COLUMBUS
KNOWLEDGE TRANSFER FOR BLUE GROWTH

Acronym: COLUMBUS
Title: Monitoring, Managing and Transferring Marine and Maritime
Knowledge for Sustainable Blue Growth
Grant agreement n° 652690

Deliverable 4.3
Report on KO's identification
August 2016

Lead parties for Deliverable: EurOcean Foundation

Due date of deliverable: M18

Actual submission date: M18

Revision: V.1

Project co-funded by the European Commission within the H2020 Programme (2004-2020)	
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)	

COLUMBUS
KNOWLEDGE TRANSFER FOR BLUE GROWTH

CONTENTS

LIST OF FIGURES AND TABLES

List of Figures

List of Tables

EXECUTIVE SUMMARY

Objectives

Work Package (WP) 4 – Knowledge Supply objective is to identify, collect and monitor past and current research activity with view to collecting Knowledge Outputs[1] (KOs) focused on priority areas defined in WP3 – Knowledge Demand. Furthermore WP4 aims to maintain and develop the Marine Knowledge Gate[2] ensuring it is up to date and fit for purpose, meeting the needs of the EC and stakeholders as requested by the EC (Marine Research Information Platform by 2015 (COM(2014) 254 final/2).

The vital aim of the Knowledge Supply step is to collect relevant Knowledge Outputs from EC research projects, the cornerstones of the COLUMBUS project, to inform WP5 and WP6 as to promote the transfer of those with higher potential to realise an impact in the context of the Blue Growth and Marine and Maritime Governance.

The KOs collection follows a proven methodology[3] culminating in the development and validation of a **Knowledge Output Table** (KOT) per project - record of all relevant information related to the knowledge coming out of a project and its potential application to various target users.

This report aims to illustrate how is the KO collection process and how the KOT informs COLUMBUS subsequent Knowledge Transfer steps. KOT components and their relevance with regard to the maintenance of the EurOcean_KG-Marine Knowledge Gate will be also explained.

Rationale

While Deliverable 4.1[4] described the identification of EC marine-related[5] research projects and the subsequent identification of potentially relevant research based on the identified gaps and needs of **each Competence Node** (CN) (WP3), Deliverable 4.3 will focus specifically on the **KO Collection and Validation** process.

According to Deliverable 2.2[6] "*In order for COLUMBUS to achieve its objective of bringing new knowledge from marine research to relevant users, it is first necessary to capture, and have a thorough and critical understanding of the collected knowledge*". This thorough understanding entails **the identification of potential applications and respective end users** of the knowledge.

The results of the 1st Knowledge Transfer Cycle[7] Collection Step, between the period of November 2015 to June 2016[8], is presented as well as the main barriers and lessons learned based on direct Knowledge Fellows[9] feedback.

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[1] Knowledge Output (KO) – not necessarily the same as a project result as it is defined as "*A unit of knowledge or learning generated by or through research activity*"

[2] EurOcean_KG: Marine Knowledge Gate Infobase - the most comprehensive and innovative information repository on marine and maritime research projects and their results

[3] KOs collection methodology developed by FP7 Environment project MarineTT – European Marine Research Knowledge Transfer and Uptake of Results and, implemented in various FP7 projects including the FP7 Environment STAGES - Science and Technology Advancing Governance of Good Environmental Status an FP7.

[4] COLUMBUS Deliverable 4.1. "Inventory of Relevant Projects by Priority Focus Area", April 2016

[5] The marine-related term comprises both marine and/or maritime activities

[6] COLUMBUS Deliverable 2.2. "Knowledge Guidelines on carrying out COLUMBUS Knowledge Transfer and Impact Measurement", November 2015

[7] COLUMBUS Knowledge Transfer Cycle comprises the Collection, Analysis and Transfer of KOs and it is envisioned to run three times over the course of the project to ensure it responds to end-users timely knowledge needs.

[8] The official timespan of the 1st Collection Period is from Mid-Nov2015 until mid-Mar2016, however this report covers all activities carried out until June 2016 as to reflect the dynamic nature of the Knowledge Transfer process.

COLUMBUS
KNOWLEDGE TRANSFER FOR BLUE GROWTH

Results

In synthesis, during this collection exercise within the 1st Knowledge Transfer Cycle, 937 marine-related projects were flagged as relevant the nine Competence. Of these 347 (~37%) were identified as potentially relevant in terms of Knowledge Outputs Collection. From these projects, a total of 1,141 Knowledge Outputs were extracted of which it was possible, so far, to validate 794 (~70%). A total of 124 (~16%) of validated KOs are considered relevant for subsequent Knowledge Transfer activities.

Based on these results the Collection process has been shown to be appropriate for the extraction of Knowledge Outputs. Nevertheless the process and all steps it entails is very time consuming and highly dependent on Project Coordinators engagement. For the next Knowledge Transfer Cycle, steps are being taken to further streamline and improve the process in order to increase both the number and relevance of validated KOs.

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[9] Node Fellows (NF) – the main actor in charge of the Knowledge transfer activities in each Competence Node (in a total of 9 Nodes as to address key activities, both sectoral and cross-cutting, of particular relevance for Blue Growth and Marine and Maritime Governance)

COLUMBUS
KNOWLEDGE TRANSFER FOR BLUE GROWTH

INTRODUCTION

Background

COLUMBUS - Monitoring, Managing and Transferring Marine and Maritime Knowledge for Sustainable Blue Growth, is a €4 million H2020 Blue Growth[10] project funded by DG Research and Innovation for 36 months (March 2015 - February 2018) involving 26 partners from 12 European countries.

COLUMBUS "aims *to ensure that applicable knowledge generated through EC-funded science and technology can be transferred effectively to advance the governance of the marine and maritime sectors while improving competitiveness of European companies and unlocking the potential of the oceans to create jobs and economic growth in Europe (Blue Growth)"* (COLUMBUS Description of Action[11]).

The project, designed to **demonstrate value creation of EU funded research outputs** for a wide range of end users, will focus on unlocking the potential of past and current relevant EC funded projects research results, that better address existing knowledge gaps and needs, with the aim to foster Blue Growth as well as, assisting in the implementation of marine legislation, including the Marine Strategy Framework Directive (MSFD) and the revised Common Fisheries Policies (CFP) among others.

