Study on the Support of KICs (Knowledge Innovation Communities) to the Development of the Blue Economy

Final Report

20th of June, 2014

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Executive Summary

Background and aim of the study

In 2012, the European Commission set the way forward for unleashing the potential of Europe's oceans, seas and coasts to help the EU economy back on track, while at the same time safeguarding its biodiversity and protecting the marine environment. The Communication "Blue Growth opportunities for marine and maritime sustainable growth[1]" was developed on the basis of a comprehensive overview of the Blue Economy in Europe, which showed that the economic potential within the Blue Economy is significant, provided that appropriate investments in among others research and innovation are made.

Within this context, an initiative to develop a Marine KIC "Our Blue Future – The Integrated and Sustainable Development of the Seas and Oceans"[2] was launched in 2010 in order to promote the creation of a Knowledge and Innovation Community (KIC) focusing on the sustainable development of marine resources. The Marine KIC initiative is led by a European partnership of marine industry, technology, research institutes, universities, public sector and regional clusters led by the German Marine Research Consortium KDM. It seeks to promote the competitiveness of Europe's RTD-based maritime economy through the EIT. It is motivated by the size of the Blue Economy and its potential in the future.

The above initiative, as well as the growing insight in Europe's maritime economy, has led to the question: to what extent could KICs provide a substantial support for the development of the EU's marine/maritime economy? After all, a reinforced knowledge base which is better interconnected with industry and excellent education institutions may lead to a better and more sustainable use and development of our seas and oceans via technological development, more innovative activities and broader knowledge diffusion. DG MARE is at this very moment assessing to what extent KICs could contribute to this development, or whether there are other alternatives to achieve the same objective. Therefore, the general purpose of this study is to provide intelligence and background knowledge that can feed into this assessment exercise.

More in particular, this study has as objectives to:

1. Assess to what extent the current KICs cover sufficiently the themes and activities related to the 'Blue Economy', and how the current situation could/should be adjusted to ensure a sufficient coverage and support in the future;

2. Consider and evaluate three policy options in this regard, i.e.:
   a) Establishing a new, 'own' Marine / Maritime KIC, which would concentrate its activities on the Blue Economy;
   b) Using the marine / maritime components of the current KICs in support of the Blue Economy;
   c) Creating new links between their activities to create a 'KIC Platform' focusing on the Blue Economy.

The study defines the scope of the Blue Economy, maps the relevant actors and activities involved under the current KICs as well as the actors and activities that can be specifically related to the Blue Economy. It evaluates the Blue Economy 'coverage' of the activities in existing KICs in order to make an

[1] COM(2012) 494 final; http://ec.europa.eu/maritimeaffairs/policy/blue_growth/documents/com_2012_494_en.pdf

[2] http://www.marinekic-initiative.eu/index.php?sp=en&id=home

objective and sound assessment of the relevance and need for each of the proposed policy options through a rounding-up SWOT analysis.

For this purpose, detailed data and information were collected at the level of each KIC, on each co-location centre and each project launched by the current KICs. Subsequently, each project was assessed against its effective 'maritime coverage' and advanced network analysis was carried out to identify significant connections between actors from the Knowledge Triangle with 'maritime' relevance and/or capabilities. However, gathering this data appeared to be particularly cumbersome, as there is no coherent or transparent way of reporting KICs activities. Some KICs report centrally, others report at the level of each co-location centre, others refer to specific project-level websites. The content and the type of variables which are reported also vary strongly between KICs and co-location centres. All this makes any coherent reconstruction and analysis of the EIT's and the KICs' current activities particularly complex. Moreover, it appeared to be extremely difficult to get any financial or budget data at project level. The involvement of private partners and private funding and the related confidentiality constraints may be considered as an explanation for this lack of information.

Identifying and assessing the maritime component of existing KICs

This study assessed to what extent the current KICs cover sufficiently the themes and activities related to the Blue Economy, and how the current situation could/should be adjusted to ensure a sufficient coverage in the future. Based on an extensive literature review of main economic activities in all sea basins of Europe, the study identified the key dimensions in research, education and innovation that should be covered by a 'maritime KIC'. These dimensions were grouped under five main 'Blue Growth KIC themes' and their related main economic activities, i.e.:

- Maritime Transport and Shipping
- Food, Nutrition and Health
- Energy and Raw Materials
- Coastal Protection and Development
- Marine Data and Information Services (cross-cutting to the four previous ones)

The geographic location of a KIC's co-location centre to a large extent determines the geographic location of its members. These are predominantly the institutions from the same country or from the neighbouring regions that have close economic ties. This has a two-way implication for a possible maritime KIC or a maritime research component in the existing KICs.

The maritime research themes and challenges tend to be geographically localised or at least regionally specific. Therefore the geographic proximity of KIC members clustered around a particular CLC can be considered as a positive factor facilitating more intensive collaboration (especially in CLCs with coastal location). On the other hand such localised research clusters may face a danger of overlooking important knowledge and technological developments produced in other regions. A particular challenge for a maritime KIC would be the fact that members would be geographically rather dispersed (sometimes in peripheral locations that are not very accessible), and that geographic remoteness may prevent synergies taking place.

It is, therefore, advisable to seek a proper balance between the local critical mass and affinity facilitated by the CLCs coastal location, and the open character of collaboration where partners pro-actively seek knowledge and contribution from other maritime research and economic actors in other regions. CLCs involved in maritime related research activities should be well equipped for facilitating collaboration of partners from various European regions (e.g. significantly improving transparency and visibility of supported activities).

Examining the current state of affairs regarding the maritime related research performed by the existing KICs, we observe that these maritime topics also tend to gravitate towards a smaller number of 'specialising' CLCs (which is the case for InnoEnergy and Climate KIC). In principle, this points to the existing potential critical mass of maritime research expertise in particular locations. At the same time one can become concerned about possible inertia forces that might slow down the development of maritime themes in other locations (either at the new or existing CLC).

The scorecard analysis of possible relevance of the KICs' projects and activities to the Blue Economy and maritime topics shows that, in the first instance, all three existing KICs touch upon these issues with equal intensity. However, only Climate KIC carries out projects which are more or less evenly spread across different maritime topics. The InnoEnergy KIC specialises heavily on issues of maritime energy and raw materials, and ICT Labs leans strongly towards topics on marine data and information services. Furthermore, the maritime profile of partners also differs strongly between the existing KICs. Climate KIC has the highest proportion of partners (four fifths) which are open to Blue Growth topics, followed by InnoEnergy (about a half) and lastly ICT Labs (just slightly more than one third).

The gap analysis has demonstrated that a large part of the Blue Economy is still not covered by the existing KICs (all KIC projects together address less than 15% of the relevant Blue Growth KIC themes), and thus that additional attention to the maritime dimension of KICs is justifiable.

Refining the Policy Options

Policy Option A: Establishing a new maritime KIC

This option is the clearest to define: based on the experience of the three existing KICs, it would create a new KIC that would re-group a set of well-chosen co-location centres (in majority but not exclusively) located in coastal regions and distributed across Europe's main sea basins. At this moment, Mediterranean, Nordic (including Baltic) and North-Western (UK, Ireland) coastal regions are relatively weakly represented amongst existing CLCs. The existing expertise involved in current KIC activities (from Germany, France, Benelux, Sweden) could be 're-allocated' to this new KIC to generate critical mass and scale effects.

According to the latest policy developments, this option is, however, not realistic in the short or medium term, i.e. not before 2020. There is indeed a consensus on the new KICs to be created under Horizon2020 and none of the new KICs will be a dedicated 'Maritime' one … As a matter of fact, new KICs will be launched in three waves between now and 2020:

- 2014: A call for two new KICs will be launched in 2014 in the areas of Innovation for Healthy Living and Active Ageing; and Raw Materials: sustainable exploration, extraction, processing, recycling and substitution;
- 2016: A call for two new KICs will be launched in 2016 in the areas of Food4Future and Added Value Manufacturing;
- 2018: Subject to a positive outcome of the review of the EIT foreseen in Horizon 2020, a call for one new KIC will be launched in 2018 in the area of Urban Mobility.

Even though they would not be a dedicated 'maritime' KIC, some of these new KICs (especially the Healthy Living, Raw Materials and Food4Future ones) may cover important maritime topics in the future; therefore they can be considered as part of policy options B or C.

Policy Option B: Using the maritime components of the current (and future) KICs

This would be the easiest option to implement as it advocates, more or less, for a 'status quo'. But this would imply at least that much more transparency and 'publicity' is given to the maritime projects and activities currently on-going in the existing KICs, so that these activities / projects in turn can leverage additional activities, funding and projects. In this regard, it is essential that the KICs develop better intelligence and monitoring tools about their own activities, so that ongoing work is at least 'visible' from the outside and for the larger community of researchers, students and companies. Climate KIC does have already relatively good management practices in terms of centralized project-level intelligence, from which INNO-Energy and ICT Labs could learn. We observed large differences (in terms of managing project-level or activity-specific information) not only between the KICs, but also between the CLCs. Under this option, the best level to organise intelligence is obviously at the level of the KIC itself.

Additionally, one could consider adding some new CLCs to the existing KICs with a more 'coastal' or maritime dimension. As already mentioned, coastal regions are relatively weakly represented in the three existing KICs. Adding new CLCs, however, should not boil down to 'shifting' existing capabilities elsewhere while adding new, fixed costs to the functioning of a KIC. Rather, the objective would be to leverage new, additional capabilities and to increase critical mass in some domains.

On the other hand, this option would still have the tendency to keep maritime activities 'fragmented' because they still would be organised within the boundaries of each KIC and individual topic/action lines are likely to be concentrated around individual CLCs. Therefore, another option would be to consider maritime activities in a transversal manner, i.e. across KICs (see below).

Policy Option C: Creating a 'KIC Maritime Platform'

This third policy option would add to the three existing KICs (as well as to the 5 new ones to be created) a transversal 'Maritime platform' that would link, coordinate and promote maritime activities carried out under the existing KICs. This would improve the overall visibility of maritime activities and would contribute to their better promotion. In doing so, fragmentation and redundancies between KICs would be reduced, with a further concentration of means and stronger critical mass as a result.

It would also have the substantial advantage that "maritime issues" are not treated in an isolated way, but take into account that much cross-fertilization can be achieved from integrating maritime with traditional "land" aspects (land-sea integration as needed for instance in energy issues, i.e. grid development – exchange of ocean and land based energy generation, but also with regard to an integrated approach between agri- and aquaculture as well as nutrient flows). It also takes best into account the need to build ocean research, technology and innovation on knowledge gathered in land based industries (i.e. biorefineries, deap-sea mining, etc.). Last but not least, it is the best mechanism to create the necessary linkages across the various KICs which are related not only to the "blue" industry, but also the various aspects between the blue and land issues. For instance, it has been shown in the analysis of existing KICs that there are cross-linkages to be made between the "blue" InnoEnergy KIC projects, the "blue" ICT Labs projects as well as the blue ClimateKIC projects. More such cross-linkages can be imagined if one takes into account the new KICs to be established (i.e. blue biotechnology for food, health, etc.). In other words, this 3rd, 'platform option' would better acknowledge the fact that 'blue issues' are cross-cutting in nature, and would allow for a better exploitation of land-sea integration, as much knowledge, research and innovation for 'land' purposes can cross-fertilize 'sea purposes', and vice-versa.

However, this new 'tool' should operate in a context where its mandate and modus operandi are clearly established to allow for an optimal collaboration with the existing KICs. These and many other questions would very likely require adjusting the legal framework of the EIT and the KICs.

Assessment of Policy Options and Recommendations

Given the dynamic and diverse nature of maritime topics, an open and flexible approach to KICs is to be preferred. A gradual integration of new activities would be favoured. However, this appears to be not so effective through 'within-KICs options' such as policy options 1 (maritime KIC) and 2 (using existing KIC activities).

Given the above, the third option (a cross-KIC maritime component) appears to be the most appropriate configuration as it will be able to utilise different types of expertise across different research domains and across different KICs. It is expected that this cross-cutting dimension would become even more important in the future, with new relevant KICs being established, and with coordination challenges within and between KICs increasing. The third policy option will allow for a gradual integration of activities from the new KICs and an expansion of the spectrum of maritime dimensions covered – thus benefiting the Blue Economy most.

Elaborating further on this option of a (cross-KICs) Maritime Platform (MP) in the framework of the existing KICs, it is evident that such a platform can be implemented in a variety of ways. On the one side of the spectrum of possibilities, we see a "soft" version of MP which is primarily implemented by a series of actions aimed at improving the transparency and visibility of the maritime related activities inside different KICs. The existing KICs could commit themselves to mutual disclosure and coordination of their research so as to make the best possible use of synergies between different projects and to benefit from information exchange and joint exploitation of market opportunities. The control over the research priorities and actual project implementation would remain in the hands of the existing KICs and the actual performance of this "soft" MP will greatly depend on each individual KIC's commitment to this idea. From an operational point of view, this would boil down to improving the knowledge management systems of the KICs and to integrate or link them into one coherent IT-platform.

On the other side of the spectrum of options we see a "hard" (or "hardwired") version where a separate cross-KICs/EIT legal entity is created with a mandate to coordinate the maritime related activities of the KICs and provide a stable information and management platform for collaboration. This platform would have a mission and several objectives towards facilitating the maritime research in the framework of the existing KICs and will have to be able to communicate directly with the stakeholders responsible for implementation of the relevant projects and activities. Realisation of such a "hardwired" MP, however, presents its own challenges. First of all, establishing the MP will require changes in the legal statutes of the KICs and, most likely, the EIT itself. Secondly, the question arises about who will have the main authority regarding the definition of key topics and priorities for maritime related research in the KICs.

In our opinion, the most promising modus of the MP's implementation should be a combination of the "soft" and "hardwired" approaches, where the necessary balance between the different entities that are involved can be determined.

The Commission's Communication on Innovation in the Blue Economy[3] presents already several policies and local solutions that are expected to efficiently address the barriers in realisation of the Blue Economy's potential, such as:

[3] Communication from the Commission: Innovation in the Blue Economy: realising the potential of our seas and oceans for jobs and growth - COM(2014) 254/2 (13/05/2014)

- Gaps in knowledge and data about the current state of the oceans, seabed resources, marine life and risks to habitats and ecosystems;
- Diffuse research efforts in marine and maritime science that hinders interdisciplinary learning and slows the progress of technological breakthroughs in key technologies and innovative business sectors;
- Lack of scientists, engineers and skilled workers able to apply technologies in the marine environment.

The description of the first two barriers in this Communication matches to a large extent the challenges that are expected to be tackled by the cross-KIC maritime platform. Furthermore, the Marine Research Information Platform, which the Commissions plans to put in place to make new research opportunities widely accessible and increase synergies between nationally funded research activities and Horizon 2020, represents a very good conceptual basis for the Maritime Platform as well. In particular, the EC is planning to launch from 2015 a "Blue Economy Business and Science Forum" (BEBS Forum) in order to examine further cross-fertilisation of ideas and research results between industrial sectors, NGOs and other stakeholders with a common interest in the Blue Economy[4]. This BEBS Forum, which will be established as a large-scale, yearly conference would be an excellent tool to give publicity to new areas of RDI collaboration and it would therefore fit very well in the concept of a 'maritime platform'. In the context of this BEBS, the European Commission should pro-actively seek to consult and communicate the Blue components of the planned KICs (until 2020).

Moreover, such a Forum will only be 'the visible top of the iceberg'. Besides, an important feature of the cross-KIC Maritime Platform should be the presence of a continuously operating back-office whose role is to stimulate the Blue Economy by pro-actively monitoring, (where needed) supporting, coordinating, disseminating and promoting the results of the maritime research activities in the existing KICs (and even beyond). Its communication strategy must involve a broad set of stakeholders including but not limited to all organisations with a potential to participate in the Horizon 2020 framework. Moreover, it should pro-actively support the creation of related cross-cutting maritime KIC projects by receiving Blue project requests and channelling and coordinating them among the given KICs.

A number of interesting ideas for a cross-KIC MP setting can be found in the currently operational KETs Observatory[5] designed to provide EU and national policymakers and business stakeholders with information (quantitative and qualitative) on the performance of EU Member States and competing economies regarding the deployment of Key Enabling Technologies.

[4] Ibidem, p.6.

[5] https://webgate.ec.europa.eu/ketsobservatory/

1 Introduction

1.1 Policy background and objectives of this study

1.1.1 The European Institute for Innovation and Technology (EIT) and the Knowledge and Innovation Communities (KICs)

In 2010 the European Commission launched the Europe 2020 strategy establishing new strategic goals for Europe over the next decade. This places greater emphasis on knowledge and innovation, a more sustainable economy, high employment and social inclusion[6]. In order to address the key challenges that it faces, Europe has to become more attractive for business (and citizens), implying that the manner and extent of investments, whether within or between the three components of the Knowledge Triangle, will be crucial for ensuring success in terms of productivity, competitiveness and employment. Moreover, the EU Council Conclusions of 26th May 2010 acknowledge that 'research and innovation policy has moved up in terms of EU policy priorities and become widely recognised as a key enabler of competitiveness, productivity growth and sustainability to tackle global and societal challenges'[7].

The implementation of Europe 2020 aims in relation to the research and innovation field will largely be implemented through the flagship initiative **'Innovation Union'**, which aims to achieve the following objectives: make Europe into a world-class science performer; remove obstacles to innovation which currently prevent ideas reaching the market quickly[8]; revolutionize the way public and private sectors work together, notably through Innovation Partnerships between the European institutions, national and regional authorities and business.

In fact, from 2000 the **Lisbon Strategy** recognised the role that research plays in ensuring the competitiveness of European economies in its overarching aim to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion. In 2002, the Barcelona European Council agreed that R&D investment in the EU must be increased with the aim of approaching 3% of GDP by 2010. At around the same time, the importance of investing in research and technological development was stressed in the Commission Communication, *'Towards a European Research Area'*[9], which highlighted the growing gap between Europe and the other technological powers and to achieve the transition to a knowledge-based economy. The **European Research Area (ERA)** established the integration of Europe's scientific and technological area as an essential condition, requiring a more coherent approach involving measures taken by the Member States, the European Union, and intergovernmental cooperation organisations.

Although universities were at the centre of these efforts, in 2003 the Commissions Communication 'The role of the universities in the Europe of knowledge'[10] stated that "*universities are not at present globally competitive with those of our major partners, even though they produce high quality scientific publications"* and emphasised that to reach its economic and social goals **Europe needs a first-class university system**. To this end, three objectives have since been pursued simultaneously: ensuring that European universities have sufficient and sustainable resources and use them efficiently;

6 As highlighted by the expert group undertaking the interim evaluation of FP7.

7 http://ec.europa.eu/research/evaluations/pdf/archive/other_reports_studies_and_documents/fp7_interim_evaluation_expert_group_report.pdf#view=fit&pagemode=none

8 Such as expensive patenting, market fragmentation, slow standard-setting and skills shortages.

9 COM(2000) 6 final, "Towards a European research area".

10 COM(2003) 58 final "The role of the universities in the Europe of knowledge".

consolidating their excellence in research and in teaching, particularly through networking; and opening up universities to a greater extent to the outside and increasing their international attractiveness.

