **risk capital for commercial-scale, first-of-a-kind demonstration plants, their market uptake and wider deployment**, and the availability of **debt finance for RDI infrastructures**.

The InnovFin products operate in conjunction with those of EU program COSME.

COSME[21]

[17] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2542-bg-12-2014-1.html
[18] For results of Phase 1 see: http://ec.europa.eu/research/participants/portal/doc/call/h2020/h2020-smeinst-1-2014/1637613-sme-instrument-phase1-beneficiaries_en.pdf
[19] For results of Phase 2 see: http://ec.europa.eu/research/participants/portal/doc/call/h2020/h2020-smeinst-2-2014/1637611-sme-instrument-phase2-beneficiaries_en.pdf
[20] http://ec.europa.eu/programmes/horizon2020/en/h2020-section/access-risk-finance
[21] http://ec.europa.eu/growth/smes/cosme/index_en.htm

COSME is the EU program for the Competitiveness of Enterprises and SMEs, **supporting SMEs in accessing finance and markets**, providing **support to entrepreneurs** and improving conditions for competitiveness. COSME improves access to finance for SMEs through two financial instruments managed by the European Investment Fund, namely the **Loan Guarantee Facility** and the **Equity Facility for Growth.**

Fast track to innovation

Fast Track to Innovation (FTI) is a new a pilot action of the EC introduced in the 2015/2016 Work Program with the objective to support innovative projects in any type of technological area by reducing the time from idea to market and increasing the participation of industry, SMEs, and first-time industry applicants in H2020. FTI projects must be **business-driven** demonstrating a **realistic potential for quick results, such as innovative, attractive products or services**.

PUBLIC-PRIVATE FUNDING SCHEMES

Funding for successful public private partnerships was identified by many stakeholders answering to the ERA-MBT Open Consultation as one of the main bottlenecks for MBT funding (ERA-MBT, 2014: 14). Acknowledging cooperation between public and private institutions is still young with few success stories and many projects corresponding to a sum of contributions by individual entities rather than true team work (ERA-MBT, 2014: 29). Additional training and support is needed for successful implementation (ibid).

The overview bellow provides some examples of successful RDI collaborations and regional examples of support tools and mechanisms.

Local and European Regional initiatives as funders and facilitators to funding

Supporting MBT RDI on regional level happens through the installment of **regional bio-innovation and marine/maritime clusters**, which include **CIESM** in the Mediterranean region and **ScanBalt** in the Baltic region. CIESM recognizes the difficulties of SMEs and advocates a new and innovative policy initiative to bring SMEs together with biotechnology associations, venture capitalists, funding bodies and other stakeholders (Ecorys et al., 2014:27).

France tops the list with many relevant local clusters, such as **Pole Mer Bretagne Atlantique and Mediterranee, CaapBiotek and Atlanpole Blue Cluster**, with similar networks existing in **Norway, Spain and the UK**, and activities also in **Belgium, Denmark, Germany and Iceland** (Ecorys et al., 20014: 45-46).

Such clusters have a significant role in helping common projects with innovative aspects emerge and there is a need for the clusters to be developed further. In the case of Pole Mer, clear economic incentive led to initial cluster support being followed by a further investment of 650 million EUR

(Lloyd-Evans, 2014), allowing for additional investment in MBT RDI by providing **support for collaborative projects of public and private research institutions and enterprises both in research and training**.

Covering the whole MBT value chain, the funding of these clusters is both public (national, regional, European) and private.

Additionally the DG MARE study identifies 2 networks with a more international reach, namely the **Biomarine** and the **Biomarine International Clusters Association**, which aim at fostering SMEs' business opportunities and facilitating access to funding (BICA, 2015), while Lloyd-Evans (2014) also identifies **Europabio**, the European trade organization for biotechnology and also the founding partner of the relevant BBI JTI, a public-private partnership on bio-based industries, as an important actor in MBT (with a Marine Biotechnology Exploratory Task Force active in 2011 and 2012).