COLUMBUS' structure was designed to achieve this aim as a result of the completion of a **Knowledge Transfer Cycle** underpinned by the accomplishment of some key complementary support actions such as the analysis of the demand, the setup of a suitable methodology and an efficient communication plan.
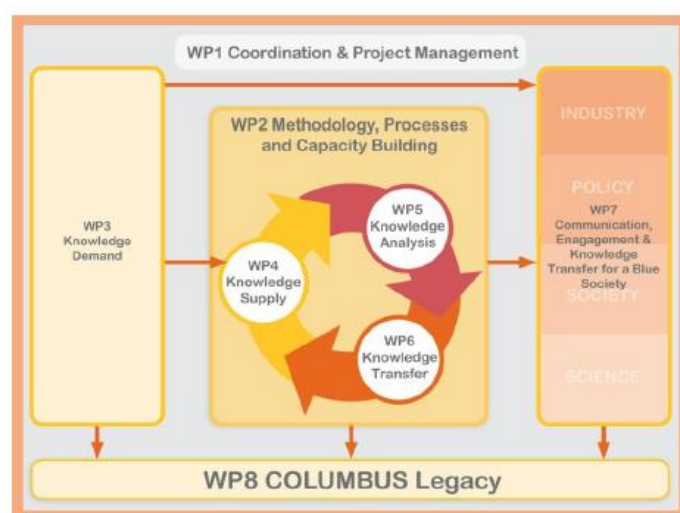
*Figure 1- COLUMBUS PERT Diagram*

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[10] Blue Growth projects aimed at supporting the long term strategy of Blue Gorwth, the maritme contributuion to achieving the goals of the the It is the maritime contribution to achieving the goals of the Europe 2020 strategy for smart, sustainable and inclusive growth

[11] COLUMBUS Project Description of Action, Grant Agreement nº 652690; 13th February 2015

The COLUMBUS' Knowledge Transfer Cycle entails a five steps approach, designed to ensure the strategic, coordinated and effective: **Collection** (WP4); **Analysis** (WP5) and **Transfer** (WP6) of relevant research findings known **as Knowledge Outputs** (KOs) in a wide scope of nine marine and maritime areas/sectors termed **Competence Nodes** (CN)[12].
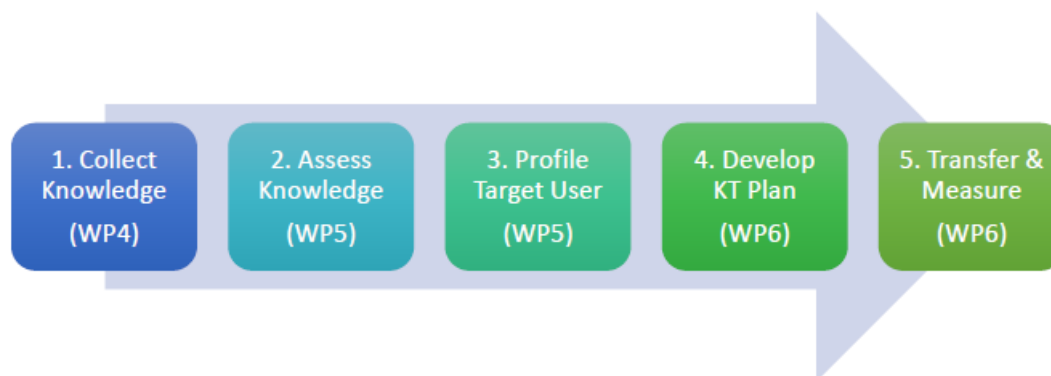
Figure 2- COLUMBUS Knowledge Transfer Cycle Steps

To ensure that all COLUMBUS activities are responding to timely knowledge needs of all end users (industry, administration, academia or society), the Knowledge Transfer Cycle runs over three times during the lifetime of the project.

Prior to the identification of research outcomes with the potential to fulfil knowledge needs (KOs), the latest relevant EC-funded marine and maritime research projects must be identified.

Consequently, WP4 – Knowledge Supply, is composed of four main steps:
- Identification of Potential Research Activity (Task 4.1) and Information/Data (Task 4.2), which entails the identification of EC-funded marine and maritime research projects and, a subsequent the identification of relevant projects based on the identified knowledge gaps and needs of each Competence Node (CN) (WP3);
- Collection of Research Knowledge Outputs (Task 4.3) through the active engagement of each Node Fellow with the most potentially relevant short-listed projects, aimed at the development and validation of a comprehensive **Knowledge Output Table (KOT)**;
- Maintenance of the EurOcean_KG-Marine Knowledge Gate InfoBase (Task 4.4) comprised of the update of EurOcean_KG with newly identified research projects and research outcomes (KOs) and,
- Analysis of the remaining knowledge gaps per area (Competence Node) (Task 4.5).

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[12] COLUMBUS Competence Nodes – the COLUMBUS project aiming to ensure a competent team with sufficient critical mass to carry out all stages of the Knowledge Transfer process, implemented 9 Competence Nodes to ensure a full Competence and spatial coverage. The 9 Competence Nodes are:i) Fisheries; ii) Aquaculture; iii) Monitoring & Observation; iv) Marine Biological Resources; v) Maritime Transport & Logistics; vi)Marine Physical Resources; vii) Maritime Tourism; viii) Marine Governance & Management and, ix) Marine Environment & Futures.

Organisation of this report

While the **Identification** step of the Knowledge Supply component was already described in Deliverables 4.1 and 4.2[13], this report aims to illustrate the **KO Collection and Validation** process and how the KOT informs COLUMBUS subsequent Knowledge Transfer steps. The KOT components and their relevance with regard to the maintenance of the EurOcean_KG-Marine Knowledge Gate will be also explained.