In September 2011, the European Commission published a new agenda for **modernisation of Europe's higher education systems**[11]. The main areas for reform identified in the new agenda are to:

- Increase the number of higher education graduates;
- Improve the quality and relevance of teaching and researcher training, to equip graduates with the knowledge and core transferable competences they need to succeed in high-skill occupations;
- Provide more opportunities for students to gain additional skills through study or training abroad, and to encourage cross-border co-operation to boost higher education performance;
- Strengthen the "knowledge triangle", linking education, research and business; and
- Create effective governance and funding mechanisms in support of excellence.

More recently, this agenda has been reinforced by the launch of the High-level group on the Modernisation of Higher Education[12], part of a three-year review of the sector across the EU, focusing on achieving excellence in teaching and adapting learning to the needs of the digital age.

Within this broader policy context, the European Institute of Innovation and Technology (EIT) is charged with promoting and integrating higher education, research and innovation of the highest standards in order to reinforce the innovation capacity of the Member States and the EU[13]. It represents a novel approach to stimulating innovation capacity within the EU, to promote sustainable long-term economic growth, which involves establishing autonomous and highly integrated partnerships of Higher Education (HE) institutions, research organisations, companies and other stakeholders, through competitive calls for application focused on identified priority themes. These partnerships (Knowledge and Innovation Communities or KICs) are intended to be long-lasting and, eventually, self-sustaining. The first calls for KICs were launched in April 2009 with the first three examples being designated in December 2009[14]:

- KIC InnoEnergy (sustainable energy)[15];
- EIT ICT Labs (future ICT)[16]; and
- Climate KIC (climate change mitigation and adaptation)[17].

Each KIC comprises a number of partners from the worlds of business, HE and research, joined together in a single structure. The focus of the KICs is, broadly, to stimulate entrepreneurial education, innovation activities, business creation and value formation through combining and integrating education, business and research activities. The KICs are each led by a full-time Chief Executive Officer (CEO). Each KIC is also organised around a small number of co-location centres (CLCs) which are intended to act as geographical hubs for the practical integration of the knowledge triangle.

By the end of 2013 the **Climate KIC** had 28 core and about 110 affiliate and public partners organised around five 'national' centres (CLCs), in Germany, the UK, France, the Netherlands and Switzerland. In addition, there are six Regional Innovation and Implementation Centres or RICs in: Central Hungary, Lower Silesia (Poland), the West Midlands (UK), Hessen (Germany), Emilia Romagna (Italy) and Valencia (Spain). The legal form of the Climate KIC is a non-profit association, the "Association Climate

11 COM (2011) 567, 20.09.2011: Supporting growth and jobs – an agenda for the modernisation of Europe's higher education systems.

12 http://ec.europa.eu/education/news/20120918b_en.htm

13 A more detailed description and analysis of the EIT, the KICs, their modus operandi, activities, partners networks etc is given in Annex 2.

14 From a shortlist of six candidates.

15 http://www.kic-innoenergy.com/

16 http://eit.ictlabs.eu/

17 http://www.climate-kic.org/

KIC". CLC Directors and RIC Coordinators are included in the Executive Team, reporting to the CEO, Governing Board (composed of the 20 core partners) and Assembly of Association[18]. RICs have a Steering Group and central coordinator.

InnoEnergy has six co-locations (CLCs): Alps Valley (France), Sweden, Benelux, Germany, Iberia and Poland Plus (Katowice and Krakow). Each CLC is based on a KIC theme (clean coal technologies; European smart electric grids and electric storage; intelligent energy-efficient buildings and cities; energy from chemical fuels; renewable and sustainable nuclear and renewable energy convergence). The KIC is a commercial company (*Societas Europaea* with headquarters in the Netherlands) comprising by the end of 2013 27 shareholders or 'formal partners'. In addition, there are 125 'associated partners' and 'network partners', among which 89 are industrial, 19 are research centres, and 17 universities[19]. An Executive Board comprises the CEO, Chief Financial Officer, and the six co-location centre Managers and is supported by an IP Board, a Scientific Board and (potentially) an Industry Board. Each Co-Location Centre also has its own Board.

ICT Labs has six nodes (CLCs)[20]: Berlin, Eindhoven, Helsinki, Paris, Stockholm and Trento. By the end of 2013 ICTLabs had 30 core partners comprising companies, research institutes and universities, and 57 Affiliate Partners. The KIC has been established as a legal entity under Belgian Law (not for profit Association of all partners with limited liability. Like InnoEnergy the ICT Labs governance model has a 'general assembly' where all core members are represented and have voting rights. There is an Executive Steering Board and Management Committee.

Previous work[21] has established that the KICs have successfully established structures and activity portfolios in line with the overall objectives of the EIT. Partnerships are framed by legal entities, long-term plans are in place and educational, research and innovation activities are underway. KICs have also developed their own approaches to delivering their own particular visions and to take account of varied geographical, thematic and governance contexts. At the same time, the EIT/KIC's inclusion in the new Horizon 2020 framework, with proposed funding of €2.8 billion, makes it a key pillar of the EU's overall approach to the economic, societal and environmental challenges that Europe faces over the coming years[22]. Success to date is acknowledged in the EIT's Strategic Innovation Agenda (SIA)[23] and the planned expansion to include five new KCIs during 2012-2020[24]. The KICs are currently entering into their main implementation phase, and so attention is now turning to the added value of the overall EIT/KICs model: to what extent does this integrated model permit, promote and facilitate activities that are demonstrably different from previous activity in the same field?

1.1.2 The Blue Economy in the EU

In 2012, the European Commission set the way forward for unleashing the potential of Europe's oceans, seas and coasts to help the EU economy back on track, while at the same time safeguarding its biodiversity and protecting the marine environment. The Communication "Blue Growth opportunities for marine and maritime sustainable growth[25]" was developed on the basis of a comprehensive overview of

18 Revised Business Plan, 10 February 2011.
19 http://www.kic-innoenergy.com/about-us/key-facts.html
20 Six from January 2012 with the addition of Trento.
21 ECORYS. (2012). Study on the concept, development and impact of co-location centres using the example of the EIT and KICs. Ecorys UK Ltd, February 28, [cited February 8 2013]. http://ec.europa.eu/education/eit/eit-studies_en.htm
22 http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=h2020-documents
23 "*Investing in Innovation beyond 2014*": http://eit.europa.eu/fileadmin/Content/Downloads/SIA/EIT_Strategic_Innovation_Agenda_Final.pdf
24 MEMO 11/851, 30.11.201,1 http://europa.eu/rapid/press-release_MEMO-11-851_en.htm?locale=en
25 COM(2012) 494 final; http://ec.europa.eu/maritimeaffairs/policy/blue_growth/documents/com_2012_494_en.pdf

the Blue Economy in Europe, which showed that the economic potential within the Blue Economy is significant, provided that appropriate investments in among others research and innovation are made.

Blue Growth is however a strategy that should be situated in a wider context. It represents the maritime dimension of the Europe 2020 strategy for smart, sustainable and inclusive growth, and is an integral component of the Integrated Maritime Policy (IMP) (2007) which aims to increase coordination and provide a more coherent approach to cross-cutting issues such as Blue Growth, Marine data and knowledge, Maritime spatial planning, Integrated maritime surveillance as well as Sea basin strategies.

A number of EU policies and initiatives act as building blocks for the Blue Economy. Among others, these include the Marine Strategy Framework Directive (2008)[26] which aims to protect the marine environment and the resource base upon which marine-related economic and social activities depend across Europe through a commitment by Member States to achieve good environmental status of the EU's marine waters by 2020. The Marine Knowledge 2020[27] initiative provides an integrated knowledge infrastructure based on national data collection systems delivering data products at a European-level through the internet. The Common Information Sharing Infrastructure (CISE)[28] for the surveillance of the EU maritime domain will allow maritime authorities to share information on risks and threats. The European Maritime Transport Space without Barriers[29] aims to simplify administrative procedures for maritime transport. The proposed Maritime Spatial Planning and Integrated Coastal Management directive[30] aims to establish a common framework for maritime spatial planning and integrated coastal management. At sea-basin level, strategies for increased cooperation between Member States located in a given sea-basin have been launched to pool resources and policy action on a number of maritime economic activities of high relevance for the sea-basin.[31] The EU's programme for marine and maritime research and innovation[32] will provide funding through the Horizon 2020 programme for research and innovation on food security, clean energy, green transport, climate action and resource efficiency as well as cross thematic marine and maritime research.

The importance of maritime economic activities in Europe is expected to grow by 2020 to an estimated GVA of €590 billion and to a total of 7 million persons employed[33]. Eleven maritime economic activities are anticipated to be essential for Europe's Blue Economy. These are: Short-sea shipping, Offshore oil and gas, Coastal tourism, Coastal protection, Marine aquaculture, Offshore wind, Cruise shipping, Maritime monitoring and surveillance, Blue biotechnology, Ocean renewable energy and Marine minerals mining. The significance of these activities may not be of equal importance across all coastal states or across all sea-basins, which is why sea basin strategies, such as the Atlantic Action Plan, are an important component of the Blue Growth strategy and IMP, and special focus has been given to them lately. Sea basin strategies seek to promote growth and development by fostering cooperation between coastal states in a given region. As conflicts and synergies between sea uses are best addressed at regional sea basin level, rather than being the subject of uncoordinated national policies, sea basin strategies also tend to involve non EU countries as much as possible. Accordingly, a series of sea basin studies have been undertaken on behalf of DG MARE which emphasize the regional

26 2008/56/EC
27 COM(2012) 473 final
28 COM(2010) 584 final
29 COM(2009) 10
30 COM(2013) 133 final
31 European Union, 2013: Action Plan for a Maritime Strategy in the Atlantic area - Delivering smart, sustainable and inclusive growth. COM(2013) 279 final. 13th May 2013.
32 COM(2008) 534
33 Blue Growth: Scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts. Final Report, Annexes and Sub-function Reports, 2012, Contract MARE/2010/01. https://webgate.ec.europa.eu/maritimeforum/content/2946"

importance of Blue Economy in Member States and across sea basins (i.e. Atlantic Arc, North Sea and English Channel, Baltic Sea, Mediterranean, Adriatic/Ionian Sea and Black Sea).

An initiative to develop a Marine KIC "Our Blue Future – The Integrated and Sustainable Development of the Seas and Oceans"[34] was launched in 2010 in order to promote the creation of a Knowledge and Innovation Community focusing on the sustainable development of marine resources. The Marine KIC initiative is led by a European partnership of marine industry, technology, research institutes, universities, public sector and regional clusters led by the German Marine Research Consortium KDM. It seeks to promote the competitiveness of Europe's RTD-based maritime economy through the EIT. It is motivated by the size of the Blue Economy and its potential in the future. Its immediate aim is to lobby for the inclusion of a topic in the EIT's Strategic Innovation Agenda, which would enable the creation of an integrated Marine KIC.

1.1.3 Objectives of this study

Because of their objectives, specific mission and operational configuration, KICs may provide a substantial support for the development of the EU's marine/maritime economy. A reinforced knowledge base which is better interconnected with industry and excellent education institutions may lead to a better and more sustainable use and development of our seas and oceans via technological development, more innovative activities and broader knowledge diffusion. DG MARE is at this very moment assessing to what extent KICs could contribute to this development, or whether there are other alternatives to achieve the same objective. Therefore, the general purpose of this study is to provide intelligence and background knowledge that can feed into this assessment exercise.

More in particular, this study had as objectives to:

1. Assess to what extent the current KICs cover sufficiently the themes and activities related to the 'Blue Economy', and how the current situation could/should be adjusted to ensure a sufficient coverage and support in the future;

2. Consider and evaluate three policy options in this regard, i.e.:
   a. Establishing a new, 'own' Marine / Maritime KIC, which would concentrate its activities on the Blue Economy;
   b. Using the marine / maritime components of the current KICs in support of the Blue Economy;
   c. Creating new links between their activities to create a 'KIC Platform' focusing on the Blue Economy.

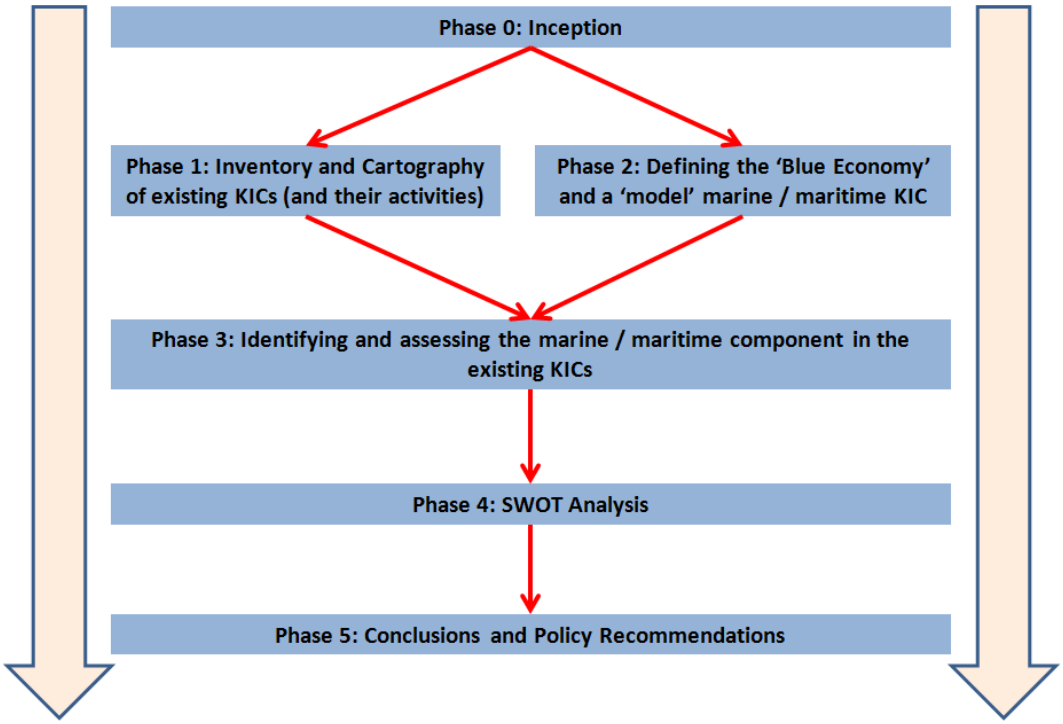
Therefore, the study aimed to sequentially define the scope of the Blue Economy, map the relevant actors and activities involved under the current KICs as well as the actors and activities that can be specifically related to the Blue Economy, evaluate the 'Blue Economy coverage' of the activities in existing KICs in order to, finally, make an objective and sound assessment of the relevance and need for each of the proposed policy options through a rounding-up SWOT analysis.

1.2 Overall approach and process

In line with the objectives and tasks specified in the Terms of Reference, the overall approach and sequence of operations can be drawn as follows (see Figure 1.1 below):

[34] http://www.marinekic-initiative.eu/index.php?sp=en&id=home

Figure 1-1 Overall approach



The study was carried out according to 5 distinctive phases, of which the first two after inception were run in parallel. Phases 1 and 2 represented the basis and input for the subsequent phases, in particular phase 3 which was be the core of the analysis. In more details:

- Phase 1 analysed, for each KIC, linkages between partners at both project level and thematic level. It also analysed the geographical coverage of the current projects and of the topics under investigation. To do so, we collected detailed public information at project-level for all on-going projects under the three KICs (title and abstract, number and names of partners, co-location centre(s) involved, start and end year, and general description) and applied network analysis on the datasets. The set of projects examined is exhaustive (n=129 projects) and up-to-date (dated end of February 2014).
- Simultaneously, phase 2 defined in detail and on the basis of an extensive literature review what can be understood under 'the Blue Economy' in terms of main economic activities, scientific disciplines and technological fields. Consequently, it identified the key themes that should ideally be covered by the KICs to effectively support the development of the Blue Economy in the EU, as well as a 'model' maritime KIC.
- Subsequently and on the basis of the input from phases 1 and 2, phase 3 aimed at identifying and assessing to what extent maritime components or themes are currently covered by the existing KIC activities. We screened and analysed detailed project-level information from more than 120 projects. For each KIC, we identified projects (partly or not) related to 'Blue Economy themes' based on the definition given under phase 2. We analysed the specific linkages between partners and the geographical dimension of these 'Blue Economy projects'. We developed for each KIC specific indicators and a specific 'scoreboard' to assess in the most objective way to what extent the KIC 'covers' Blue Economy themes. An overall scoreboard was then developed and filled in that summarizes the information across KICs. This allowed us to carry out a 'gaps analysis' i.e. identifying the maritime fields and topics currently not (yet) covered by the existing KIC activities.

- Building on the previous phase, it was then possible to distil the strengths and weaknesses of each policy option under consideration (see above), as well as to formulate some policy recommendations for a better coverage of 'Blue Economy Themes' in the future (phases 4 and 5).

1.3 Structure of the final report

This final report is structured as follows:

- After this first introductory chapter, chapter 2 defines what should be understood under 'Blue Economy'. Starting from a literature review on economic activities in all sea basins of Europe, we identified the most promising economic activities and all research, educational and business dimensions related to them were regrouped under five big 'Blue Growth Themes'. The listing of these dimensions is detailed in Annex 4; the detailed analysis of economic activities per sea basin is detailed in Annex 3.
- Chapter 3 subsequently identifies and assesses the coverage of Blue Growth Themes by the existing KICs. We first present the method followed and the scoreboards / indicators used. Then we analyse the 'maritime coverage' of each KIC separately. Finally, we present an overall assessment and the results from the gaps analysis.
- Chapter 4 presents the results from the SWOT analysis of each policy option, as elaborated previously in this introduction and put forward in the Terms of Reference.
- A final conclusion summarises the key findings of this study and further elaborates on some policy recommendation for the future.
- Some important but detailed information has been included in Annex, to which the main text may be referring where needed. These Annexes are:
    - Annex 1: short description of Network Analysis Methodology
    - Annex 2: detailed description and analysis of the EIT's KICs (setting, organisation, activities, topics covered, partners and collaborative network)
    - Annex 3: Analysis of most promising economic activities by sea basin
    - Annex 4: Detailed description of the key Blue Growth KIC Themes.

2 Defining the 'Blue Economy' and a 'Model' Marine/Maritime KIC

2.1 Introduction

This chapter presents the results from Phase 2 of the study, defining the Blue Economy and elaborating a 'Model' Marine/Maritime KIC. In particular, it:

- provides a clear and concise understanding of what is meant by Blue Economy in the context of this study,
- identifies and develops Blue Growth topics that could be covered by KICs, and
- elaborates a 'Model' Marine/Maritime KIC.