ESIF – opportunities and synergies

Current projects, such as the ScanBalt flagship project SUBMARINER project and past projects, such as ShareBiotech[22], are funded through the **ERDF** – the European Regional Development Fund, as one of the five European Structural and Investment Funds (ESIF). Among 11 thematic objectives of ESIF two, including Strengthening research, technological development and innovation and Enhancing the competitiveness of SMEs of the agricultural sector (for the European Agricultural Fund for Rural Development - **EAFRD**) and of the fishery and aquaculture sector (for the European Maritime and Fisheries Fund - **EMFF**) are especially relevant for MBT funding. Furthermore ERDF also funds **INTERREG**, a mechanism providing funding for interregional cooperation in different areas (an example in MBT is INTERREG MARMED). Additionally possibilities to find synergies and combine ESIF and H2020 funds to fund MBT relevant research, innovation and cooperation should be explored further.

KICs

The so-called Knowledge and Innovation Communities (KICs), the operational basis of the European Institute of Innovation and Technology (EIT), bring together **all three sides of the 'knowledge triangle'**, i.e. higher education, research and business. 3 KICs were launched in 2010, 2 in 2014 with 3 more to be launched until 2018. An initiative to develop a **Marine KIC** focusing on the sustainable development of marine resources was already launched in 2010, but cannot be expected in the short to medium term, based on EITs objectives. An extensive *Study on the Support of KICs to the Development of the Blue Economy* providing an insight into the extent current KICs are covering the themes and activities related to the Blue Economy, has however been conducted, concluding that a large part of the Blue Economy is still not covered by the existing KICs (Ecorys et al., 2014a:5). Additional attention to the maritime dimension of KICs is thus justifiable, with a possibility for marine topics to be covered in the new KICs, especially the **Healthy Living, Raw Materials and Food4Future** (ibid.).

[22] The objective ShareBiotech (2010-2013) was to strengthen the biotechnology sector within the Atlantic Area and to improve the service offer of the technological core facilities involved in the project. More at: http://www.sharebiotech.net/.

Currently there are a number of projects that cover some MBT topics. The DG MARE study lists 4 projects in the **Climate KIC**, 2 under Cutting Edge Research and 2 under Innovation Potential (Ecorys et al., 2014a: 49-50) .

EUREKA

EUREKA is an intergovernmental network that **supports marked-oriented RDI projects and facilitates access to finance to SMEs** through EUROSTARS, Clusters and Umbrellas (not applicable for MBT).

- Projects[23]

With no thematic restriction, there have been 14 Eureka projects with participants form 17 countries and the total cost of 17.3 million EUR in Biomarine technologies, 7% of which were in Marine science, 36% in Fishing technologies and 57% in Aquaculture technologies. At least 5 of the projects have a direct MBT focus.

- Clusters[24]

EUREKA Clusters are strategic initiatives proposed and led by industry, developing generic technologies of key importance for European competitiveness. Clusters facilitate R&D and innovation projects on the basis of a broad industrial participation spanning large industry and SMEs as well as research institutions and other public or private organization. Currently there are 7 clusters in the EUREKA network, including ACQUEAU – a cluster focusing on the development of water technologies, with a new **BioMarine Cluster** currently being considered with the main objective to bring together public authorities and the industry to support projects and provide breakthrough innovations in biomarine technologies (BICA, 2014).

- EUROSTARS[25]

Eurostars is a joint program between more than 30 EUREKA member countries and the European Union supporting research-performing SMEs by providing funding for transnational innovation projects with the aim to develop innovative products, processes and services, thus gaining competitive advantage. The search through the Eurostars project search engine resulted in 4 projects with MBT focus.

EUROTRANSBIO[26]

The international funding initiative EuroTransBio (in many ways similar to a JPI), brings together individual countries/regions pulling resources in calls of interest in order to support trans-national RDI co-operation between companies, especially SMEs, and research organizations, active in the

[23] http://www.eurekanetwork.org/eureka-projects
[24] http://www.eurekanetwork.org/content/eureka-clusters
[25] https://www.eurostars-eureka.eu/eurostars-projects
[26] https://www.eurotransbio.eu/

field of modern biotechnology. A total of 157 cooperative RDI projects have so far been recommended for funding with only 2% of projects in MBT, despite the fact MBT is in the funding scope of the initiative.