Additionally this report will briefly present the results of the 1st Knowledge Transfer Cycle Collection step, which will be later supplemented by an update of the current report, foreseen for May 2017 (M27) so as to reflect the remaining KT Cycles.
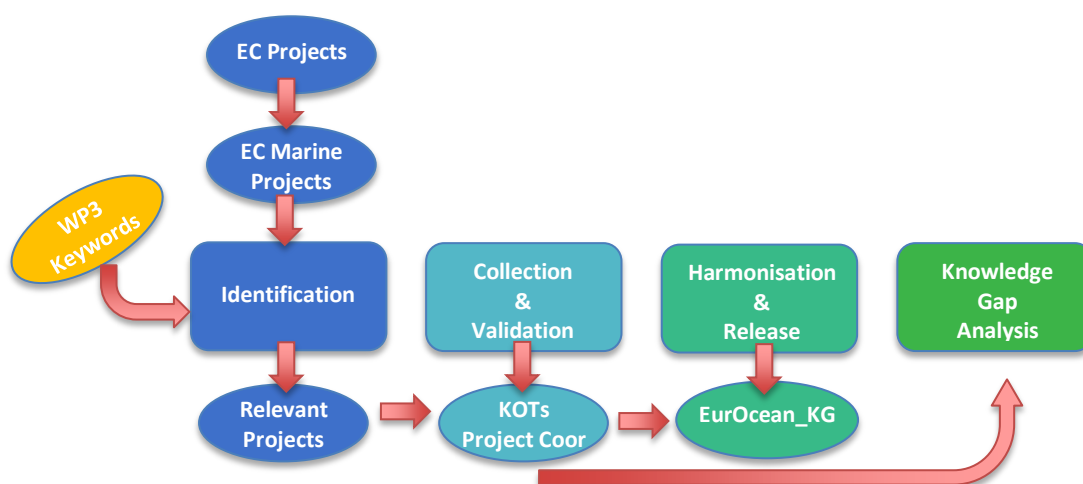
Figure 3- COLUMBUS WP4-Knowledege Supply Steps

Moreover, the report will provide the main Collection barriers and lessons learned based on direct feedback of the Knowledge Fellows.

The document is structured into four main sections:
- This section which briefly introduces the COLUMBUS project and the structure of this report;
- Section 2 which describes the methodology used to collect relevant KOs, KOT components, development and validation and,
- The third and fourth sections which present and discuss COLUMBUS' 1st Collection Cycle results respectively.

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[13] COLUMBUS Deliverable 4.2. "Portals and repositories and their role in Knowledge Transfer to support Blue Growth", April 2016

Terminology

This document uses several terms, the majority of which have been defined in the COLUMBUS deliverable "*Knowledge Guidelines on carrying out COLUMBUS Knowledge Transfer and Impact Measurement*"[14] as follows:

Knowledge Transfer (KT): The term for the overall process of moving knowledge between knowledge sources to the potential users of knowledge. Knowledge Transfer consists of a range of activities which aim to capture, organise, assess and transmit knowledge, skills and competence from those who generate them to those who will utilise them.
The ambition of Knowledge Transfer is to expedite innovation.

Knowledge Output (KO): A unit of knowledge or learning generated by or through research activity. They are not limited to de-novo or pioneering discoveries but may also include new methodologies/processes, adaptations, insights, alternative applications of prior know-how/ knowledge.

Knowledge Output Table (KOT): Record of all relevant information related to the Knowledge coming out of the project and its potential application to various target users: one file per relevant project.

End User(s): The individual(s) who will apply the Knowledge Output at the end of the Knowledge Output Pathway.

Knowledge Output Pathway (KOP): This can be one step or a series of steps required to carry a Knowledge Output (KO) to its Eventual Impact. Where there are a series of steps, it will include detailed mapping of the steps, the users involved at each step and their predicted role in the pathway to Eventual Impact.

Eventual Impact: The ultimate end benefit of the application of the Knowledge Output (KO). It is defined as an enhanced situation that is contributing to "Blue Growth" including the implementation of the Marine Strategy Framework Directive (MSFD).

Competence Nodes (CN): A key objective of the COLUMBUS project, and its legacy, is a network organised within COLUMBUS to ensure there is a competent team with sufficient critical mass to carry out a technology and Knowledge Transfer process as a peer community. COLUMBUS comprises a total of 9 Competence Nodes addressing key activities, both sectoral and cross-cutting, of particular relevance for Blue Growth and Marine and Maritime Governance:

- Fisheries
- Aquaculture
- Monitoring & Observation
- Marine Biological Resources
- Maritime Transport & Logistics
- Marine Physical Resources

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[14] COLUMBUS Deliverable 2.2. "Knowledge Guidelines on carrying out COLUMBUS Knowledge Transfer and Impact Measurement", November 2015

- Maritime Tourism
- Marine Governance & Management
- Marine Environment & Futures

Knowledge Fellow (KF): The Knowledge Transfer Fellows' primary job role is to ensure knowledge generated via European Research is effectively transferred to different end-users who can take up and apply the knowledge resulting in significant value creation. Each Competence Node in COLUMBUS has been assigned a Full-time Equivalent Fellow for a minimum of 24 months.

Knowledge Transfer Cycle: Each of the three rounds planned in COLUMBUS comprising KO collection, KO analysis (with KOP design and target uses profiled) and transfer planning and development (including the measurement of impact).

EurOcean_KG: EurOcean Marine Knowledge Gate Infobase - the most comprehensive and innovative information repository on marine and maritime research projects and their results, with over 6,000 project from more than 20 European and National Programmes and, 1,800 Knowledge Outputs.

Marine-related: The term encompasses not only all activities commonly considered as marine but also all maritime-related activities.

2   METHODOLOGY

Upon identification of the most potentially relevant marine-related EC funded research projects per Competence Node, based on illustrative keywords of the key knowledge challenges, bottlenecks, barriers and gaps determined under WP3 and the subsequent scope refinement through a project potential prioritisation exercise (already reported in Deliverable 4.1[15]), Fellows initiated the KO collection process.

A Knowledge Output, described in COLUMBUS as "*a unit of knowledge or learning generated by or through research activity*", may not be the same as a project result as the latter can contain several KOs, for example as can be the case of a project report. Furthermore as the knowledge generated by project results is usually not properly identified, classified and made widely accessible, contact with Project Coordinators and/or Knowledge Output Developers is fundamental as being the most reliable and efficient information source.

Consequently a Knowledge Output must be clearly described by a set of standard information fields (see Table 1) so as to allow a variety of users to fully understand the knowledge generated. Furthermore, given COLUMBUS' remit to capitalise on applicable knowledge generated by EC-funded research by ensuring its accessibility, transfer and uptake, in addition to the description of the knowledge, a KO also contains information on the different identified end-users and the potential applications of that KO for them.