As the starting point, we reviewed the EIT's Framework of Guidance[35], Principles for financing, monitoring and evaluating KIC activities[36] and Criteria for the Selection of KICs[37] to establish some criteria for defining a KIC. These documents are key to circumscribing the boundaries of a 'Model' Marine/Maritime KIC, and ultimately, deciding whether the KIC format is the best mechanism to "push" certain Blue Growth topics forward.

We also reviewed the results of the DG MARE Blue Growth Study: Scenarios and Drivers for Sustainable Growth from the Oceans, Seas and Coasts[38], including the Thompson-Reuters IP consulting report[39], and the subsequent Sea Basin studies, taking into account the regional dimension of maritime economic activities within each sea basin. These reviews were used to identify Blue Growth themes that could potentially be covered by a KIC.

The next step was to develop these Blue Growth KIC topics with the assistance of other pertinent studies and communications, as appropriate. Focused EC communications, e.g. Blue Energy[40], Coastal and Marine Tourism[41], Sustainable Development of EU Aquaculture[42], play an important role in this respect. Furthermore, the SEAS-ERA NET[43] has produced extensive analysis of marine and maritime research requirements across all European sea basins, with the view to strengthening marine research all across Europe. Under the ERA-NET scheme, national and regional authorities identify research programmes they wish to coordinate or mutually open up. The participants in these actions are, therefore, programme 'owners' (typically ministries or regional authorities defining research programmes) or programme 'managers' (such as research councils or other research funding agencies managing research programmes).

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35 EIT Framework of Guidance 2014 Call for KIC proposals, http://eit.europa.eu/fileadmin/Content/Downloads/PDF/2014_KIC_Call/2014_KIC_Call_Framework_of_Guidance.pdf

36 http://eit.europa.eu/fileadmin/Content/Downloads/PDF/2014_KIC_Call/EIT-Principles-financing-monitoring-evaluating-KIC-activities.pdf

37 http://eit.europa.eu/fileadmin/Content/Downloads/PDF/2014_KIC_Call/2014_KIC_Call_Selection_Criteria.pdf

38 Blue Growth: Scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts. Final Report, 2012, Contract MARE/2010/01

39 Analysis of patenting and publication output and key players, Blue Growth Study prepared by Thomson Reuters IP Consulting for IDEA Consult, 2011. In: Blue Growth Final Report, 2012. Annex 2. Available here: https://webgate.ec.europa.eu/maritimeforum/content/2946

40 http://ec.europa.eu/maritimeaffairs/policy/ocean_energy/index_en.htm

41 http://ec.europa.eu/smart-regulation/impact/planned_ia/docs/2013_mare_005_coastal_tourism_en.pdf

42 http://ec.europa.eu/fisheries/cfp/aquaculture/official_documents/com_2013_229_en.pdf

43 http://www.seas-era.eu/np4/homepage.html

Further review of schemes and opportunities related to coordination and cooperation of education activities across Europe, the ERAWATCH[44] platform on research and innovation policies and systems, and collaboration among business incubators was carried out.

Finally, the 'Model' Marine/Maritime KIC is elaborated around the Blue Growth KIC topics. We propose a format which meets the criteria for a KIC and takes into account the underlying legal requirements and principles (as reflected in the EU legislation on EIT/KICs, the Strategic Innovation Agenda[45], and the results of the evaluation of the EIT's initial period[46] and in particular, the recommendations made).

2.2 What are the criteria for a KIC?

The EIT Framework of Guidance describes a successful KIC as a sustainable, long-term, self-supporting strategic "*partnership, operating under the EIT umbrella, between research organisations, educational institutions, businesses and other innovation stakeholders such as regions or NGOs. It operates across the EU and beyond, connecting its partners' labs, factories or classrooms for joint projects. It focuses on developing innovative projects, services and training in a specific area of the economy so that it can help overcome some of society's main challenges in that field. It operates with its own management, legal structure and business plan, autonomously designed with the EIT's support. It has clear, measurable objectives, to deliver value to its partners and EU taxpayers".* [47]

A KIC must contain 3 essential ingredients that are connected by a common topic:

i. Innovative potential,
ii. Top class, cutting edge research,
iii. Higher (3rd level) educational needs.

The combination of education, research and innovation is referred to as the "knowledge triangle". The KIC topic must address a societal and economic challenge and incorporate emerging issues in the European economy that can be overcome through the smart integration of education, research and innovation across the entire value chain. A KIC topic should have sufficient critical mass within its knowledge triangle to support its activities and it should be important to Europe as a whole. Long-term, it should be sustainable and self-supporting, and provide Community added value. EIT funding of a KIC may not exceed 25% of the KIC's overall funding. The remaining 75% must come from non-EIT sources.

What distinguishes a KIC from the technology platform, industrial initiative or regional cluster formats is the combination of the knowledge triangle with a permanent structure to underpin the long-term sustainability of the KICs activities.

The selection criteria of KICs are given as follows:

1. Strategy: Strategic approach; added-value, innovativeness and synergies; KIC Partnership.
2. Operations: KIC governance; leadership and operations; KIC business model and financial plan.
3. Impact: Impact and competiveness; outputs (key performance indicators) and KIC scoreboard; communication, outreach and dissemination.

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44 http://erawatch.jrc.ec.europa.eu/erawatch/opencms/about/

45 http://eit.europa.eu/about-us/eit-key-documents/

46 http://eit.europa.eu/fileadmin/Content/Downloads/PDF/About_us/Key_documents/eitreport_en.pdf

47 EIT Framework of Guidance 2014 Call for KIC proposals, http://eit.europa.eu/fileadmin/Content/Downloads/PDF/2014_KIC_Call/2014_KIC_Call_Framework_of_Guidance.pdf

There are 3 KICs currently in operation, with an additional 5 KICs planned between 2014 and 2018.
Operational KICs:

- Climate KIC (2009)
- InnoEnergy KIC (2009)
- ICT Labs KIC (2009)

KICs in planning (no consortia yet):

- Innovation for healthy living and active ageing (2014)
- Raw materials – sustainable exploration, extraction, processing, recycling & substitution (2014)
- Food4Future (2016)
- Added Value Manufacturing (2016)
- Urban Mobility (2018)

The EIT, and hence the KICs, are intended to complement existing Community and national policies and initiatives (i.e. 7th Framework programme, Horizon 2020, Competitiveness and Innovation Programmes (CIP), and Cohesion Policy) by fostering the integration of the knowledge triangle in support of innovation.

2.3 Key Issues arising from the Blue Growth Study and Sea Basin Analyses

The Blue Growth studies undertaken on behalf of DG MARE provide the basis for identifying the economic activities and S&T disciplines that are pertinent to the Blue Economy. The structure of Maritime Functions and Maritime Economic Activities (MEAs)[48] that was developed in the course of these studies is described in the Table 2.1 below.

The definition of promising MEAs has not been an easy task, as it contains several dimensions (e.g. size, stage of development, …). The original Blue Growth scenario study (p.40) started with the identification of 27 maritime economic activities (Table 1), which were then ranked by current size, recent growth and expected future potential. This distinction led to the ranking of a top-7 in terms of current size, top-7 recent growth and top-7 in terms of future potential. This was combined in a list of 11 maritime economic activities that were subsequently further investigated, as follows:

Mature:

1. Short-sea shipping
2. Offshore oil and gas
3. Coastal tourism
4. Coastal protection

Growing:

5. Marine aquatic products
6. Offshore wind
7. Cruise shipping
8. Maritime monitoring and surveillance

Emerging:

9. Blue biotechnology
10. Ocean renewable energy
11. Marine minerals mining

[48] Blue Growth: Scenarios and drivers for Sustainable Growth from the Oceans, Seas and Coasts. Final Report, 2012, Contract MARE/2010/01

Table 2.1 Maritime Functions and Economic Activities in the Blue Economy (Note: "blue" MEAs have a direct correspondence with NACE (general name for economic activities in the EU) codes; "green" MEAs do not have a direct correspondence with NACE codes.)

Maritime Function	0. Other sectors	1. Maritime transport	2. Food, nutrition, health and ecosystem services	3. Energy and raw materials	4. Leisure, working and living	5. Coastal protection	6. Maritime and monitoring surveillance
Maritime Economic Activity	0.1 Shipbuilding and ship repair 0.2 Water projects	1.1 Deep-sea shipping 1.2 Short-sea shipping 1.3 Passenger ferry services 1.4 Inland waterway transport	2.1 Fish for human consumption 2.2 Fish for animal feeding 2.3 Marine aquaculture 2.4 Blue biotechnology 2.5 Agriculture on saline soils	3.1 Offshore oil and gas 3.2 Offshore wind 3.3 Ocean renewable energy 3.4 Carbon capture and storage 3.5 Aggregates mining 3.6 Marine minerals mining 3.7 Securing fresh water supply	4.1 Coastal tourism 4.2 Yachting and marinas 4.3 Cruise tourism	5.1 Protection against flooding 5.2 Prevent salt water intrusion 5.3 Protection of habitats	6.1 Traceability and security of goods supply chain 6.2 Prevent and protect against illegal movement of people and goods 6.3 Environmental monitoring

The sea basin-specific analysis has built on this approach, but focused on the activities that are expected to have the most promising potential within each of the sea-basins. Country experts evaluated the top 7 most promising MEAs for each Member State. These assessments were aggregated on a sea-basin level providing a regional context to the most promising MEAs. On the basis of this analysis, an overview can be constructed of the most promising MEAs for all the sea basins (Baltic Sea, North Sea, Atlantic Arc, Mediterranean Sea and Black Sea) as shown in Table 2 below. MEAs that are considered to have future potential and/or to be the most promising by at least 50% of the Member States within a sea basin are highlighted in purple. Aggregating over all the sea basins, MEAs that are considered to have future potential and/or to be the most promising by at least 40% of the sea basins are green.

This exercise[49] draws attention to the following MEAs:

- Shipbuilding and ship repair;
- Short-sea shipping;
- Fish for human consumption;
- Marine aquaculture;
- Blue biotechnology;
- Offshore oil and gas;
- Offshore wind;
- Coastal tourism;
- Cruise tourism;
- Environmental monitoring.

[49] Details of the Analysis of Future Potential and/or Most Promising MEAs by Sea Basin is given in Annex 3

Table 2.2 Regional Analysis of Most Promising MEAs

MEAs	Baltic Sea	North Sea	Atlantic Arc	Mediterranean	Black Sea	All Sea Basins
0.1 Shipbuilding & ship repair	75%	50%	60%	50%	67%	60%
0.2 Water projects	38%	25%		33%	67%	33%
1.1 Deep-sea shipping	25%	25%		42%		18%
1.2 Short-sea shipping	88%	63%		58%	100%	62%
1.3 Passenger ferry services	50%	50%		33%		27%
1.4 Inland waterway transport	25%	25%		8%	67%	25%
2.1 Fish for human consumption	50%	38%		58%	100%	49%
2.2 Fish for animal feeding				17%		3%
2.3 Marine aquaculture	50%	50%		83%	33%	43%
2.4 Blue biotechnology	38%	38%	100%	33%		42%
2.5 Agriculture on saline soils				8%	33%	8%
3.1 Offshore oil & gas	13%	50%	60%	17%	67%	41%
3.2 Offshore wind	63%	75%	80%	25%	33%	55%
3.3 Ocean renewable energy	13%	25%	100%	25%		33%
3.4 Carbon capture & storage						0%
3.5 Aggregates mining						0%
3.6 Marine minerals mining		13%	60%	8%		16%
3.7 Securing fresh water supply			20%	25%		9%
4.1 Coastal tourism	88%	50%		75%	100%	63%
4.2 Yachting & marinas	63%		20%	42%	33%	32%
4.3 Cruise tourism	50%	38%	40%	75%	67%	54%
5.1-5.2 Coastal protection		13%	20%	25%		12%
5.3 Protection of habitats	13%			25%		8%
6.1 Traceability & security of goods supply chains	25%	13%	40%	17%		19%
6.2 Prevent & protect against illegal movement of people & goods	13%	13%	40%	17%		16%
6.3 Environmental monitoring	50%	25%	100%	33%	33%	48%

It should be noted that no score for an MEA within a particular sea-basin does not imply that the MEA is not important for some of the Member States within a sea-basin but rather that it did not make the top 7 most promising MEA shortlist according to the assessment of the country experts. There are a number of MEAs that are not highlighted[50] above but which are nevertheless important either as drivers and/or support services to the Blue Economy. For example, Shipbuilding and repair, Deep-sea and Short-sea shipping and Fishing could not function properly without Water projects. Similarly, securing fresh water supply in the Mediterranean would be particularly important for Member States dependent on Coastal tourism and Cruise Tourism. Aggregates mining is an important activity in the North Sea and Atlantic Arc, in particular supporting coastal protection and development functions, as well as Water projects. We consider these other important MEAs in the grouping of potential Blue Growth KIC topics.

Notwithstanding the above, most promising MEAs are a good indicator for a potential rationale for a KIC as they represent a mixture of showing the future potential in a given country for a particular sector, indicating that there is good education, research and innovation on which to build on and/or that the currently existing gaps which still need to be filled in this field may be overcome in the medium term, therefore there is potential.

Using the number of patents filed and scientific publications and citations as indicators of the level of research and innovation activity, Thomson Reuter[51] analysed 10 MEAs as follows: *Offshore wind, Ocean renewable energy, Maritime security and surveillance, Environmental monitoring, Securing fresh water supply, Marine aquaculture, Blue biotechnology, Offshore oil and gas, Marine minerals mining,*

[50] The methodology used for the economic valuation of MEAs in the Sea Basin studies did not always capture some important MEAs for the Blue Economy.

[51] Thomson Reuters, 2011

Protection against flooding. Some important trends emerge with respect to innovation, the Blue Economy and pre-development activities.

During the analysis period 2001 to 2010, there was a strong increase worldwide (286%) in patent activity for all maritime economic activities. A high number of patents were found in pre-development activities: Ocean renewable energy (20% of total), Marine aquaculture (14%), Securing fresh water supply (16%), Blue biotechnology (11%) and Offshore oil and gas (9%). On the whole, patent activity has doubled during the analysis period, but huge increases are observed for Offshore wind, Ocean renewable energy and to a lesser extent, Maritime security and surveillance and Environmental monitoring. Overall, a boom in publications is also observed during the analysis period, from 1,300 publications in 2001 to almost 5,000 publications in 2010. The increase is particularly strong in environmental monitoring, now responsible for more than 1/3 of all publications analysed, following by Marine aquaculture, Blue biotechnology and Offshore oil and gas.

The relative strength of the EU, however, varies strongly by activity. In Offshore wind, Ocean renewable energy and Marine aquaculture, the EU is leading with more than 1/3 of global patents. In other MEAs, the EU patent activity is less dominant. With respect to publications, the EU displays a stronger position. For most MEAs, at least 4 out of 10 authors are from the EU. Environmental monitoring is the exception, with less than 30% of the global publications originating in the EU.

While the EU maintains a relatively strong position in terms of patent and publication patterns in the areas of Offshore wind, Ocean renewable energy and Marine aquaculture, the discrepancy between patent and publication patterns in EU for the other MEAs leads to an important conclusion. Whereas the EU has excellent academic and scientific capabilities in the maritime economic activities analysed, its position in patent output is less strong indicating that there is still a way to go for a better commercial exploitation of scientific research. In other words, in terms of actual innovation or commercialisation, **there is a need to establish a stronger, competitive position for Europe if its future Blue Growth potential is to be realised. In this context, a Marine/Maritime KIC could play an important role**.

In addition to identifying the exploration of a possible Marine KIC as a policy action, the Blue Growth Study identifies a number of other policy actions that contain important (complementary) elements for a KIC.

Innovation / Business Support

- Creation of critical mass in R&D funding by linking EU, Member States and private funds in a better way and establishing appropriate collaboration of R&D networks;
- Specifically address synergies already in R&D stage (e.g. inventions that can benefit multiple economic sectors);
- Strengthen the path from R&D to innovation and implementation;
- Boost access to finance;
- Invest in smart infrastructure;
- Provide cluster support;

Education

- Anticipate maritime skills needs;
- Use of European Social Funds to promote initiatives aiming at the training and increasing awareness at schools and universities for the maritime economy;
- Strengthen links between universities and companies;
- Ensure that the maritime sector (Blue Economy) is represented in the EU Skills Panorama.

2.4 Blue Growth KIC Topics and a 'Model' Marine/Maritime KIC

Taking into account the issues discussed above, 5 Blue Growth topics have been identified as potential focus areas for a Marine/Maritime KIC (Figure 2-). These are:

1. Maritime Transport and Shipping
2. Food, Nutrition and Health
3. Energy and Raw Material
4. Coastal Protection and Development
5. Marine Data and Information Services

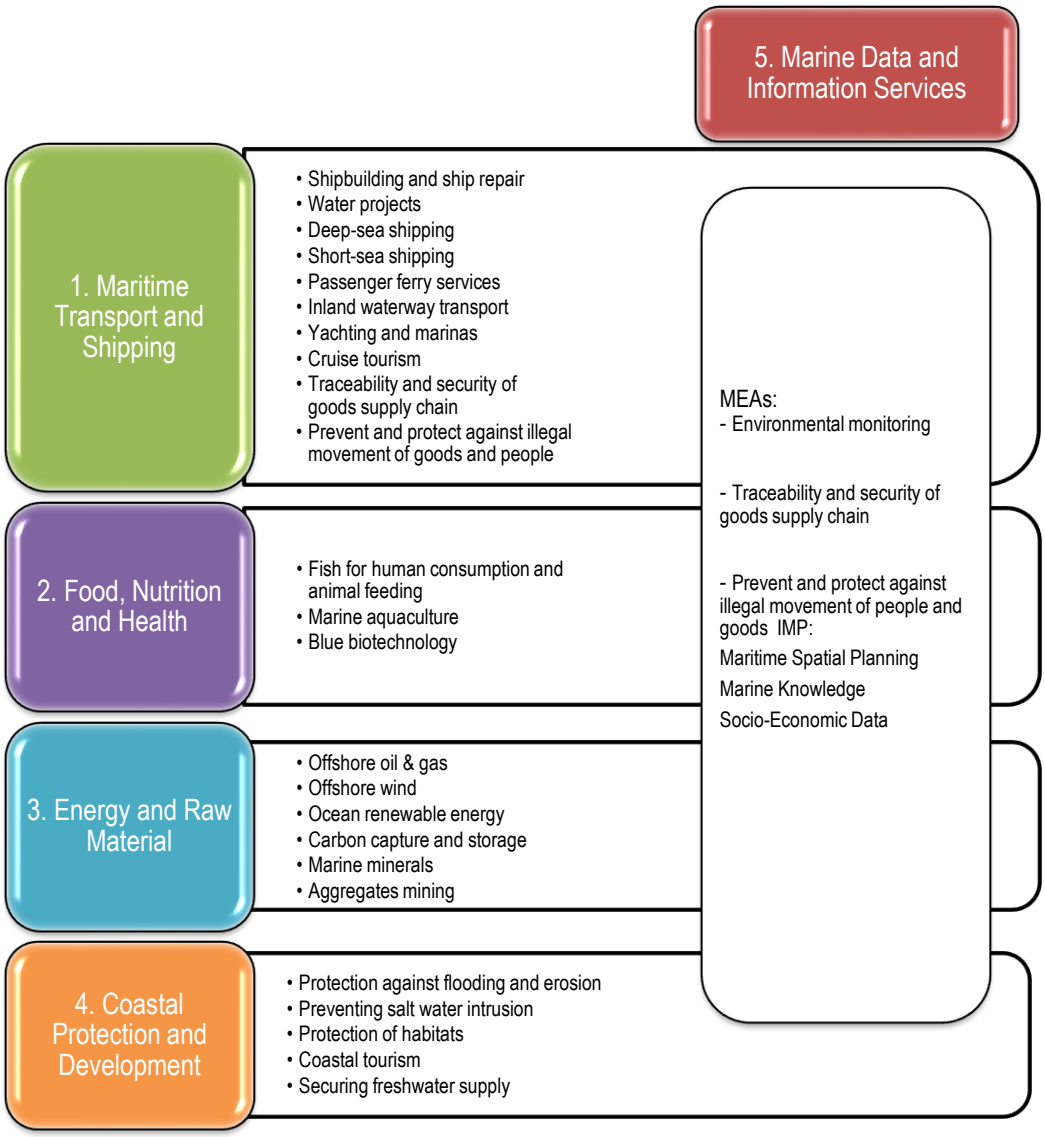
Within each of the first 4 topics, Maritime Economic Activities (MEAs) have been grouped according to their relevance to each of the topics. The last topic, Marine Data and Information Services has been identified as an essential horizontal (enabling) topic that underpins the development potential of the other 4 topics. It encompasses **Environmental Monitoring, Surveillance, Compliance** as well as **Marine Knowledge, Maritime Spatial Planning** and **Socio-Economic Data & Information**. The three latter are not MEAs on their own, but Marine Knowledge and MSP feature as parts of the Integrated Maritime Policy (IMP) with socio-economic aspects gaining more and more importance.