PRIVATE FUNDING SCHEMES

Based on the findings of the ERA-MBT Open Stakeholder Consultation private funding, either in the form of risk or other types of private capital (share capital, private investments, industrial cooperation and other commercial contracts), is still a limited source of capital for MBT stakeholders (ERA-MBT, 2014:.12). Some SMEs (though a limited amount) fund their RDI activities thorough venture or other private capital, the latter being the main source of funding for large companies (ibid.)

Venture capital

It is often argued, that the gap between R&D and commercialization is a result of the lack of venture capital in the MBT sector. The DG MARE study for example claims that the 17% fall in venture capital investment since 2008 has made SMEs operating in a high risk cash burning stage even more difficult. Meredith Lloyd-Evans (2014) is asking himself why a **sector specific fund** does not exist and why it is not being set up. The issue might be relevant, but the fact is venture capital funding is dependent more on the attractiveness of the main aim of the SME rather than the source of innovation (Ecorys et al., 2014: 26) and when it comes to the portfolio of venture capital companies, they tend to include only one marine-oriented company.

Large companies

The DG MARE study identifies the main players in MBT based on the number of patents they have filed. It is clear companies are main patent filers, accounting for more than 80% of the total number of patents (Ecorys et al., 2014: 49). The biggest include **Henkel** in cosmetics and health, **Pharmamar** and **BASF** in health and **Shell** in energy. **Bayer** is identifies as the top European investor in aquatic products and **L'Oreal** in high value products (ibid.).

Some companies have their own corporate venture capital companies. An example is **BASF Venture Capital** which aims at "linking the strategic and operational interests of BASF Group with innovative technologies of emerging businesses" (BASF, 2015[27]). In the case of BASF, the venture capital company prefers to get involved with financing in the early stages, after the creation of the company".

Other companies, such as **Unilever** and **P&G** do not provide direct investment, but look into different applications of MBT, thus providing opportunities for productive relationships between industry and research (Ecorys et al., 2014:38).

[27] http://www.basf-vc.de/index.php?id=1&L=1

CONCLUSIONS

Based on the performed activities to prepare the present report, including the ERA-MBT Open Stakeholder Consultation, the breakout session on funding at the First ERA-MBT Stakeholders meeting and the performed desk study of the publically accessible literature on public and private funding schemes for Marine Biotechnology RDI leads to the following conclusions:

- The issues regarding MBT funding have been discussed to great detail at several occasions in different settings with all of the identified stakeholders.

- The conclusions of these discussions and the proposed solutions to overcome identified funding barriers do not vary greatly, this being supported both by the findings of ERA-MBT activities in investigating funding and the comprehensive DG MARE Study.

- Many of the issues raised directly or indirectly related to funding RDI are not MBT specific (e.g. technology transfer issues, patent costs, collaboration between researchers and industry, kindling entrepreneurship in scientists, administrative burdens).

- The funding environment has changed since the beginning of Horizon 2020, with the approach to MBT RDI funding being more strategic (with the introduction of Blue Growth as a focus theme) and innovation leading the way (with new funding mechanisms that might help overcome some of the identified barriers, e.g. FTI, INNOVFIN).

- The funding environment is complex and the question is whether the main ERA-MBT stakeholders with limited human and financial resources (especially SMEs) can be fully informed, understand and successfully utilize the available funding options.

- The need for new funding measures is questionable, as many existing initiatives, funding actions and mechanisms already exist.

- The success of these funding measures varies substantially and is yet unclear when it comes to instruments introduced in H2020.

Based on the above conclusions a dedicated workshop, as envisioned in the ERA-MBT project proposal, should be organized for identified public/private funding organizations and industry representatives. The workshop, which should take into account the complexity of the funding environment the MBT stakeholders are comforted with, should aim at:

- finding complementarities and synergies within existing partnerships/initiatives directly or indirectly related to MBT,

- exploring reasons for the success of some and failure of other funding mechanisms,

- identifying those funding mechanisms and tools that have proven to be successful and could be utilized in their current form,

- Exploring ways to strengthen support and promote the identified mechanisms among ERA-MBT stakeholders.

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