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[15] COLUMBUS Deliverable 4.1 "Inventory of Relevant Projects by Priority Focus Area", April 2016

Field Name	Field Description
KO Title	Short title for the Knowledge Output
KO Description	Short comprehensive description of the Knowledge Output
KO Type	Type of the Knowledge Output produced in the course of the research project
Contact Information	Contact details of Project Coordinator or Knowledge Output Developer
Link to KO	If the information on the Knowledge Output is available to the general public
KO Sectors & Subsectors	Sectors (or sub-sectors) that might benefit from the Knowledge Output
KO End-user	Type of stakeholder community that could potentially benefit (end-user) of the Knowledge Output
KO Potential Application	Foreseen and/or possible application(s) for the Knowledge Output
KO IP/Confidentiality	If the Knowledge output has any Intellectual Property rights or confidentiality issues
Relevant to MSFD	If the Knowledge Output is relevant for the Marine Strategy Framework directive, including MSFD Indicator and Marine Region information
KO Status	Status of completion of a Knowledge Output, including its TRL (Technology Readiness Level) if applicable

Table 1 - COLUMBUS' Standard Knowledge Outputs information fields

Concrete information and understanding of the generated knowledge itself, who could benefit from it, its potential applications and what are the possible IPR/confidentiality issues are crucial elements to inform the Fellows on the potential transfer impact as well as on the potential/likelihood of KO transfer by the COLUMBUS project.

Such COLUMBUS transfer likelihood and potential impact are further evaluated in an Knowledge Analysis component, where the initial KOT information on end-user and potential applications is taken into consideration to develop the Knowledge Output Pathway (KOP) – "*one step or a series of steps required to carry a Knowledge Output to its Eventual Impact*" and, to determine who are the Target Users – "*individuals are not necessarily the ultimate user or beneficiary of the Knowledge Output; rather … place the Knowledge Output into a pathway that hopefully leads to an Eventual Impact*".

Given its remit and limited resources COLUMBUS recognises the importance of making publically available and widely accessible all the KOs collected throughout the lifetime of the project. Accordingly, all KOs will be uploaded to the EurOcean Marine Knowledge Gate Infobase, the most comprehensive and innovative open information repository on marine and maritime research projects and their results.

Marine Knowledge Gate, was developed in cooperation with a number of initiatives such as the EC MarineTT (where the KO concept and methodology was initially developed) and STAGES projects[16], where EurOcean was a partner of the consortia. As MarineTT and the STAGES projects were the precursors of COLUMBUS, the Marine Knowledge Gate research results component is not surprisingly developed based on the KO concept. Therefore all the captured KOs will be easily fed into the InfoBase although an InfoBase upgrade is being planned. Such an upgrade will be focused mainly on

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[16] MarineTT - European Marine Research Knowledge Transfer and Uptake of Results (FP7 Environment project); STAGES - Science and Technology Advancing Governance of Good Environmental Status an FP7 (FP7 Environment project),

the user interface rather than the available information fields however, possible changes in the KOs types and other fields such Sectors and Subsectors are also being considered and for that reason this report will not detail the current defined options within each field.

Acknowledging that KO quality and accuracy is vital, COLUMBUS focuses not only on the extraction of the completed KOs but also on their validation. Consequently, COLUMBUS' KO Collection process, "*aimed to identify the Knowledge Outputs from marine and maritime projects; to obtain an understanding and clear description of these outputs and, to identify potential applications and respective end-users of the knowledge*", comprises three fundamental steps (already described in Deliverable 2.2) which are:
- Step 1 – Gathering of Knowledge and Development of a Knowledge Output Table (KOT);
- Step 2 – Project Coordinator Interview and,
- Step 3 – Validation of the KOTs and Prioritisation of the Collected KOs.

Gathering of Knowledge and Development of a Knowledge Output Table (KOT)

Although Project Coordinators are considered to be the best KO information source, Knowledge Fellows were advised to carry "*out a desktop review on any publicly available material, such as project reports, publications and presentations*", to gather initial information on the Knowledge Outputs coming out of the project. To that end EurOcean as WP4 Leader additionally provided up-to-date information regarding CORDIS[17] project reports availability and of existing KOs previously collected through other initiatives[18].

This information was to be used to begin the population of the KOT (a single table per project to record all project KOs), as a pre-populated KOT was considered useful to promote the collaboration of the Project Coordinator by showcasing COLUMBUS' Fellow interest and by diminishing the Project Coordinator input effort. Furthermore such desk-top studies were crucial so as to inform the Knowledge Fellow on questions needed to be further addressed so as to fully understand the project KOs.

Project Coordinator Interview

"*The objective of this interview (was) to allow the COLUMBUS Knowledge Fellow to capture all of the Knowledge Outputs generated by the project and enough information to describe them fully in the Knowledge Output Table*". Consequently COLUMBUS Knowledge Fellows established "*contact with the Coordinator of the Project from which they are collecting Knowledge Outputs (KOs)*", guiding them through the collection process focusing on the KOT information gaps.

For an efficient and effective interview Fellows were advised to follow a previously prepared script which should entail a COLUMBUS project introduction, a description of the exercise, the Project collaboration benefits and, the Fellow's specific questions set.

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[17] European Comission CORDIS Database – Community Research and Development Information Service

[18] FP7 Environment projects MarineTT and STAGES as well as AQUAEXCELL, AquaInnova and MG4U FP7 projects

Further desk-base studies could be taken on by the Fellow if so desired, if directed to additional material by the Project Coordinator and/or Knowledge Output Developer.

Project Validation of the KOTs and Prioritisation of the Collected KOs

As all collected KOs will be made publicly available through the EurOcean_KG-Marine Knowledge Gate even if they will be subject to transfer actions, COLUMBUS recognises that KOs validation is a crucial step so as to guarantee the quality and accuracy of the extracted KOs. Hence COLUMBUS Fellows upon conclusion of the KOT were advised to contact the Project Coordinators once more so as to obtain their validation.

Upon validation of their extracted KOs, Fellows could proceed for the final Collection step action, the prioritisation of the collected KOs based on their expertise and the competences of the COLUMBUS partners. The aim of this prioritisation is to take forward to the Analysis and Transfer process only those KOs with the highest potential to be impactful when transferred.