It should be noted that the grouping of MEAs into relevant Blue Topics for a 'Model' Marine / Maritime KIC differs slightly from the grouping of MEAs within previous Blue Growth studies according to "Functions". The grouping for the 'Model' Marine / Maritime KIC has been done on the basis of the underlying knowledge triangle needed, ie. types of research, educational & innovation programmes. Thus "Cruise tourism" has for instance been moved to Maritime transport & shipping, whereas "Coastal tourism" has been linked with "Coastal protection & development" issues.

Each of the Blue Growth KIC topics form the basis of a 'Model' Marine/Maritime KIC and are elaborated further below in terms of (see also Annex 2 and 3):

- Scope
- Relevant MEAs
- Emerging Maritime KIC Issues
    - Pertinent Science & Technology (S&T) Disciplines
    - Education Needs
    - Cutting Edge Research
    - Innovation Potential
        - In all four cases with reference to Europe
- Scope of Marine Data and Information Services
- Link to existing and planned KIC topics
- Profile of existing actors, i.e.
    - Existing EU initiatives/network addressing the topic
    - Type of actors important for KIC at national / regional level
- Regional dimensions, what is important where.
- Other dimension (where relevant)
- Added value for a KIC, cross-fertilisation, value chain

Figure 2-1 **Blue Growth KIC Topics and their related Maritime Economic Areas (MEAs)**



Each of the Blue Growth topics was further reviewed against a set of KIC criteria using the details elaborated above to establish whether the topic really did meet the requirements for a KIC. The KIC criteria which were applied are:

1. **Capacity for innovation**:
    a. could technological development change the way business is done?
    b. absorption capacity & critical mass of businesses / companies throughout Europe
2. **Educational needs**:
    a. to what extent is business development hampered by lack of skills (based on higher education)?

b. is there the institutional capacity to address educational needs?

3. **Excellence in research**: Is there the knowledge available to transfer research into innovation and/or education?
4. **Benefit for Europe**: Is there an added value for a European wide as opposed to regional / national initiative? Is there a complementarity across Europe?
5. **Spillover effects**: does this topic have a synergistic impact on other BG topics?
6. **Sustainability**: To what extend can a KIC develop into a long-term sustainable, self-supporting network in relation to the given BG topic?

The review highlighted that there would indeed be added-value in applying the KIC format to all the Blue Growth KIC topics (Table 2.3). We therefore use all 5 Blue Growth KIC topics as the basis of the 'Model' Marine/Maritime KIC and for the evaluation of the maritime component of existing KICs.

The goal of the 'Model' Marine/Maritime KIC is to support the sustainable use of the sea through the application of innovation across the 5 Blue Growth KIC topics of the Blue Economy within an integrated European network of higher education institutions, research organisations, companies and other stakeholders. Each of the 5 Blue Growth KIC topics could be organized as a co-location centre (CLC) addressing a set of innovation priorities within their topic.

Overall, the 'Model' Marine/Maritime KIC would provide a focus for innovative projects and actions that promote synergies and technology transfer across maritime sectors.

Table 2.3 Review of added-value in Blue Growth KIC topics

Scoring system: ++ = high + = medium 0 = neutral	Maritime Shipping & Transport	Food, Nutrition & Health	Energy & Raw Material	Coastal Protection & Development	Marine Data & Information Services
Capacity for innovation	++	++	++	++	++
Educational needs	++	++	++	++	++
Excellence in research	++	++	++	++	++
Benefit for Europe	++	++	++	++	++
Spillover effects	++	++	++	++	++
Sustainability	++	++	++	++	++
ADDED Value	12	12	12	12	12

It should be noted that while there is a maritime geographic dimension associated with all Blue Growth KIC topics, the potential benefits that could be realised in developing various activities described below within the Blue Growth KIC topics are not limited to EU coastal states. In particular, activities related to

engineering, sensor/robotics design, manufacture, and ICT cyber infrastructure are relevant to all European States.

3 Identifying and assessing the maritime component in the existing KICs

3.1 Introduction

In this chapter we present the results of assessing the maritime component in the existing three KICs supported by EIT. It provides both general assessment of the KICs' activities and collaborations, as well as the actual assessment of the extent to which the maritime related topics and issues have been covered by these activities.

In the sections below we discuss the following aspects related to the work of the existing KICs:

- Identification, vizualisation and analysis of overall collaborative linkages per KIC;
- Screening of detailed project-level information and identification of maritime activities covered;
- Visualization of maritime activities covered in existing KICs;
- Elaboration, per KIC, of a scoreboard giving an indication of its maritime dimension.
- Elaboration of a scoreboard across KICs.

3.2 Mapping the maritime component and evaluating the maritime dimension of existing KICs

Using the inventory compiled under phase 1, we reviewed each of the existing KICs to assess their maritime component and evaluate their maritime dimension[52]. In order to evaluate the maritime dimension of the existing KICs, we established a 'Model' Marine/Maritime KIC scoreboard based on measurable indicators (Table 3.1). For each of the existing KICs, we reviewed their topics and project level data, and assessed whether these were relevant to and had the potential to have a positive impact on the maritime activities elaborated in the 'Model' Marine/Maritime KIC. We further reviewed the maritime profile and dimension of each of the KIC partners with respect to their distribution across the knowledge triangle, the number of patents filed and publications in Blue Growth KIC topics. Finally, we reviewed the geographic maritime dimension of the location of KIC co-location centres. Each of the existing KICs has been evaluated against this scoreboard and the summarized results are presented in Table 3.2 and Table 3.3 . The details of the scoreboard analysis are given in Annex 4 and 5.

[52] Marine/maritime component refers to the elements of the KIC such as activities, projects, actors, etc … which have a maritime dimension. Maritime dimension describes the extent to which various maritime components address Blue Growth aspects of the knowledge triangle (i.e. education, research, innovation).

Table 3.1 'Model' Marine/Maritime KIC Scoreboard

Scoreboard	Indicator	Interpretation
Maritime Topics	Number of Blue Growth KIC topics addressed at topic level.	What is the maritime component of given KIC topics?
Maritime Projects	Number of maritime projects.	What is the maritime component of existing KIC projects?
	Number of Blue Growth KIC topics addressed at project level.	
Relevance of Projects	Relevance of projects to model KIC issues.	What is the maritime dimension of existing KIC projects?
	Distribution of projects across Knowledge Triangle.	
Maritime Partners	Maritime profile of partners.	What is the maritime component of existing KIC partners?
	Distribution of maritime partners across Knowledge Triangle.	What is the maritime dimension of existing KIC partners?
	Number of patents filed by partners in Blue Growth KIC topics.	
	Number of publications by partners in Blue Growth KIC topics.	
Geographic Dimension	Marine/maritime network analysis. Geographic map of maritime partners.	What is the maritime component & dimension of existing KIC CLC locations?

Maritime Topics: A KIC topic is scored based on the number of Blue Growth topics it can be associated with. Maximum score for each topic is 1. Overall Maritime Topic score is sum of KIC topic scores divided by number of KIC topics.

Maritime Projects: A KIC project is scored based on the number of Blue Growth topics it can be associated with. Maximum score for each KIC project and each Blue Growth topic is 100%. The percentage of maritime projects addressing Blue Growth topics is the average final score of all Blue Growth topics.

A definition of a KIC-project is relatively broad: it is the transformation of available knowledge into new, marketable products and services related to the KIC's field that create positive impact on the market and society. A feasible commercialisation opportunity is an important element in them.

In most cases the KICs issue a project call for which the applicant submit their proposals. It is expected that the applicant secure at least 25% of co-funding in addition to the requested support from KIC. Some of the KIC calls can be issued by the core members which are looking for partners or are prepared to support innovative ideas in particular sectors.
Such a project can involve one or more of the following:

- An innovative product / service aiming at one of the KIC's goals/objectives;
- Successful proof of concept achieved;
- Convincing business opportunity;
- The commercialising company must be part of the project consortium.

The conditions for composition of the project consortia vary depending on the type of calls. KICs usually specify the major goals of the projects subject to a particular call, such as: spun-off initiatives, innovation projects towards commercialisation of an idea, SME participation actions, training programmes, networking events, etc.

Relevance of Projects: Using the information provided by the project abstracts, we assigned a rating describing the extent to which each KIC project is relevant to a Blue Growth topic as follows: +++ = high; ++ = medium; + = low. The ratings were then aggregated for all projects over Blue Growth topics, weighted accordingly (0.33/+; 0.66/++; 1/+++) to obtain the relevance of KIC maritime projects to Blue Growth topics. The combined score for all KICs was further weighted by the share of maritime projects in each KIC.

Table 3.2 Overview of existing KIC scoreboard related to KIC topics and projects[53].

Model Marine/Maritime KIC	Climate	InnoEnergy	ICT Labs	All KICs
Overall Maritime Topics	**28%**	**26%**	**33%**	**28%**
Maritime Transport & Shipping	25%	0%	33%	15%
Food, Nutrition & Health	28%	0%	17%	12%
Energy & Raw Material	38%	86%	33%	60%
Coastal Protection & Development	25%	0%	17%	11%
Marine Data & Information Services	13%	43%	67%	41%
Total Number of Projects	**43**	**41**	**30**	**114**
Number of Maritime Projects	**12**	**22**	**12**	**46**
% Maritime Projects (Weight Factor)	**28%**	**54%**	**40%**	**41%**
% BG Topics Addressed by Maritime Projects	**50%**	**27%**	**32%**	**34%**
Maritime Transport & Shipping	42%	0%	17%	15%
Food, Nutrition & Health	33%	0%	8%	11%
Energy & Raw Material	58%	100%	25%	70%
Coastal Protection & Development	58%	0%	8%	17%
Marine Data & Information Services	58%	36%	100%	58%
% BG Topics Addressed by All KIC Projects	**14%**	**15%**	**13%**	**14%**
Maritime Transport & Shipping	12%	0%	7%	5%
Food, Nutrition & Health	9%	0%	3%	3%
Energy & Raw Material	16%	54%	10%	33%
Coastal Protection & Development	16%	0%	3%	5%
Marine Data & Information Services	16%	19%	40%	24%
Relevance of Maritime Projects to BG Topics	**30%**	**19%**	**17%**	**21%**[54]
Maritime Transport & Shipping	19%	0%	11%	8%
Food, Nutrition & Health	25%	0%	6%	8%
Energy & Raw Material	33%	65%	14%	43%
Coastal Protection & Development	41%	0%	6%	12%
Marine Data & Information Services	33%	32%	50%	37%
Distribution across Knowledge Triangle				
Education	8%	9%	21%	12%
Research	42%	32%	71%	45%
Innovation	50%	59%	7%	43%

[53] Refer to detailed Scoreboard in Annex 5 for details

[54] Combined KIC score is weighted by the share of maritime projects in each KIC.

Table 3.3 Overview of existing KIC scoreboard related to KIC partners.

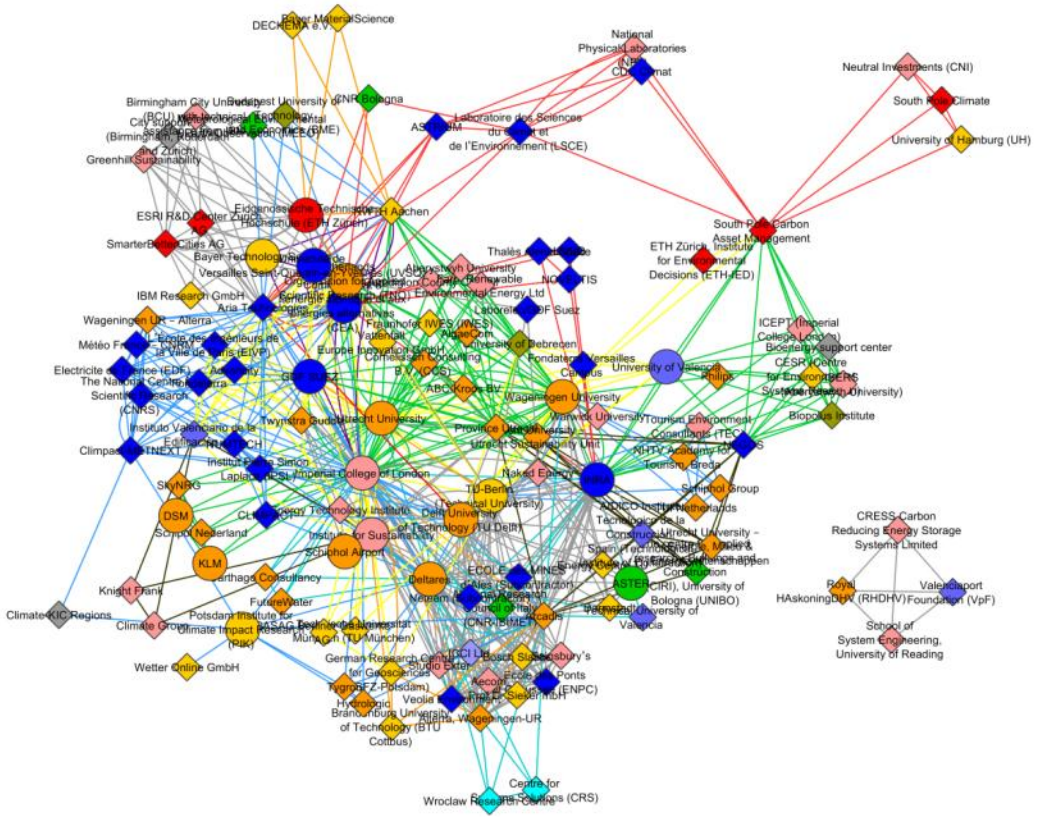
Model Marine/Maritime KIC	Climate	InnoEnergy	ICT Labs	All KICs
Maritime Profile of Partners	**81%**	**56%**	**37%**	**58%**
Distribution across Knowledge Triangle				
Education	45%	36%	64%	48%
Research	27%	29%	9%	22%
Innovation	27%	36%	27%	30%
Number of Patents	**10**	**127**	**112**	
Maritime Transport & Shipping	0	0	12	
Food, Nutrition & Health	3	0	9	
Energy & Raw Material	3	127	34	
Coastal Protection & Development	4	0	17	
Marine Data & Information Services	0	0	40	
Number of Publications	**544**	**110**	**281**	
Maritime Transport & Shipping	5	5	6	
Food, Nutrition & Health	164	12	60	
Energy & Raw Material	253	59	72	
Coastal Protection & Development	15	34	2	
Marine Data & Information Services	107	0	141	

The assessment of the maritime profile of KIC partners was determined by whether or not they have an explicit reference to maritime activities in their education, research or business focus, whether or not they have filed a patent in any of the MEAs, and/or whether or not they have published in any of the MEAs.

3.2.1 Climate KIC

3.2.1.1 Overall Collaborative Network Characteristics

Figure 3.1 Project based interactions in ClimateKIC with partner nodes colour coded per affiliated CLC (round shapes refer to core partners, diamond shapes to affiliate/associate partners correspondingly).



Legend:

Dot colour – Country of the Partner		Link colour – Thematic action line	
France		Adaptation services	
Germany		Developing a bio-economy	
Hungary		Greenhouse gas monitoring	
International		Industrial symbiosis	
Italy		Land and water	
Netherlands		Making transitions happen	
Poland		Resource efficiency	
Spain		Sustainable cities	
Sweden		The built environment	
Switzerland			
UK			

As this KIC membership overview shows, the geographic location of an individual KIC directly determines the geographic location of its members. These are predominantly the institutions from the same country or from the neighbouring regions that have close economic links (such as Benelux).

The diagram, presented in Figure 3.1 above represents a so-called spring embedded network visualisation of the cooperation links among the Climate KIC members in the framework of the joint projects. As it was mentioned in the methodological section, this diagram provides information about the members' CLC affiliation (node colour), the thematic action line of the project linking two partners (line colour) and the relative overall weight of the institution in the network (relative position to other members). We further supplement the network diagram with the quantitative information about the relative frequencies of project interactions distributed by topic and the relevant CLC presented in Table 3.4.

Looking at the network diagram in Figure 3.1, we observe that to a considerable extent the projects in the framework of an individual action line are likely to be performed by partners belonging to the same CLC, and thus be geographically localised. For example, the members belonging to the Dutch CLC clearly specialise in project along the action line of Developing a Bio Economy (44% of interactions in this topic). The French CLC's members are much more active in two lines, Adaptation Services (49%) and Greenhouse Gas Monitoring (69%), than in other topics.

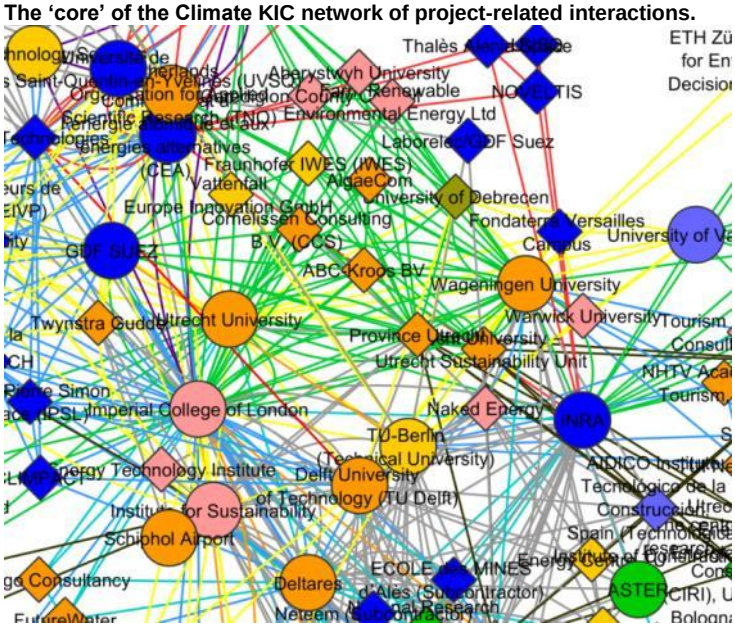
There are several action line themes that are followed up more internationally. The projects on the Sustainable Cities topic involve international participants from Germany (15%), France (12%), UK (27%) and Netherlands (28%). In the action line Making Transition Happen we observe quite active participation of French (28%), Dutch (27%) and German (16%) members.

Looking at the general patterns of cooperation occurring in the Climate KIC network we note the existence of several relatively distanced clusters, some of which are geographically centred (such as the French cluster in Adaptation Services (49%) and in Greenhouse Gas Monitoring (68%)) and some originating around a particular action line (the international cluster in Sustainable Cities in the bottom part of the diagram). Further, there are several smaller clusters at the periphery of the network and one cluster in Sustainable Cities which appears to be isolated from the rest of the network.

Table 3.4 Relative frequencies of project based interactions in ClimateKIC per CLC and topic.

	FR	DE	HU	Intll	IT	NL	PL	ES	SE	CH	UK
Adaptation services	**49%**	8%	2%	1%	2%	**28%**	0%	0%	0%	0%	11%
Developing a bio-economy	10%	9%	6%	3%	0%	**44%**	0%	3%	0%	3%	**23%**
Greenhouse gas monitoring	**68%**	3%	0%	0%	3%	5%	0%	0%	0%	10%	10%
Industrial symbiosis	0%	**50%**	0%	0%	0%	**25%**	0%	0%	0%	0%	**25%**
Land and water	**24%**	0%	0%	0%	6%	**45%**	10%	4%	0%	0%	11%
Making transitions happen	**28%**	16%	4%	0%	0%	**27%**	0%	9%	0%	3%	14%
Resource efficiency	3%	**53%**	0%	0%	0%	**24%**	0%	0%	0%	9%	12%
Sustainable cities	12%	15%	0%	2%	2%	**28%**	0%	2%	3%	7%	**27%**
The built environment	11%	0%	0%	0%	11%	**44%**	0%	17%	0%	0%	17%

Figure 3.2 **The 'core' of the Climate KIC network of project-related interactions.**



Legend: Same as in Figure II

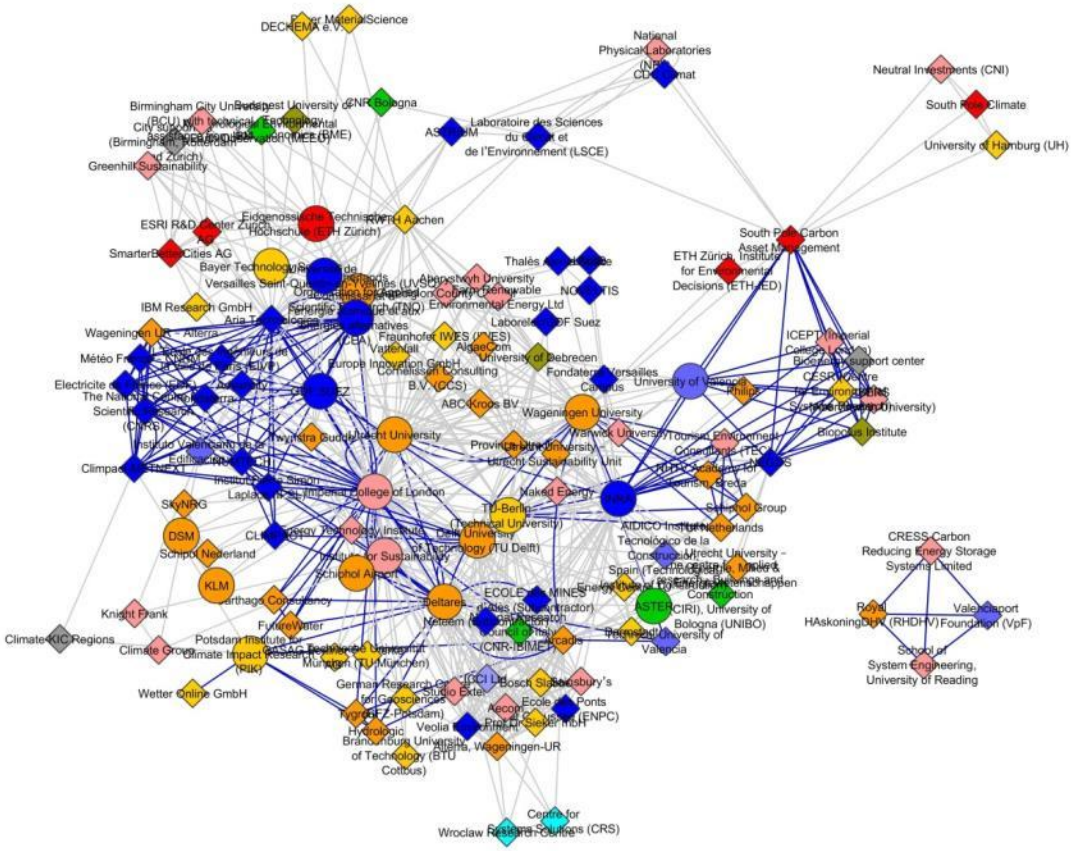
The core of the Climate KIC network is currently formed by institutions coming from four European Countries that are also the ones most frequently involved in the KIC's projects: Netherlands, France, Germany and United Kingdom. In this core we see both core members of the KIC (larger circle shapes) as the affiliate and associate members (smaller diamond shapes). This observation points to a less hierarchical construction of the network as a whole with partners at different levels of the KIC affiliation being equally active participants in joint projects.

3.2.1.2 Maritime activities

As it can be observed in Figure 3, the maritime related projects in the framework of Climate KIC predominantly involve partners from three co-location centres located in France, Netherlands and Germany. The French CLC is visibly more involved in the maritime related topics that any other co-location centre.

Looking at individual partners, one can point at GDF Suez (France), INRIA (France), Deltares (Netherlands), PIK (Germany), University College of London (UK) and University of Valencia (Spain) as the main actors in the maritime related Climate KIC research.

Figure 3.3 **Maritime related project collaboration links in Climate KIC**

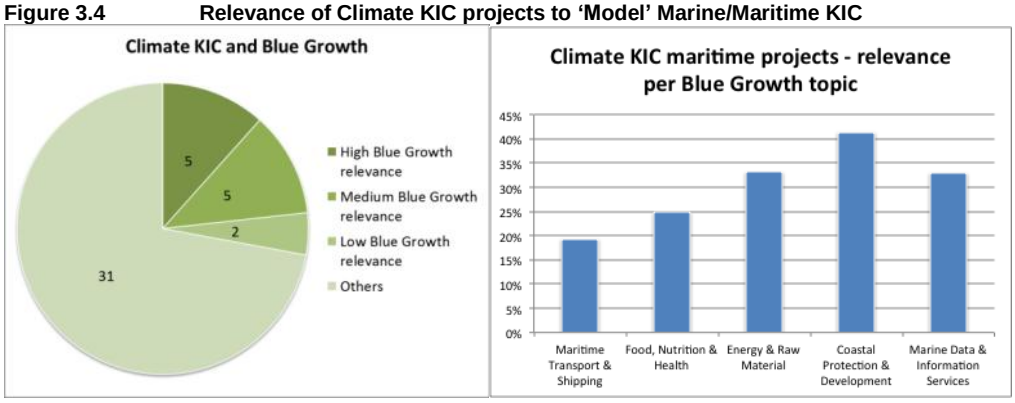


Legend:

Dot colour – Country of the Partner	
France	
Germany	
Hungary	
International	
Italy	
Netherlands	
Poland	
Spain	
Sweden	
Switzerland	
UK	

From studying the actual profiles of individual partners, we see that 81% of Climate KIC partners have a maritime component and 2 of the Climate KIC's CLCs have a maritime location, i.e. Sweden and Spain. 28% of Climate KIC topics and projects have a maritime component. The maritime Climate KIC projects address 50 % of the 'Model' Marine/Maritime KIC topics but taking into account all of the Climate KIC projects, only 14% of the 'Model' Marine/Maritime KIC topics are addressed by Climate KIC projects. Overall, the maritime Climate KIC projects are for 30% relevant to the model marine/maritime KIC. Examining the individual 'Model' Marine/Maritime KIC topics, we see that the maritime Climate KIC projects are most relevant to Coastal Protection & Development (41%), followed by Energy & Raw Material and Marine Data & Information Services (both 33%), then Food, Nutrition & Health (25%) and Maritime Transport & Shipping (19%) (Figure 3 to Figure 3).

Figure 3.4 Relevance of Climate KIC projects to 'Model' Marine/Maritime KIC



Project relevance is based on individual project ratings in the KIC scoreboard (Low: 0-14%; Medium: 15-29%; High: 30% and higher).

The distribution of Climate KIC maritime projects across the knowledge triangle lines is skewed towards innovation (50%) and research (42%) with only 8% addressing education. It is interesting to note that 45% of the core partners of Climate KIC with a maritime profile are from education, with the remaining distributed equally between research and innovation (Figure 3). In fact also the partners from the maritime projects are predominantly to be associated with an education profile (51%), with a stronger contribution from innovation partners (32%).

Figure 3.5 Distribution of Climate KIC core maritime partners across knowledge triangle by country

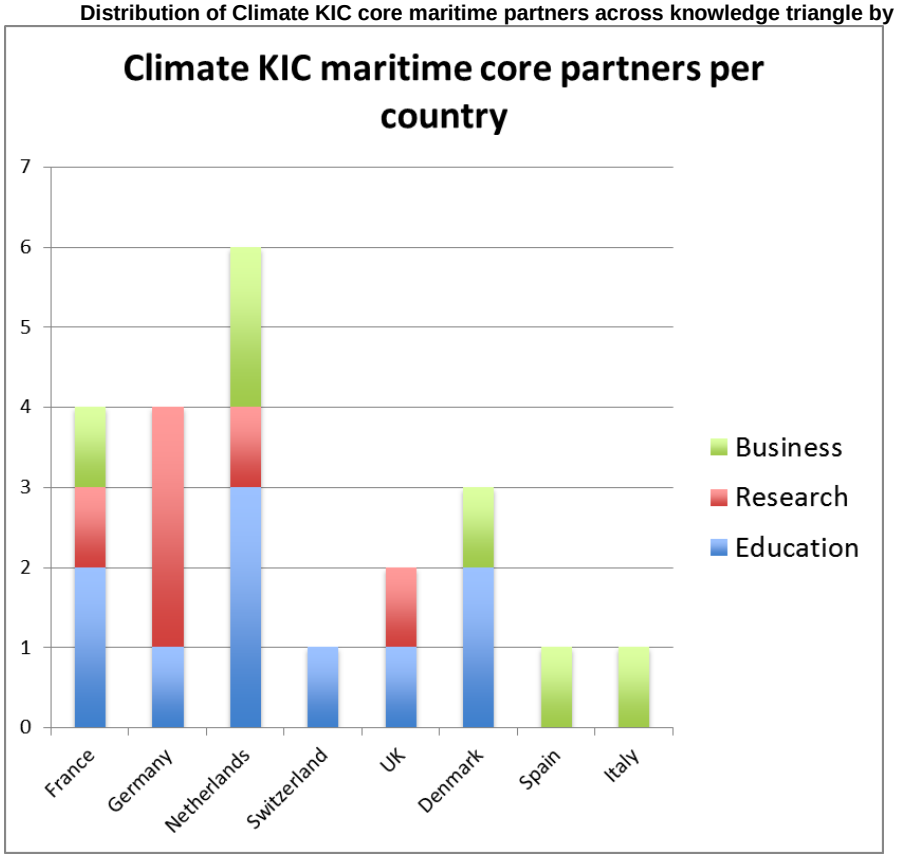
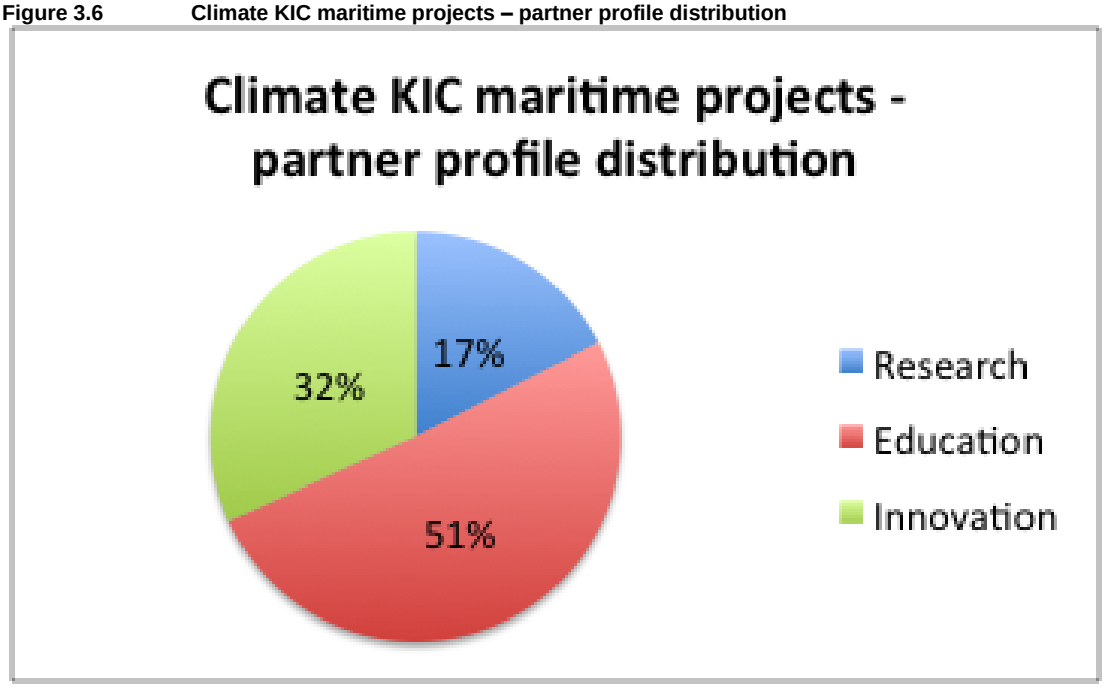


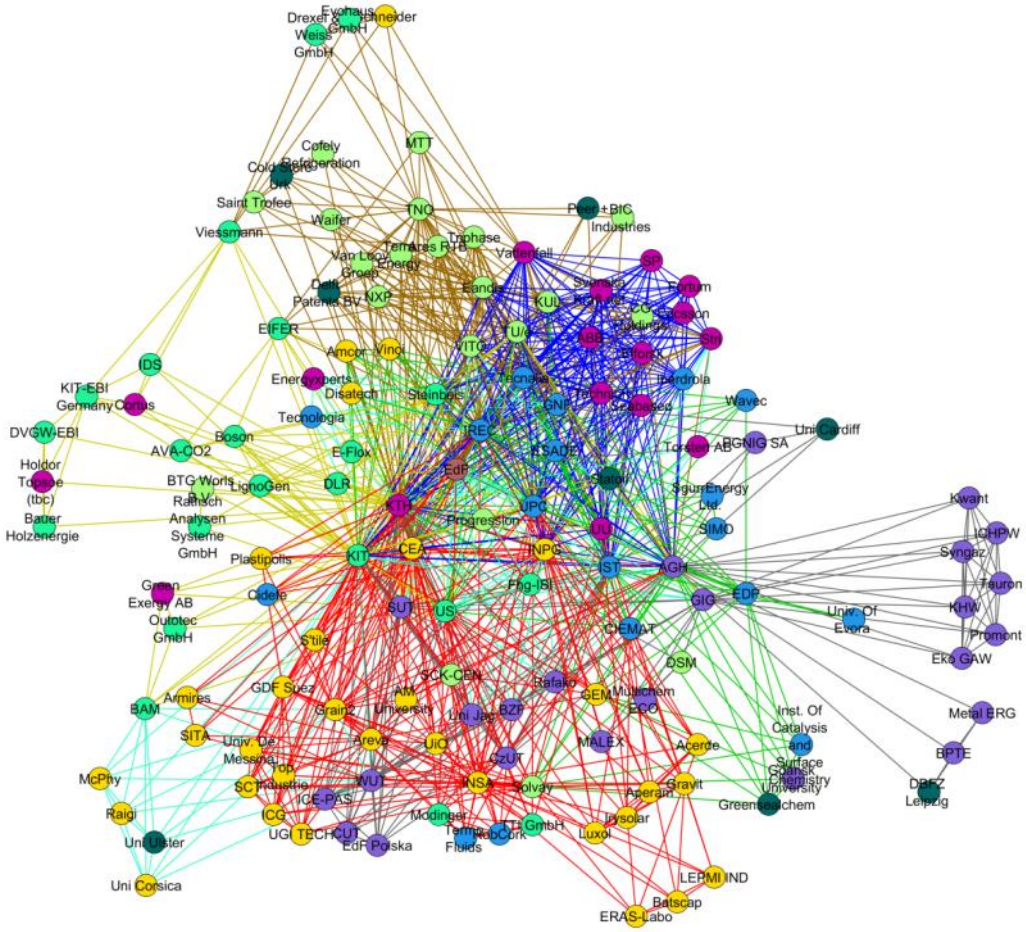
Figure 3.6 Climate KIC maritime projects – partner profile distribution



3.2.2 Inno-Energy

3.2.2.1 Overall Collaborative Network Characteristics

Figure 3.7 The project based interactions in the Inno Energy KIC with partner nodes colour coded per affiliated CLC.