Additional criteria to support the COLUMBUS Fellows in determining the prioritization levels of KOs apart from the KO relevance regarding the identified challenges, barriers or knowledge needs, was developed by WP5 – Knowledge Analysis Leader (CETMAR, Spain) and reported under Deliverable 5.1[19].

Given however the high dependency of the Collection process on Project Coordinators (PC), Fellows were given freedom to adapt the methodology on a case-by-case basis in order to adapt to the challenges diversity. Thus Fellows could for instance initiate the contact with Project Coordinators prior to the desk-study so as to determine the willingness of the PCs in the whole collection process. If a PC availability would be less than ideal, Fellows could also aim just for the collection of what were deemed more relevant/potential KOs, as well as for the validation of only those ones rather than the other collected KOs.

For that reason, even though only validated KOs will be taken forward through Steps 2 to 5 of the Knowledge Transfer Cycle and made publically available through the Marine Knowledge Gate, this document which reports the Collection activities from the period comprised from month 9 (Nov. 2015) to month 16 (June 2016)[20] includes as well information on the non-validated KOs.

Non-validated KOs will be subject to specific Project Coordinators tailored actions, currently under discussion, before the end of the COLUMBUS project. Remaining non-validated KO will be presented as an annex to the final updated version of this report, foreseen for May 2017 (M27) so as to reflect the remaining KT Cycles.

This report takes also into consideration the results of the Oceans of Tomorrow (OoT) pilot exercise performed through the non-contractual request of the EC, which was previously reported in D.4.1.

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[19] COLUMBUS Deliverable 5.1. "Knowledge Output Analysis including Knowledge Output Pathway Generation and Results", May 2016

[20] Although officially COLUMBUS' 1st Collection Cyle was from Mid November 2015 until Mid March 2016 (M9-M13), this report due to the dynamic nature of COLMUBUS strucutre where all KT Stpes can occur at same time for different projects/KOs, compreends the period from November 2015 to June 2016 (M9 – M16) to provide the most up-to.date information.

RESULTS

As reported in Deliverable 4.1, as a result of the decisions taken by the COLUMBUS consortium at the 2nd Partner Meeting (Berlin, Germany; 9th July 2015), COLUMBUS' 1st Knowledge Transfer Cycle focused primarily on all marine-related FP7 funded research projects. Additional projects, regardless of their funding nature (European or national) were possible to be considered based on Fellows perceived high relevance.

As of April 2016, upon a first prioritisation of Nodes allocated research projects by their potential relevance with regard to COLUMBUS objectives, a significant number of Knowledge Outputs had been already collected, the majority of which were gathered during the Oceans of Tomorrow (OoT) pilot exercise which was performed through the non-contractual request of the EC (see D.4.1).

However although the first round of the Collection process was already officially concluded, validation by Project Coordinators of several KOs was still pending and therefore this report, based on progress reported and information provided by Fellows by the end of month 16 (June 2016), considers additional carried out activities.

Despite the extended timeline not all KOs have been validated due to lack of Project Coordinators response and hence, further validated KOs are expected to be submitted in the future. Nonetheless, the current results of this first KOs Collection Cycle are presented below in Table 2.

Competence Nodes	Marine Allocated Projects*	Potentially Relevant Projects	KOT	Validated KOs	Non validated KOS	Potentially Relevant KOs
Fisheries	17	12	8	57	11	30
Aquaculture	101	53	17	21	48	0
Biological Resources	171	28	16	65	27	3
Environment & Futures	86	54	9	51	19	3
Physical Resources	84	32	19	122	118	56
Governance & Management	131	35	9	250	1	21
Tourism	135	26	9	54	0	0
Transport & Logistics	121	82	17	105	123	9
Monitoring & Observation	91	25	12	69	0	2
TOTAL	**937**	**347**	**116**	**794**	**347**	**124**

*Marine Allocated Projects consider: i) Nodes allocated projects; ii) Additional projects deemed relevant by the Nodes regardless of their funding nature; iii) Project reallocation, this is when a different Node from that which was initially allocated the project took it over regardless of KO collection status and, iv) Node allocated OoT projects if not subject to subsequent reallocation. Values differ from those presented in D4.1 as the reallocated projects were counted mistakenly twice.

Table 2 - COLUMBUS' 1st Knowledge Transfer Cycle Preliminary Results by Competence Node