Legend:

Dot color – CLC Affiliation of the Partner	Link color – Thematic action line
CC Alpes Valley	Clean coal technologies
CC Benelux	Energy from Chemical Fuels
CC Germany	Lighthouse projects
CC Iberia	Renewables
CC Poland	Smart & Intelligent cities and buildings
CC Sweden	Smart Grid and Storage
KIC level	Sustainable Nuclear and Energy Convergence

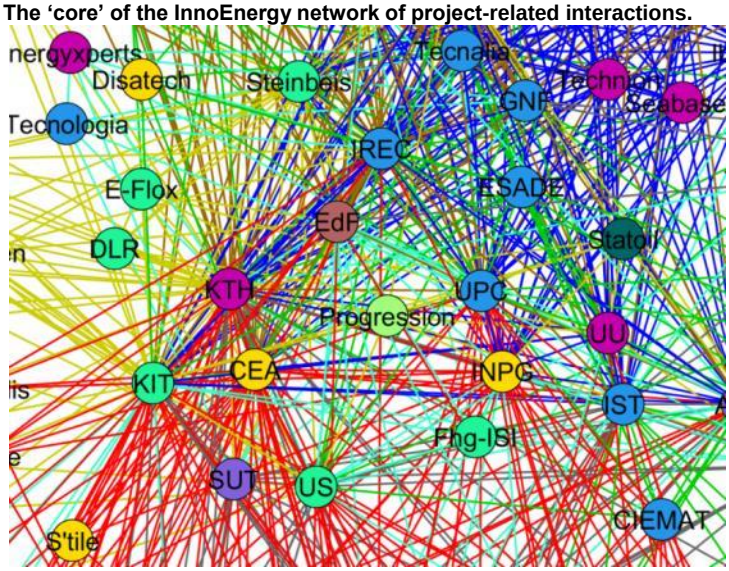
The collaboration network in the InnoEnergy KIC exhibits the same patterns of thematic and geographic cluster formation as in the case of Climate KIC. The action line on sustainable Nuclear and Energy Convergence is dominated by the KIC members from CC Alps Valley (France) with 64% of interactions and the issues of Smart Grid and Storage are concentrated around the members from CC Sweden (54%) and CC Iberia (22%). The organisations from Benelux tend to specialise on projects in Smart and Intelligent Cities and Buildings (57% of all interactions in the topic), while the projects in the Clean Coal Technologies action line are strongly concentrated around CC Poland (82%!).

The collaborative projects in the thematic action line on Renewables appear to be concentrated around CC Iberia (Spain/Portugal) (68%). In general, the network of the InnoEnergy KIC is more concentrated than the one of ClimateKIC with a single CLC covering more than a half of project interactions in six out of seven considered topics.

Table 3.5 Relative frequencies of project based interactions in Inno Energy KIC per CLC and topic.

	Germany	Alps Valley	Benelux	Iberia	Poland	Sweden	KIC level
Energy from Chemical Fuels	**65%**	1%	8%	1%	3%	19%	2%
Sustainable Nuclear and Energy Convergence	10%	**64%**	7%	11%	3%	4%	1%
Renewables	5%	11%	5%	**68%**	4%	4%	1%
Clean coal technologies	4%	0%	3%	4%	**82%**	4%	1%
Smart & Intelligent cities and buildings	10%	4%	**57%**	16%	1%	10%	2%
Smart Grid and Storage	5%	5%	9%	22%	5%	**54%**	1%
Lighthouse projects	11%	14%	1%	13%	15%	**43%**	3%

Figure 3.8 The 'core' of the InnoEnergy network of project-related interactions.



Legend: Same as in Figure

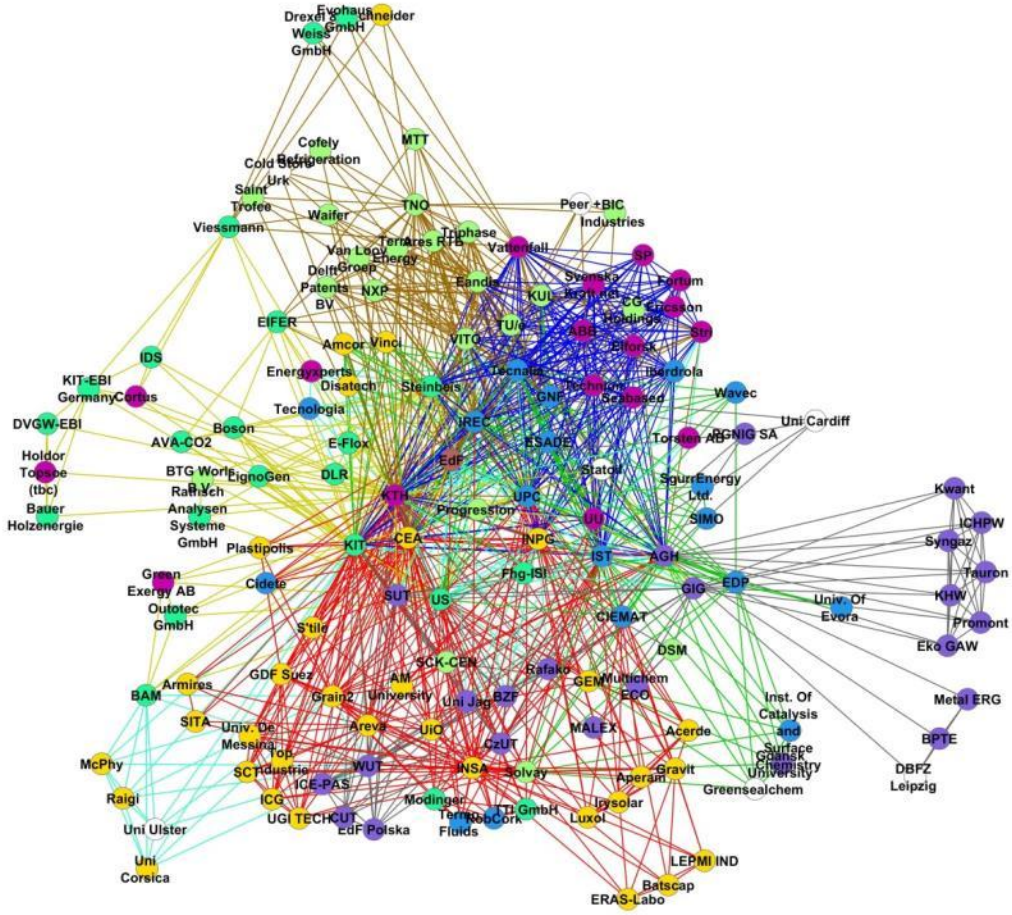
In the core of the InnoEnergy network we see a number of very strong and intensively connected players from different CCs: Most of the core members of the network are active in projects covered by multiple thematic action lines. For example, KTH - Royal Institute of Technology of Sweden is mostly involved in three thematic action lines: Sustainable Nuclear and Energy Convergence, Energy from Chemical fuels and Smart Grid and Storage. EDF - Électricité de France has even broader involvement across various InnoEnergy's action lines. Such core players, as Utrecht University (UU) and Catalonia Institute for Energy Research (IREC) appear to be in particular interested in Renewables and Smart Grid and Storage thematic lines.

3.2.2.2 Maritime activities

Compared to the Climate KIC example discussed in the previous section, the maritime related research involves partners from relatively more co-location centres: CC Sweden, CC Benelux, CC Iberia and CC Alps Valley (France). There are also three partners from CC Germany which are quite actively involved in the maritime topics.

As a result of the greater involvement of different CLCs it is rather difficult to pinpoint the individual partners, which play the more prominent role in such a maritime cluster. As a remarkable example we would like to point at the role of German KIT, which serves a kind of bridge institution linking the projects concentrated around CC Alps Valley (France) to the activities in the projects performed by partners from CC Sweden and CC Benelux.

Figure 3.9 **Maritime related project collaboration links in the Innoenergy KIC.**



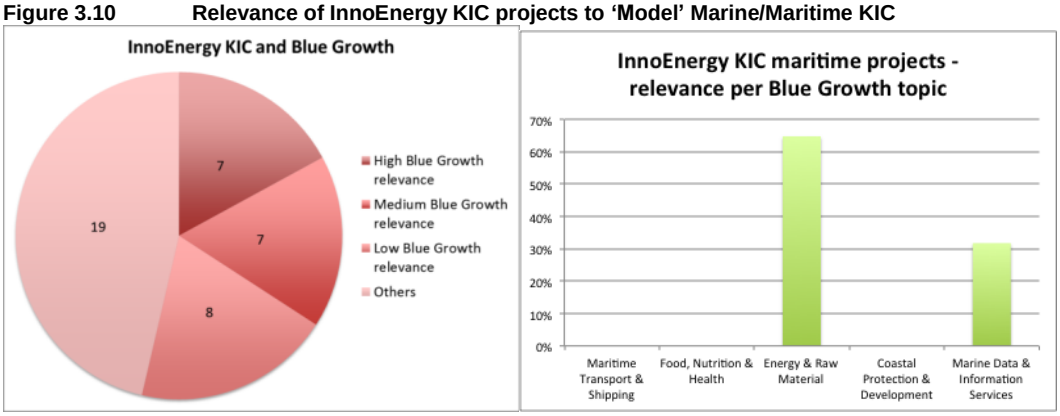
Legend:

Dot color – CLC Affiliation of the Partner	
CC Alpes Valley	
CC Benelux	
CC Germany	
CC Iberia	
CC Poland	
CC Sweden	
KIC level	

The individual partner profiles show that 56% of InnoEnergy KIC partners have a maritime component and 2 of the InnoEnergy KIC's CLCs have a maritime location, i.e. Spain and Sweden. 26% of InnoEnergy KIC topics and 54% of InnoEnergy projects have a maritime component. The maritime InnoEnergy KIC projects address 27% of the 'Model' Marine/Maritime KIC topics but taking into account all of the InnoEnergy KIC projects, only 15% of the 'Model' Marine/Maritime KIC topics are addressed by InnoEnergy KIC projects. Overall, the maritime InnoEnergy KIC projects are 19% relevant to the model

marine/maritime KIC. Examining the individual 'Model' Marine/Maritime KIC topics, we see that the maritime InnoEnergy KIC projects are most relevant to Energy & Raw Material (65%) and Marine Data & Information Services (32%). There is no relevance to the other 'Model' Marine/Maritime KIC topics (i.e. Maritime Transport & Shipping, Food, Nutrition & Health and Coastal Protection & Development) (Figure 3 to Figure 3).

Figure 3.10 Relevance of InnoEnergy KIC projects to 'Model' Marine/Maritime KIC



Project relevance is based on individual project ratings in the KIC scoreboard (Low: 0-14%; Medium: 15-29%; High: 30% and higher).

The distribution of InnoEnergy KIC maritime projects across the knowledge triangle lines is skewed towards innovation (59%) and research (32%) with only 9% addressing education. Similar to Climate KIC, this is interesting to note given that 36% of the core InnoEnergy KIC partners with a maritime profile are from education, 36% are from innovation, and 29% are from research (Figure 3). Again the picture changes, however, when looking into the profile of partners within the maritime projects themselves (Figure 3). At project level partners are predominantly associated with an innovation profile (58%).

Figure 3.11 **Distribution of InnoEnergy KIC core maritime partners across knowledge triangle by country**

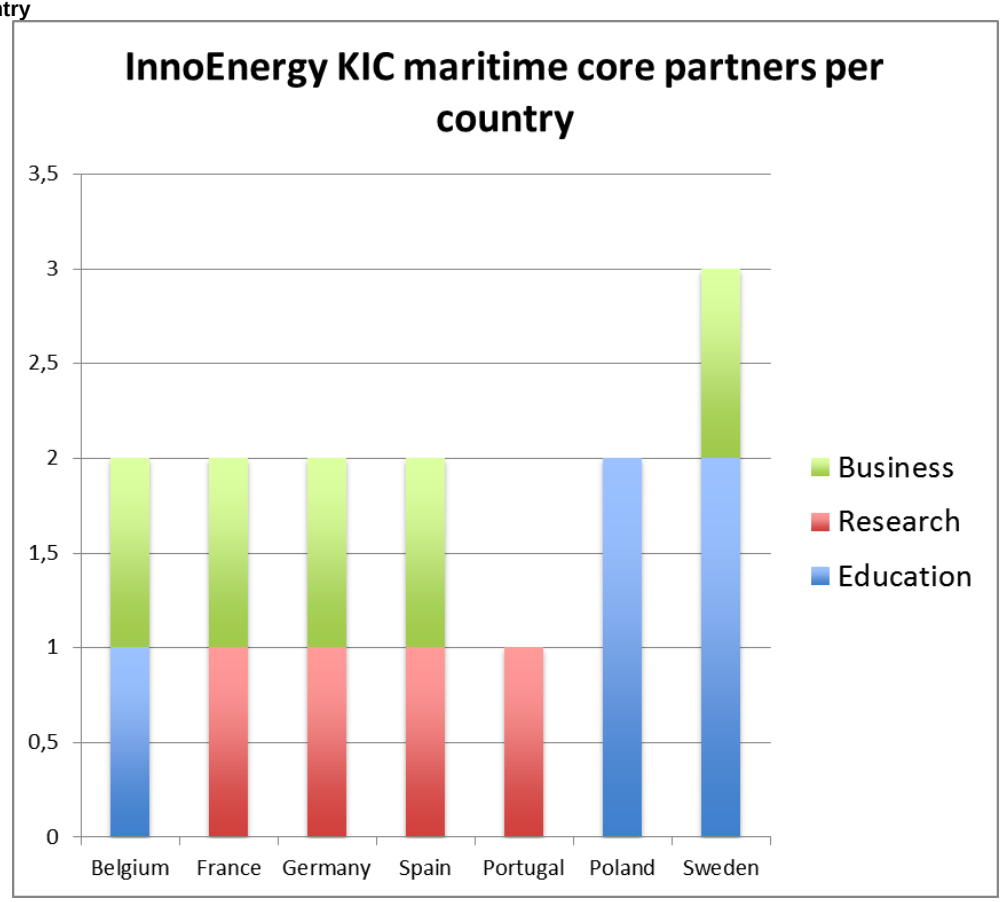
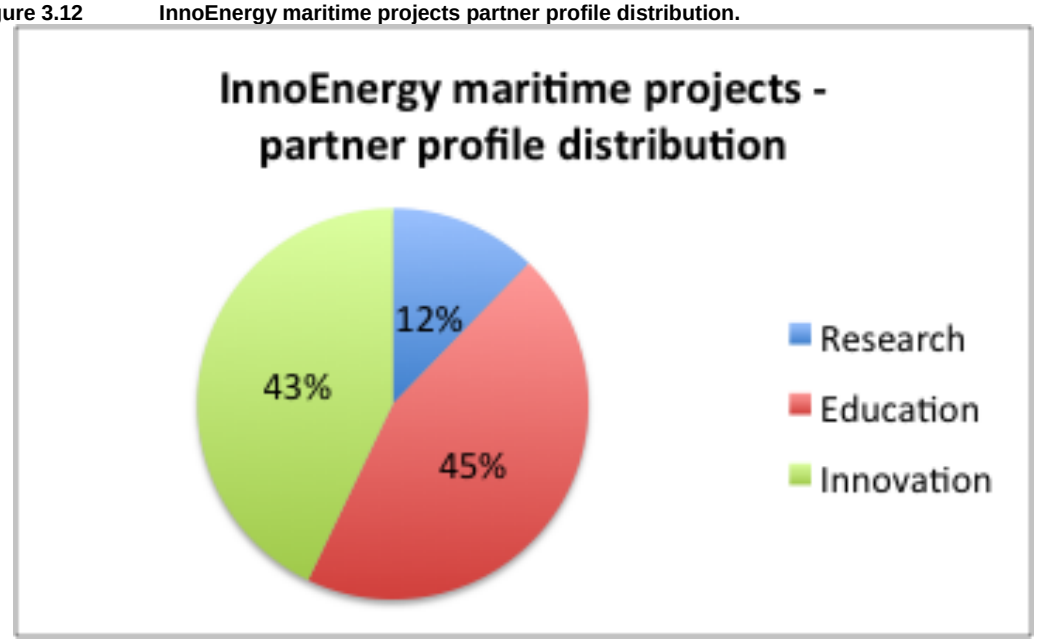


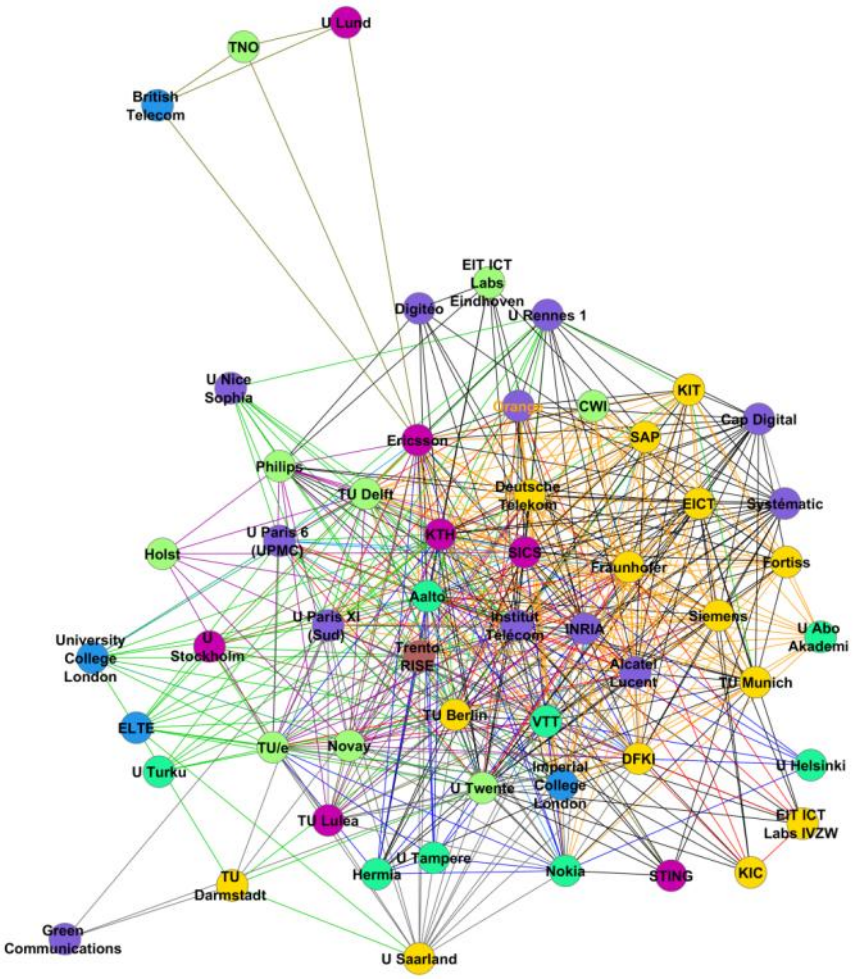
Figure 3.12 **InnoEnergy maritime projects partner profile distribution.**



3.2.3 ICT Labs

3.2.3.1 Overall Collaborative Network Characteristics

Figure 3.13 The project based interactions in the ICT Labs KIC with partner nodes colour coded per affiliated CLC



Legend:

Dot color – CLC Affiliation of the Partner	Link color – Thematic action line
Berlin	ACLD - Computing in the Cloud
Eindhoven	ADCT - Digital Cities of the Future
Helsinki	ADSL - Doctoral School
London	AHWB - Health & Well-being
Paris	AIMS - Intelligent Mobility and Transport Systems
Stockholm	AITA - Internet Technologies and Architectures
Trento	AMSL - Master School
	ASES - Smart Energy Systems
	ASSP - Smart Spaces
	CBDV - Business Catalyst Development

Compared to two previous KIC examples, the ICT Labs KIC presents the least fragmented collaboration network among the existing communities with the frequencies of project interactions les concentrated around a single CLC. Nonetheless, the activities in Intelligent Mobility and Transport Systems appear to

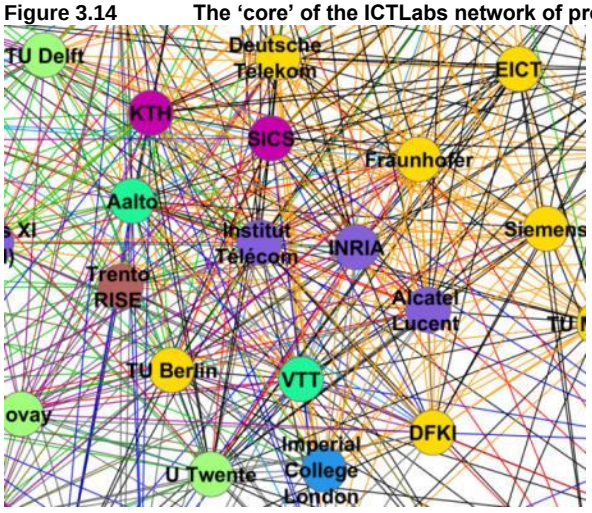
be more frequent around the Swedish CLC (67% of all interactions in the topic), and Smart Spaces being more actively pursued in Finland (64%). It is seen that CLCs in Paris and Berlin are more actively involved in several topics, while the CLC in Helsinki is more specialised in one.

This network appears to be rather uniform (with an exception of one strongly outstanding cluster in the field of Intelligent Mobility and Transport Systems). The network as a whole exhibits a specific feature that, while the core members are involved in projects covering a variety of action lines (definitely more than three action lines at the same time), the network members at the periphery are involved mostly in projects covering one particular theme. For example, University College London and Turku University contribute mostly to doctoral and Master Schools, University of Helsinki works in Smart Spaces, and French firms Cap Digital and Systematic are involved almost exclusively in Business Catalyst Development.

Table 3.6 Relative frequencies of project based interactions in ICTLabs KIC per CLC and topic.

	Berlin	Eindhoven	Helsinki	London	Paris	Stockholm	Trento
ACLD - Computing in the Cloud	**33%**	0%	8%	0%	**33%**	**25%**	0%
ADCT - Digital Cities of the Future	17%	**28%**	7%	11%	**25%**	9%	3%
ADSL - Doctoral School	0%	25%	13%	13%	**50%**	0%	0%
AHWB - Health & Well-being	**29%**	**39%**	10%	0%	2%	17%	2%
AIMS - Intelligent Mobility and Transport Systems	0%	10%	14%	5%	5%	**67%**	0%
AITA - Internet Technologies and Architectures	**21%**	7%	11%	0%	**54%**	7%	0%
AMSL - Master School	**20%**	14%	14%	12%	**26%**	9%	5%
ASES - Smart Energy Systems	**45%**	12%	12%	6%	12%	10%	4%
ASSP - Smart Spaces	7%	7%	**64%**	0%	7%	14%	0%
CBDV - Business Catalyst Development	**31%**	9%	13%	0%	**32%**	12%	2%

Figure 3.14 The 'core' of the ICTLabs network of project-related interactions.



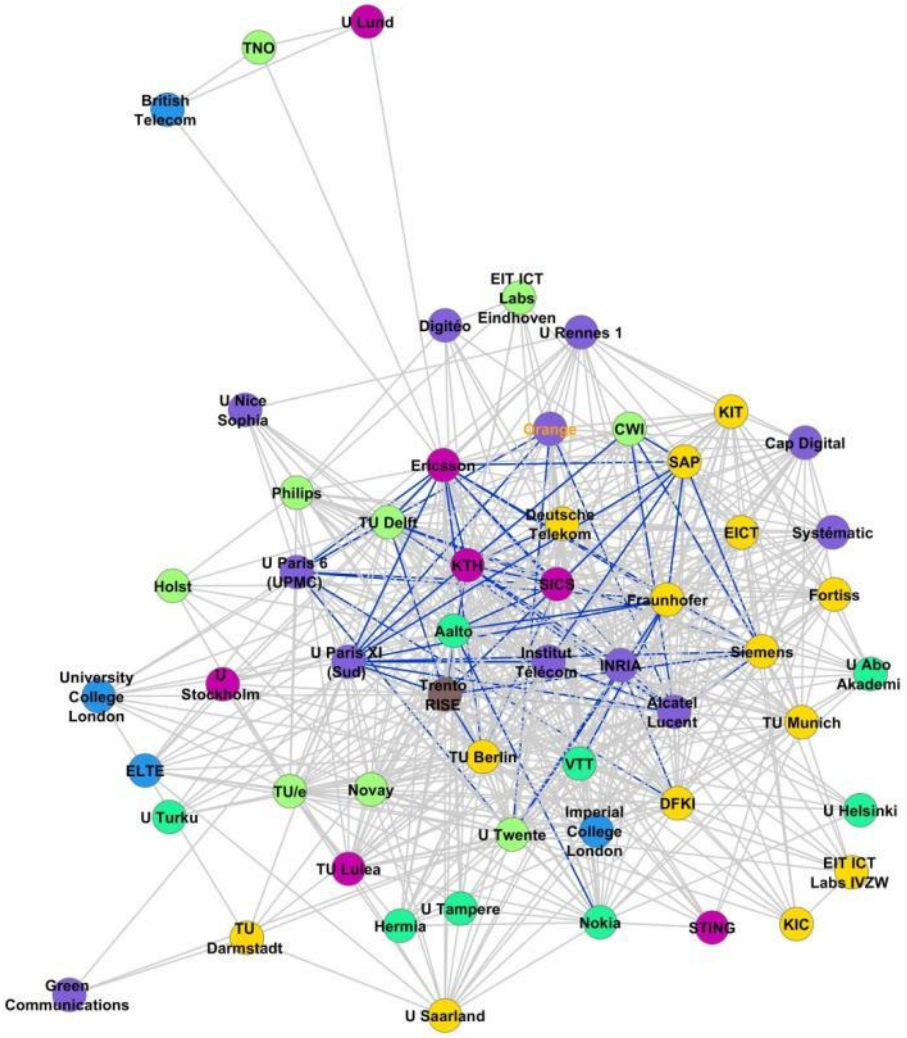
Legend: Same as in Figure

As the ICT Labs network is rather uniform in distribution of links among participants, its core is not that distinctively visible as in previous KIC-cases. Figure 3 shows a snapshot of the network's centre part, where the most connected organisation are located. As we can see, the members of the German Berlin co-location centre are the most numerous, followed by Eindhoven and Paris. As it was mentioned above, these core participants are involved in a rather wide variety of thematic action lines both in terms of type of activities (education, research, commercialisation) and in research themes.

3.2.3.2 *Maritime activities*

Following the same line as the findings of the general landscape analysis of project related links in the ICT Labs KIC, we can state that the maritime related research in this KIC involves partners from different CLCs. Nonetheless, it should be noted that the maritime related research projects involve partners predominantly from the central region of the network, meaning that these are the organisations which are more intensively involved in the KIC's research in general. We also see that French and German partners form a majority of members in this 'maritime' sub-cluster.

Figure 3.15 Maritime related project collaboration links in Climate KIC.

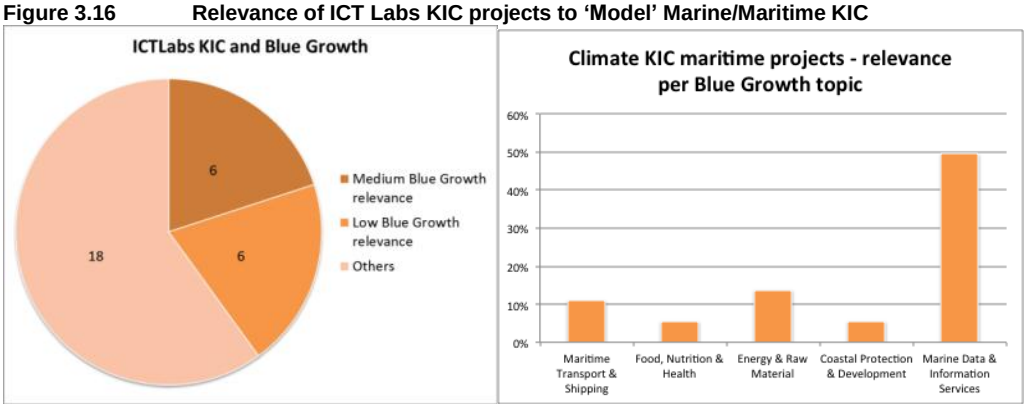


Legend:

Dot color – CLC Affiliation of the Partner	
Berlin	
Eindhoven	
Helsinki	
London	
Paris	
Stockholm	
Trento	

From examining the individual partner information, we observe that 33% of ICT Labs KIC partners have a maritime component and 2 of the ICT Labs KIC's CLCs have a maritime location, i.e. Finland and Sweden. 33% of ICT Labs KIC topics and 40% of ICT Labs projects have a maritime component. The maritime ICT Labs KIC projects address 32% of the 'Model' Marine/Maritime KIC topics but taking into account all of the InnoEnergy KIC projects, only 13% of the 'Model' Marine/Maritime KIC topics are addressed by ICT Labs KIC projects. Overall, the maritime ICT Labs KIC projects are 17% relevant to the model marine/maritime KIC. Examining the individual 'Model' Marine/Maritime KIC topics, we see that the maritime ICT Labs KIC projects are most relevant to Marine Data & Information Services (50%), followed by Energy & Raw Material (14%), then Maritime Transport & Shipping (11%) and Food, Nutrition & Health and Coastal Protection & Development (both 6%) (Figure 3 to Figure 3).

Figure 3.16 Relevance of ICT Labs KIC projects to 'Model' Marine/Maritime KIC



Project relevance is based on individual project ratings in the KIC scoreboard (Low: 0-14%; Medium: 15-29%; High: 30% and higher).

The distribution of ICT Labs KIC maritime projects across the knowledge triangle lines is very focused on research (71%) with only 8% the projects addressing both education and innovation lines. This may be a symptom of the fact that ICT Labs KIC organizes its activities somewhat differently from the other two KICs and is more activity driven than project driven. Nevertheless, this is still a stark contrast with the profile of maritime partners. 64% of the maritime partners are from education, 27% from innovation and only 9% from research. (Figure 3).

Figure 3.17 **Distribution of ICT Labs KIC core maritime partners across knowledge triangle by country.**

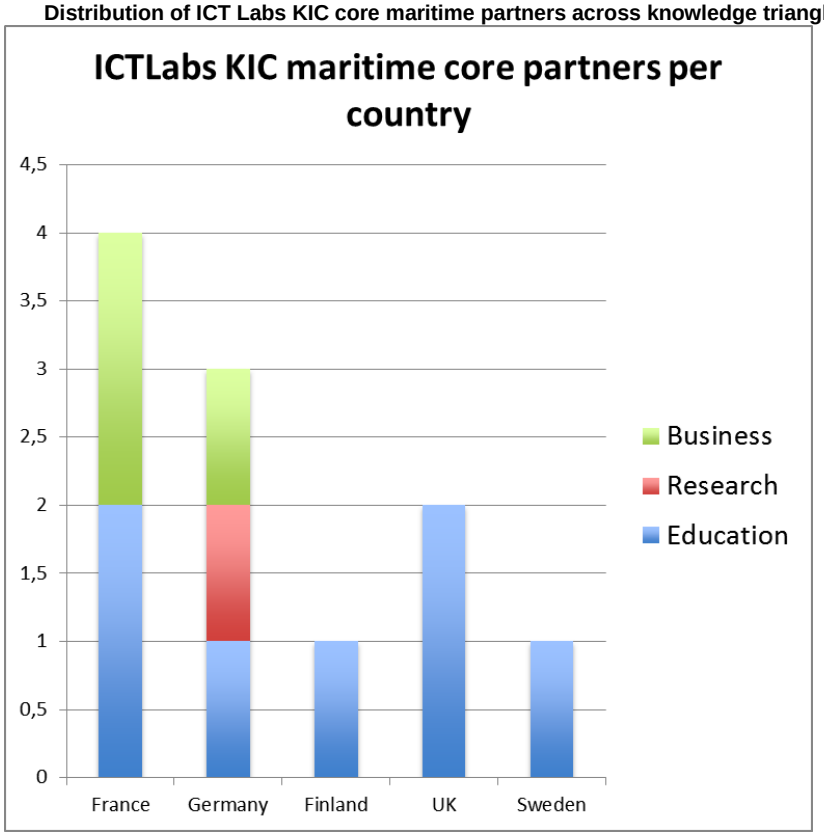
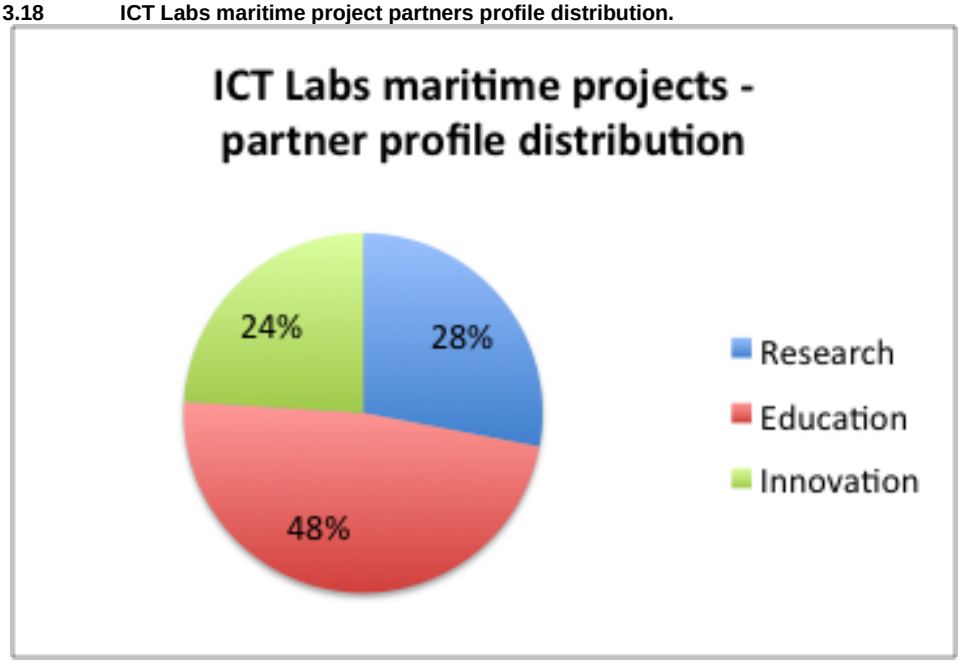


Figure 3.18 **ICT Labs maritime project partners profile distribution.**



3.3 Overall coverage of maritime dimensions, across all KICs, and gaps analysis

3.3.1 Maritime dimensions across all KICs

On average, 58% of the combined KICs partners have a maritime component. 28% of the combined KIC topics and 44% of the combined KIC projects have a maritime component. The maritime combined KIC projects address 34% of the 'Model' Marine/Maritime KIC topics but taking into account all of the

combined KIC projects, only 14% of the 'Model' Marine/Maritime KIC topics are addressed by the combined KIC projects. Overall, the maritime combined KIC projects are 21% relevant to the model marine/maritime KIC. Examining the individual 'Model' Marine/Maritime KIC topics (Figure 3 and Figure 3), we notice a number of interesting aspects. Figure 3 describes the weighted (by share of maritime projects) average relevance of KIC maritime projects to Blue Growth topics. Figure 3 illustrates the average relevance of KIC projects in relation to the number of KIC maritime projects within a given 'Model' Marine/Maritime KIC topic. The weighted maritime combined KIC projects are most relevant to Energy & Raw Material (43%), followed closely by Marine Data & Information Services (37%). These topics also have the largest number of maritime projects associated with them (Figure 3).

The number of maritime combined KIC projects and their weighted relevance associated with Coastal Protection & Development and Food, Nutrition & Health are much smaller, however both topics score highest in terms of average relevance (Figure 3).

Figure 3.19 Weighted average relevance of KIC Maritime Projects by Blue Growth Topics

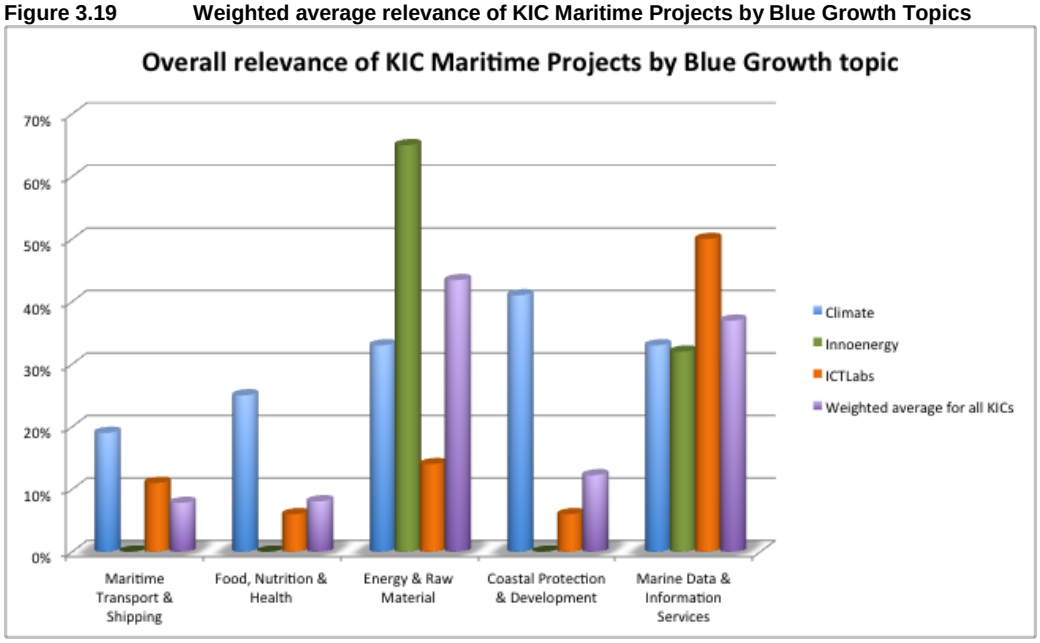
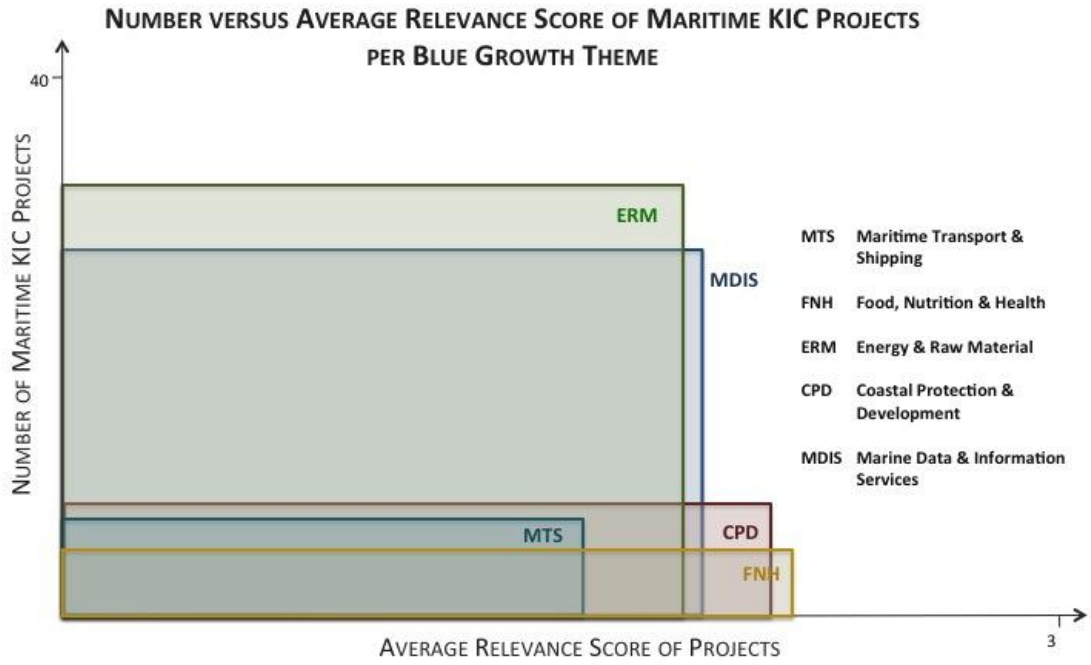


Figure 3.20 Number of Maritime Projects versus Average Model Marine/Maritime KIC Relevance



On average, 48% of the combined KICs projects are found under the research line, followed by 39% under the innovation line and only 8% under the education line. In contrast, the distribution of maritime partners for the combined KIC is more even, 48% education, 22% research and 30% innovation.