14

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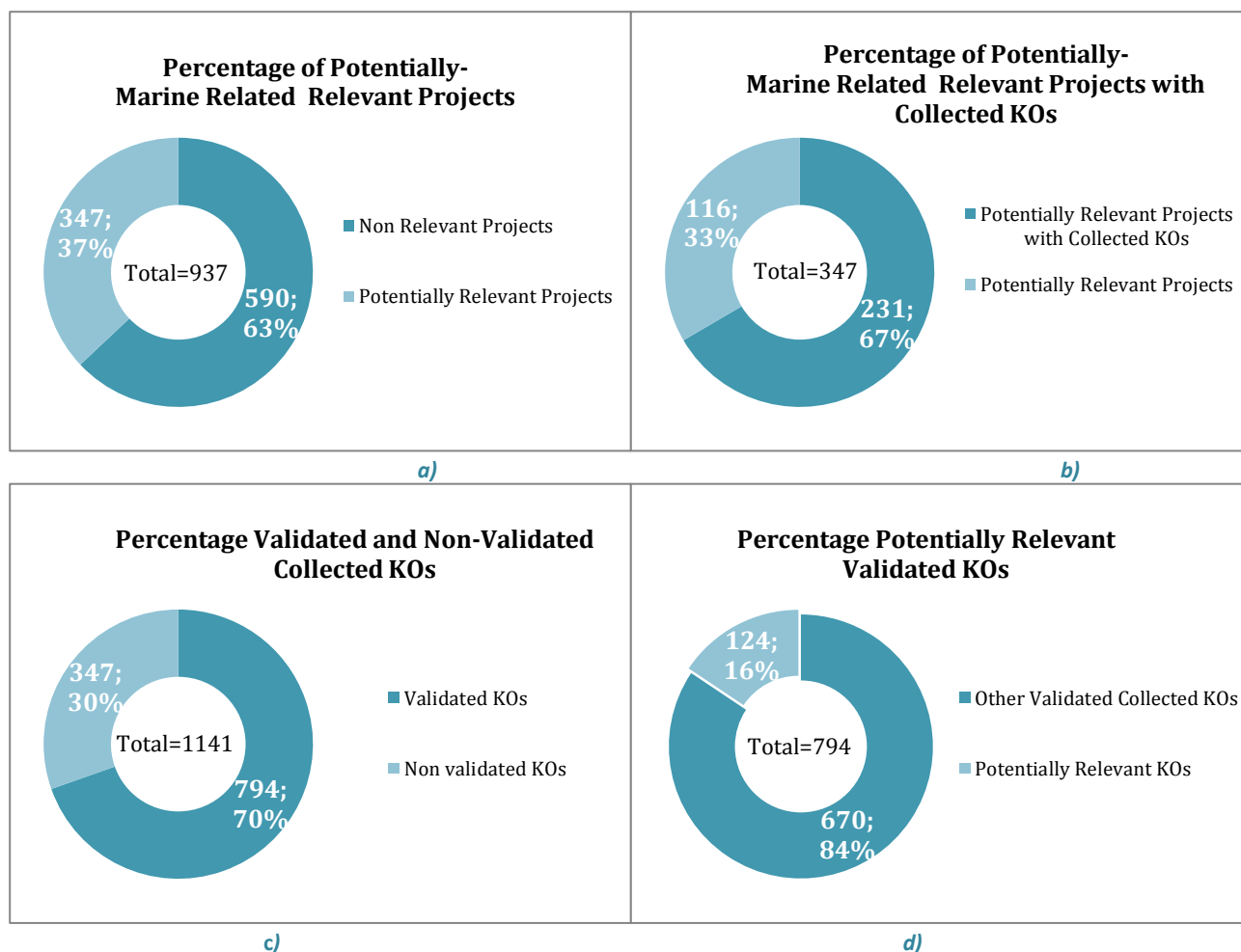
Figure 4- COLUMBUS 1st Knowledge Transfer Cycle Collection Results
a) Percentage of Potentially Marine-Related Relevant Projects
b) Percentage of Potentially Marine-Related Relevant Projects with Collected KOs
c)Percentage of Validated and Non-Validated Collected KOs
d)Percentage of Potentially Relevant Validated KOs

Over 37% of the total number of projects identified by COLUMBUS were prioritised for KO collection in the 1st KT Cycle (n=347 including OoT and other additional projects and n=937 EC-Marine allocated Projects, respectively).

Of these potentially relevant projects, just over one third were subject to KO collection thus clearly revealing the time consuming nature of KO collection (n=116, corresponding to 12% of total EC-Marine allocated Projects universe and 33% of Potentially Relevant Projects).

The nature of the Ocean of Tomorrow projects funded under the FP7 cross-thematic calls aimed "*to foster multidisciplinary approaches and cross-fertilisation between various scientific disciplines and economic sectors on key cross-cutting marine and maritime challenges*"[21] involving the participation

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[21] The Ocean of Tomorrow Projects (2010-2013), Directorate-General for Research and Innovation, European Union, 2014

of business, is still very evident when considering that 31 projects (27% of projects with collected KOs; n=116) generated circa 48% of all collected KOs (n= 546 OoTs KOs in line with data provided by AquaTT already reported in D4.1. and n=1,141 total collected KOs).

Almost 70% (n= 794 Validated KOs out of n=1,141 Total KOs) of the KOs were validated. This is quite an achievement given the challenges faced in involving Project Coordinators in this step. Nonetheless it should be noted that all KOs validated were at the KOT/project level. In other words once a Project Coordinator was engaged, all the KOs related to that project went through the validation step.

Although insufficient data is available to infer a response rate across the different FP7 Specific Programmes and the effect of previous contacts established by past initiatives, a higher validation rate by the Cooperation funded projects was detected. This behaviour was observed in previous projects, and indicates that they are more likely to validate KOs regardless if previous contact had been established or not.

Furthermore of all validated KOs only 16% (n= 124 of 794 validated KOs) were considered by the Fellows to be of potential high impact within the COLUMBUS remit, and therefore brought into the Analysis step.

This disparity in the percentage of relevant collected KOs between Competence Nodes can be explained by absence of complete Node reporting such is the case for the Aquaculture and Tourism and, the Competence Node nature in the case of the Monitoring & Observation Node as well as the apparent misalignment between the extracted KOs and the current knowledge gaps and needs in particular for the marine Biological Resources Node.

Noteworthy is the fact that a few of the collected KOs are already totally or partially available under the EurOcean_KG-Marine Knowledge Gate. However as the information Harmonisation step of the Collection process has just started, the extent to which these KOs have been updated is not yet known. If proven that no changes to the KO status have been recorded these KOs (circa 50 representing a total of 4% of the total number of collected KOs n=1,141) will be later disregarded for the quantitative analysis of the KOs collection results and reported in the second version of this report foreseen for May 2017 (M27).

As all KOs will be later featured online in the EurOcean_KG-marine Knowledge Gate InfoBase, in order to avoid duplication, this report does not list all collected KOs. It does however present in Annex I the number of extracted KOs per project and their validation status.

Moreover and to conclude, a wide diversity of KOs types is observed as expected. A full analysis of the extracted KOs in terms of their descriptors (type, sectors, end-users, etc.) will be presented as part of D4.4- Upgraded Marine Knowledge Gate foreseen by the end of the project (February 2018) so as to take into consideration possible InfoBase information field upgrades, as previously mentioned.

As an example however, Table 3 below presents the distribution of the **Marine Environment & Futures** Competence Node validated KOs per KO type.

COLUMBUS
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KO Type	Nº Validated KOs
Book/Review	0
Data	0
Exploitable scientific result	7
Exploitable technical result	0
Guidelines/Standards	1
Multimedia	5
Product	3
Prototype	0
Report	20
RTD protocol/Technical manual	0
Scientific Publication	5
Services/Tools	7
Software/Modelling tools	1
Training activity/Learning module	2
TOTAL	**51**

Table 3 - COLUMBUS' Marine Environment & Futures Competence Node validated KOs per KO Type

Table 3 highlights a tendency commonly observed to some extent in all other Nodes which is that of none or very few developed prototypes and a significant predominance of reports. This trend is somewhat representative of the main nature/type of the FP7-funded projects while in contrast the OoT projects, with the mandatory involvement of business; tend to generate overall more exploitable/transferable results and fewer reports.

DISCUSSION

Knowledge Output Collection is extremely time consuming and very highly dependent on Project Coordinators for validation. However since the development of Deliverable 4.1 in April 2016, additional efforts after the official conclusion of the Collection process, translated into a significant increase of the number of validated KOs from 665 to 794 and a marginal decrease in the number of non-validated KOs (from 352 to 347).

Of all validated KOs, only 16% were considered as potentially relevant to be taken forward the COLUMBUS Knowledge Transfer methodology. This relatively low percentage can be partly explained by the specific focus of COLUMBUS and does not reflect the overall transfer potential of all the collected KOs. It does highlight, however the importance of a comprehensive collection process in order to mine as many potentially relevant KOs as possible since on average only 16% of the 10 KOs per project (n=1,141 total collected KOs per n=116 addressed projects) are suitable for COLUMBUS.

Several barriers to the Collection process where identified and reported by the Node Fellows at the 3rd Partnership Meeting held in Brussels, Belgium on March 3rd 2016. The majority of the barriers were already presented and discussed in Deliverable 4.1 namely those dealing with "internal" factors such as:

- COLUMBUS' 1st Collection process broad universe (sectorial and timeframe wise) and,
- Competence Node scope.

In addition to these, additional external factors were also identified such as information availability/accessibility difficulties and, Project Coordinators engagement which leads to a significant number of projects to be considered thereby implying the necessity for a project prioritization pre-step.

Subsequently, and in addition to the flexibility of the COLUMBUS KT methodology as previously discussed, EurOcean as WP Leader together with the project Management Team[22] is currently debating how to best approach the 2nd Collection Cycle. Informing this debate are also a few barriers expressed by a minority of the Nodes related to some misalignment between the extracted KOs and the current knowledge gaps and needs.

As to take into consideration the lessons learned EurOcean is proposing that the 2nd Collection Cycle should focus in more recent projects, including those funded under the H2020 Programme, which could prove to be beneficial for the COLUMBUS efforts in terms of:

- Relevance of the extracted KOs to the identified knowledge gaps and needs, even for faster paced thematic areas,
- Better alignment of project descriptions wording with the knowledge gaps and needs representative keywords,
- Easier access to all information sources (project websites and Project Coordinators for example);
- Possible stronger Project Coordinators engagement as COLUMBUS' can be perceived as supporting the projects' dissemination efforts and,
- Possible direct collaborations with the funded projects in Knowledge Transfer Activities, including support in a KT Plan development.

Considering the positive example of the OoT projects where just 31 projects generated nearly half of all collected KOs, identification and targeted approaches to key projects is also being considered.

However regardless of the Management decision and the previously described actions, COLUMBUS 2nd Collection Cycle is expected to rely on an EC and COLUMBUS' Coordinator support letter as requested by the Node Fellows in order to better secure the Project Coordinators engagement. In fact, in addition to the nature of the project, the main difference reported by the Fellows between the OoT projects and the other FP7 funded ones was the engagement level of the Project Coordinators which were previously addressed by the EC as to support COLUMBUS' efforts.

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[22] COLUMBUS Management Team is comprised off all Work Package and Competence Nodes Leaders

CONCLUSION

1. The Collection process has been shown to be appropriate for the extraction of Knowledge Outputs; the basis of the COLUMBUS project.
2. The Collection process and all steps it entails is very time consuming process and highly dependent on Project Coordinators engagement.
3. As not all collected Knowledge Outputs are adequate or possible to be transferred within the remit of the COLUMBUS project, and extensive and exhaustive Knowledge Output collection is vital in order to maximise the number of relevant KOs.
4. COLUMBUS methodology has evolved and will continue evolving as a result of lessons learnt from implementation.
5. Methodology flexibility is crucial notwithstanding the difficulty in overcoming some barriers such as a strong Project Coordinator engagement.
6. An informed discussion on how to best proceed with the 2nd Cycle collection is on-going, where among other actions, a combined EC and COLUMBUS Coordination support letter is envisioned.
7. COLUMBUS Fellows efforts should be directed to the identification and engagement with key projects, such as for example the Ocean of Tomorrow projects, as to be able to extract a higher number of possibly the most relevant Knowledge Outputs.

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ACRONYMS

CFP	Common Fisheries Policy
CN	Competence Node
EC	European Commission
EU	European
EurOcean_KG	Marine Knowledge Gate InfoBase
FP7	Seventh Framework Programme for research and innovation
H2020	Horizon 2020 EU Framework Programme for Research and Innovation
KF	Knowledge Fellow
KO	Knowledge Output
KOP	Knowledge Output Pathway
KOT	Knowledge Output Table (1 per project listing of all collected KO)
KT	Knowledge Transfer
OoT	Fp7 Oceans of Tomorrow projects
MSFD	Marine Strategy Framework Directive
PC	Project Coordinator
WP	Work Package

REFERENCES

- COLUMBUS Grant Agreement. Annex I Description of Action, February 2015
- COLUMBUS Deliverable 2.2. "Knowledge Guidelines on carrying out COLUMBUS Knowledge Transfer and Impact Measurement", November 2015
- COLUMBUS Deliverable 4.1 "Inventory of Relevant Projects by Priority Focus Area", April 2016
- COLUMBUS Deliverable 4.2. "Portals and repositories and their role in Knowledge Transfer to support Blue Growth", April 2016
- COLUMBUS Deliverable 5.1. "Knowledge Output Analysis including Knowledge Output Pathway Generation and Results", May 2016
- The Ocean of Tomorrow Projects (2010-2013), Directorate-General for Research and Innovation, European Union, 2014

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KNOWLEDGE TRANSFER FOR BLUE GROWTH

ANNEXES

COLUMBUS' 1st Knowledge Transfer Cycle Results per Relevant Project by Competence Node

Competence Node	Relevant Marine Project	Number of Collected KOs	Validation Status
Fisheries	NeXOs	14	Validated
Fisheries	BENTHIS	11	Validated
Fisheries	Fishermen-research network	1	Validated
Fisheries	UTOFIA	1	Validated
Fisheries	NECESSITY	29	Validated
Fisheries	FAST TRACK	1	Validated
Fisheries	MYFISH	10	Not Validated
Fisheries	ECOFISHMAN	1	Not Validated
Aquaculture	SELFDOTT	5	Not Validated
Aquaculture	SALMOTRIP	3	Not Validated
Aquaculture	ENRICH	1	Not Validated
Aquaculture	PASSA	5	Not Validated
Aquaculture	OYSTERECOVER	3	Not Validated
Aquaculture	FISHINUTRIGEN	5	Not Validated
Aquaculture	CLOSEDFISHCAGE	1	Not Validated
Aquaculture	COEXIST	4	Not Validated
Aquaculture	SETTLE	2	Not Validated
Aquaculture	AQUAEXCEL	3	Not Validated
Aquaculture	PRO-EEL	3	Not Validated
Aquaculture	PREVENT ESCAPE	1	Not Validated
Aquaculture	SEAT	5	Not Validated
Aquaculture	DEAMMRECIRC	2	Not Validated
Aquaculture	IRC-IMTA	5	Not Validated
Aquaculture	EnviGuard	11	Validated
Aquaculture	AQUATRACE	10	Validated
Biological Resources	MESODERM EVOLUTION	5	Validated
Biological Resources	PROTOBRAIN	17	Validated
Biological Resources	SQUID-SWITCH	1	Not Validated
Biological Resources	GENMARPHYTO	2	Not Validated
Biological Resources	LYNGBYA-KENYA	2	Not Validated
Biological Resources	PIMCYV	4	Not Validated
Biological Resources	SEAWEED AD	3	Not Validated
Biological Resources	THE WEAKEST LINKS	4	Not Validated
Biological Resources	SYMBIOCORE	4	Validated
Biological Resources	BIVALIFE	11	Validated
Biological Resources	COGNISEPLANCTOMYCES	3	Not Validated
Biological Resources	SYMBIOX	3	Not Validated

Biological Resources	GRACE	1	Not Validated
Biological Resources	HYFFI	4	Not Validated
Biological Resources	MICRO B3	21	Validated
Biological Resources	BIOCLEAN	7	Validated
Environment & Futures	AWARE	4	Not Validated
Environment & Futures	SIDARUS	5	Not Validated
Environment & Futures	ARCH	5	Not Validated
Environment & Futures	ENHANCE	3	?
Environment & Futures	N-CHITOPACK	8	Validated
Environment & Futures	FIELD_AC	4	Validated
Environment & Futures	LAGOONS	5	Not Validated
Environment & Futures	MONARCH-A	10	Validated
Environment & Futures	ACCESS	8	Validated
Environment & Futures	MARLISCO	21	Validated
Physical Resources	EQUIMAR	37	Not Validated
Physical Resources	AQUAGEN	7	Not Validated
Physical Resources	DEEPWIND	17	Validated
Physical Resources	HIPRWIND	9	Not Validated
Physical Resources	GEOWAVE	12	Not Validated
Physical Resources	WAVETRAIN 2	13	Validated
Physical Resources	NANOMAR	4	Not Validated
Physical Resources	SNAPPER	8	Not Validated
Physical Resources	MAGNETIDE	6	Not Validated
Physical Resources	PLENOSE	6	Not Validated
Physical Resources	TIDALSENSE	13	Not Validated
Physical Resources	MERIKA	9	Validated
Physical Resources	ACORN	9	Not Validated
Physical Resources	TIDALSENSE DEMO	7	Not Validated
Physical Resources	H2OCEAN	19	Validated
Physical Resources	TROPOS	24	Validated
Physical Resources	LEANWIND	27	Validated
Physical Resources	TURNKEY	4	Validated
Physical Resources	MERMAID	9	Validated
Governance &Management	HERMIONE	3	Validated
Governance &Management	DS³F	1	Not Validated
Governance &Management	CLIMSAVE	3	Validated
Governance &Management	COCONET	55	Validated
Governance &Management	DEVOTES	21	Validated
Governance &Management	PERSEUS	89	Validated
Governance &Management	STAGES	12	Validated
Governance &Management	ECsafeSEAFOOD	50	Validated
Governance &Management	VECTORS	17	Validated

Tourism	STACHEM	4	Validated
Tourism	BOMA	5	Validated
Tourism	4SEAS	3	Validated
Tourism	COMEX	2	Validated
Tourism	CITCLOPS	2	Validated
Tourism	LUPE	3	Validated
Tourism	Sea Change	1	Validated
Tourism	CLEANSEA	18	Validated
Tourism	SONIC	16	Validated
Transport & Logistics	TULCS	5	Not Validated
Transport & Logistics	EXTREME SEAS	5	Not Validated
Transport & Logistics	RETROFIT	10	Validated
Transport & Logistics	THROUGHLIFE	21	Validated
Transport & Logistics	MINOAS	11	Not Validated
Transport & Logistics	CYCLADES	8	Not Validated
Transport & Logistics	INCASS	11	Validated
Transport & Logistics	SELEKTOPE	1	Validated
Transport & Logistics	HILDA	8	Validated
Transport & Logistics	CLEANSHIP	4	Not Validated
Transport & Logistics	ADAM4EVE	25	Validated
Transport & Logistics	BESST	83	Not Validated
Transport & Logistics	SEAFRONT	7	Validated
Transport & Logistics	AQUO	16	Validated
Transport & Logistics	ECO2	6	Validated
Transport & Logistics	CBS Maritime	4	Not Validated
Transport & Logistics	Green Ships of the Future	3	Not Validated
Monitoring & Observation	JERICO	1	Validated
Monitoring & Observation	PEGASO	4	Validated
Monitoring & Observation	SEADATANET II	6	Validated
Monitoring & Observation	MYOCEAN2	1	Validated
Monitoring & Observation	MYOCEAN	1	Validated
Monitoring & Observation	COMMON SENSE	10	Validated
Monitoring & Observation	SenseOCEAN	6	Validated
Monitoring & Observation	SMS	0	Not Validated
Monitoring & Observation	BRAAVOO	12	Validated
Monitoring & Observation	SCHeMA	11	Validated
Monitoring & Observation	SEA-ON-A-CHIP	2	Validated
Monitoring & Observation	MARIABOX	12	Validated
Monitoring & Observation	SEADATANET	3	Validated

7