3.3.2 Gap analysis

We have reviewed where existing KIC projects target emerging 'Model' Marine/Maritime KIC issues (Table 3.7). The number of existing KIC projects which target to some extent emerging 'Model' Marine/Maritime KIC issues is shown in tables 3.7 – 3.11 below. The emerging 'Model' Marine/Maritime KIC issues which do not feature among any of the existing KIC projects are highlighted in pink. (It should be noted that given the lack of financial data available for most of the maritime projects analysed only an indication can be given as to what extent a topic is covered or not, but with no indication on the depth (as expressed by budget dimension) of the given activity / project. The involvement of private partners and private funding, and related confidentiality constraints may be considered as an explanation for this lack of information.)

On the one hand, this exercise draws attention to where the existing KICs are really tackling some of the important emerging issues for a 'Model' Marine/Maritime KIC. On the other, it shows that there are some very significant gaps which remain in terms of the 'Model' Marine/Maritime KIC. Without a doubt, training, recruiting and maintaining a critical mass of highly skilled workers are important gaps across all 'Model' Marine/Maritime KIC topics. So is developing new curricula to cope with new concepts, legal frameworks and technologies within each of the topics. In the context of emerging research and innovation issues, there may be the possibility to address some of the gaps within the existing and planned KICs. For example, the 2014 call for a Raw materials KIC is an obvious match for many of the emerging issues identified under Energy & Raw Material (table 3.9) and to a lesser extent, Maritime Transport & Shipping (table 3.7). Similarly, the 2014 call for Innovation for healthy living and active ageing KIC and the planned 2016 call for a Food4Future KIC would be good matches for many of the

issues falling under Food, Nutrition & Health (table 3.8). However, the current scope of information available concerning existing and planned KICs does not indicate how or if emerging 'Model' Marine/Maritime KIC issues will be addressed. Moreover, while superficially, Marine Data & Information Services and Coastal Protection & Development could fall under the auspices of ICTLabs and Climate KIC, respectively, there is no clear strategy to address many of the issues which fall under these Blue Economy topics. Consultation and communication of emerging Marine/Maritime issues across KICs is missing. There is a need to strategically prioritise, coordinate and focus the emerging 'Model' Marine/Maritime KIC issues and ensure that these are communicated proactively with existing KICs and planned KICs. An appropriate forum to facilitate this process should be identified.

Table 3.7 Emerging 'Model' Marine/Maritime KIC Issues, Maritime Transport & Shipping

Maritime Transport & Shipping	Climate	Inno	ICT Labs	All
Education Needs:				
• Recruiting, retaining skilled workforce.				
• International Masters in Shipping.				
• New curricula emphasizing niche design markets.				
• E-learning tools			**1**	**1**
Cutting Edge Research:				
• E-maritime solutions information, safety, monitoring.	**1**		**1**	**2**
• New technologies and smarter traffic management.			**1**	**1**
• Energy efficiency of ships and vessels.				
• Compliance checking, onshore electricity.	**1**			**1**
• System modelling, life-cycle cost, performance optimisation of waterborne assets.				
Innovation Potential:				
• Increasing competitiveness and specialisation in niche markets.				
• Engineering, design clean ship technology				
• Deep sea / offshore technologies.				
• LNG technology, port reception facilities, reduction in shipping noise, compliance checking systems, e-navigation solutions.	**1**			**1**
• Link to Blue Biotech: provision of alternatives to anti-fouling hull coatings (e.g. nano-skins).				

Table 3.8 Emerging Model Marine/Maritime KIC Issues, Food, Nutrition & Health

Food, Nutrition & Health	Climate	Inno	ICT Labs	All
Education Needs:				
• Training fisheries scientists, mathematical modellers and related Earth Science disciplines.				
• Critical mass of highly skilled workers needed in research and innovation for all sectors.				
• E-learning tools			**1**	**1**
Cutting Edge Research:				
• **Fish:** Data collection (CFP), stock assessment, sustainability of the resource, multi-species modelling to support mixed fisheries advice and management; understanding climate change induced changes on biogeography and physiology of commercially important species; fishing gear, reduction of discards, fishing vessel design, energy efficiency; traceability of product; socio-economic assessment and evaluation of management regulations, regional management plans, market development and technological advancements on dependent fishing and coastal communities.	**2**			**2**
• **Marine aquaculture for food**: disease control, sustainable feed source, combating disease, reduce/minimise organic and chemical waste, new species; recirculating aquaculture systems, innovation in energy source, offshore aquaculture systems including multi-purpose platforms; traceability of product; streamlining environmental and regulatory interactions.				
• **Blue biotech / related upscaling processes**: discovery & bioprospecting, process & product development, up-scaling & commercialisation with consideration of sub-sectors, Health, Cosmetics, Food, Energy, Aquaculture, Marine Environmental Health, Bio-refineries; traceability of product.	**2**			**2**

Table 3.9 Emerging Model Marine/Maritime KIC Issues, Food, Nutrition & Health (continued)

Food, Nutrition & Health	Climate	Inno	ICT Labs	All
Innovation Potential:				
• **Fish**: sustainability of the resource, stock assessments, dealing with discards, innovative technology, vessel and equipment design and compliance, business innovation in retail aspect of fishing; promotion of safe, nutritious, healthy European seafood, including certification and branding.				
• **Marine aquaculture for food**: Innovation in stock enhancement, disease prevention, new species, new production technologies including multi-purpose structures (servicing energy, aquaculture and marine biotech activities), improved cultures and feeding techniques; promotion of safe, nutritious, healthy European seafood, including certification and branding.				
• **Marine aquaculture for other purposes**: development of biorefinery concept (technology & economic combinations) using combined innovation in e.g. bio-energy, environmental remediation, high value blue biotechnology products				
• **Blue biotech**: huge potential for innovation and spill-over effects on other industries (e.g. cosmetic, pharma, food, chemical). Marine biotechnology can be an important source of products to combat bio-fouling on ships and marine structures, or stimulate natural habitats through bio-remediation or produce food compounds to supplement fish feed.	**2**			**2**

Table 3.10 Emerging Model Marine/Maritime KIC Issues, Energy & Raw Material

Energy & Raw Material	Climate	Inno	ICT Labs	All
Education Needs:				
• Critical mass of highly skilled workers in geology, geophysics, oceanography and marine engineering.				
• Metocean modelling forecasting/hindcasting.				
• Retraining of fishermen to work in offshore sector (e.g. North Sea example).				
• E-learning tools			**1**	**1**
Cutting Edge Research:				
• Improved resource assessment techniques, risk analysis particularly deep sea environments.	**1**			**1**
• Cabling and grid infrastructure.		**2**		**2**
• Novel approaches to electricity storage.		**8**		**8**
• Improve cost competiveness.				
• Materials & engineering: increase the reliability of technology.				
• Multi-physics modelling.	**1**			**1**
• Adapting existing expertise/approaches (e.g. Oil and Gas sector) to other sectors (e.g. Offshore wind, Ocean renewable energy, …).				
• Sensors, remote condition monitoring, adequate data management.		**4**		**4**
• Optimising processes and procedures to allow installation and retrieval in short weather windows.		**2**		**2**
• Marine forecasting.	**2**	**4**		**6**
• Critical assessment of carbon capture and storage in the oceans, its potential environmental impacts and long-term monitoring and management requirements.		**1**		**1**
• Assessment of environmental impacts of deep sea mining and mitigation techniques.				
• Impacts of increased off-shore sand and gravel extraction for beach nourishment and to counteract sea level rise impacts.				

Table 3.11 Emerging Model Marine/Maritime KIC Issues, Energy & Raw Material (continued)

Energy & Raw Material	Climate	Inno	ICT Labs	All
Innovation Potential:				
• Innovation in design and engineering (i.e. offshore structures, robotics).				
• New generation of turbines, less maintenance.	**1**			**1**
• Steep learning curve in installation and logistics.				
• North Sea important hub of knowledge and expertise in oil and gas sector, sharing of knowledge important factor for advancing innovation potential.				
• Improved methods for enhanced oil recovery.				
• Improved exploration techniques for identifying and quantifying marine gas hydrates and assessing their economic potential.		**1**		**1**
• Developing innovative techniques for exploration and production of natural gas from hydrate-bearing sediments, including economic evaluation and risk assessment of each technique.				
• Research and innovation could potentially make new reserves accessible.				
• Developing sub-seabed carbon storage and sequestration techniques, including economic evaluation and risk assessment of each technique.				
• New acoustic monitoring technologies and systems.				
• Synergistic development of offshore energy/aquaculture/observation and associated technologies.				

Table 3.12 Emerging Model Marine/Maritime KIC Issues, Coastal Protection & Development

Coastal Protection & Development	Climate	Inno	ICT Labs	All
Education Needs:				
• Improving education and training: increasing environmental sustainability of the coastal tourism industry (also against the background of (existing) regulatory measures).				
• Encouraging ocean literacy and recognizing the potential for a broad range of marine/maritime leisure and tourism opportunities.				
• Requirement for curricula that address fundamentals and implementation of Maritime Spatial Planning, Integrated Coastal Zone Management, Marine Strategy Framework and Floods Directives.				
• Requirement for curriculum that addresses economics of ecosystems and the environment.				
• E-learning tools			**1**	**1**
Cutting Edge Research:				
• Implementation of Maritime Spatial Planning, Integrated Coastal Zone Management, Marine Strategy Framework, Floods Directives and sustainable ICZM practices.	**4**			**4**
• Impact of climate change on coastal regions.	**3**			**3**
• Forecasting, mapping, risk assessment.	**4**			**4**
• Strengthen sustainability of maritime and coastal tourism through integrated regional approaches, increase income for local groups as opposed to “big” companies.	**1**			**1**
• Innovative approaches to environmental remediation: clean water, beaches.				
• Social innovation to address seasonality of coastal tourism, including volatility of demand and improve accessibility and visibility.				
• Economics of ecosystems and environmental monitoring.				
• Methods to assess economics and monetary valuation of ecosystem services.				
Innovation Potential:				
• Innovative business models, enhance competitiveness & strengthen response capacity.				
• Application of ICT to promote skills, innovation, access to resources and innovative marketing.				
• Innovative mapping, valuation and finance tools to assess economics of ecosystem services.				

Table 3.13 Emerging Model Marine/Maritime KIC Issues, Marine Data & Information Services

Marine Data & Information Services	Climate	Inno	ICT Labs	All
Education Needs:				
• Applied Marine ICT curricula				
• Developing core skills in data analytics, ocean modelling forecasting/hindcasting				
• Marine mapping, GIS, data management				
• Environmental economics				
• e-learning tools			**1**	**1**
Cutting Edge Research:				
• Ocean Observing Systems: sensors, platforms and cyber infrastruture.		**4**	**10**	**14**
• New materials, instruments.				
• Multidisciplinary data integration techniques, product development	**5**			**5**
• Socio-economic modelling & interdisciplinary decision-support	**2**			**2**
Innovation Potential:				
• Integration of multiple data sources and data analytics for ocean monitoring, modelling, forecasting, compliance and surveillance.	**3**	**2**		**5**
• Product & services for marine monitoring: i.e. sensors, robotics, communications.	**4**	**2**	**10**	**16**
• Intelligent sensors and robotics to support work in remote and offshore locations.		**2**		**2**
• Develop integrated ocean services for safe navigation, ship routing and risk assessment.		**2**		**2**
• Development of 'Digital Ocean' capability.				
• Incorporation of the fishing sector into real-time monitoring and forecasting system.				
• Eco-genomic sensors linked to ocean observation systems.				
• Downscaling of global climate models to predict the climate change impact at regional, sub-regional seas and local areas.				
• Develop satellite-based maritime tracking, container screening and monitoring systems and biometric ID port perimeter security.				
• Improve monitoring of economic data.				
• New ways of "marketing/labeling" clean shipping (i.e. clean shipping index).				

4 Policy Options and SWOT analysis

4.1 Refining Policy Options

The three policy options under consideration are as follows (cfr. Introduction and ToR):

a) Establishing a new, 'own' Marine / Maritime KIC, which would concentrate its activities on the Blue Economy;
b) Using the marine / maritime components of the current KICs in support of the Blue Economy;
c) Creating new links between their activities to create a 'KIC Platform' focusing on the Blue Economy.

4.1.1 Policy Option A: Establishing a new maritime KIC

This option is the clearest to define: based on the experience of the three existing KICs, it would create a new KIC that would re-group a set of well-chosen co-location centres (in majority but not exclusively) located in coastal regions and distributed across Europe's main sea basins. At this moment, Mediterranean, Nordic (including Baltic) and North-Western (UK, Ireland) coastal regions are relatively weakly represented amongst existing CLCs. The existing expertise involved in current KIC activities (from Germany, France, Benelux, Sweden) could be 're-allocated' to this new KIC to generate critical mass and scale effects.

According to the latest policy developments, this option is, however, not realistic in the short or medium term, i.e. not before 2020. There is indeed a consensus on the new KICs to be created under Horizon2020 and none of the new KICs will be a dedicated 'Maritime' one. As a matter of fact, new KICs will be launched in three waves between now and 2020:

- 2014: A call for two new KICs will be launched in 2014 in the areas of Innovation for Healthy Living and Active Ageing; and Raw Materials: sustainable exploration, extraction, processing, recycling and substitution;
- 2016: A call for two new KICs will be launched in 2016 in the areas of Food4Future and Added Value Manufacturing;
- 2018: Subject to a positive outcome of the review of the EIT foreseen in Horizon 2020, a call for one new KIC will be launched in 2018 in the area of Urban Mobility.

Even though they would not be a dedicated 'maritime' KIC, some of these new KICs (especially the Healthy Living, Raw Materials and Food4Future ones) may cover important maritime topics in the future; therefore they can be considered as part of policy options B or C.

4.1.2 Policy Option B: Using the maritime components of the current KICs

This would be the easiest option to implement as it advocates, more or less, for a 'status quo'. But this would imply at least that much more transparency and 'publicity' is given to the maritime projects and activities currently on-going in the existing KICs, so that these activities / projects in turn can leverage additional activities, funding and projects. In this regard, it is essential that the KICs develop better intelligence and monitoring tools about their own activities, so that ongoing work is at least 'visible' from the outside and for the larger community of researchers, students and companies. Climate KIC does have already relatively good management practices in terms of centralized project-level intelligence, from which INNO-Energy and ICT Labs could learn. We observed large differences (in terms of

managing project-level or activity-specific information) not only between the KICs, but also between the CLCs. Under this option, the best level to organise intelligence is obviously at the level of the KIC itself.

Additionally, one could consider adding some new CLCs to the existing KICs with a more 'coastal' or maritime dimension. As already mentioned, coastal regions are relatively weakly represented in the three existing KICs. Adding new CLCs, however, should not boil down to 'shifting' existing capabilities elsewhere while adding new, fixed cost to the functioning of a KIC. Rather, the objective would be to leverage new, additional capabilities and to increase critical mass in some domains.

However, this option would still have the tendency to keep maritime activities 'fragmented' because they would still be organised within the boundaries of each KIC and individual topic/action lines are likely to be concentrated around individual CLCs. Therefore, another option would be to consider maritime activities in a transversal manner, i.e. across KICs (see below).

4.1.3 Policy Option C: Creating a 'KIC Maritime Platform'

This third policy option would add to the three existing KICs (as well as to the 5 new ones to be created) a transversal 'Maritime platform' that would link, coordinate and promote maritime relevant activities carried out under the existing and new KICs. This would improve the overall visibility of maritime activities and would contribute to their better promotion. In doing so, fragmentation and redundancies between KICs would be reduced, with a further concentration of means and stronger critical mass as a result.

It would also have the substantial advantage that "maritime issues" are not treated in an isolated way, but take into account that much cross-fertilization can be achieved from integrating maritime with traditional "land" aspects (land-sea integration as needed for instance in energy issues, i.e. grid development – exchange of ocean and land based energy generation, but also with regard to an integrated approach between agri- and aquaculture as well as nutrient flows). It also takes best into account the need to build ocean research, technology and innovation on knowledge gathered in land based industries (i.e. biorefineries, deap-sea mining, etc.). Last but not least, it is the best mechanism to create the necessary linkages across the various KICs which are related not only to the "blue" industry, but also to the various aspects between the blue and land issues. For instance, it has been shown in the analysis of the already existing KICs that there are cross-linkages to be made between the "blue" InnoEnergy KIC projects, the "blue" ICTLabs projects as well as the blue ClimateKIC projects. More such cross-linkages can be imagined if one takes into account the new KICs to be established (i.e. blue biotechnology for food, health, etc.). Indeed, a recent report on the 'Innovation synergies fostered by the EIT' has highlighted that many (but not all) relevant maritime dimensions will be covered by the current and upcoming, new KICs[55]. In other words, this 3rd, 'platform option' would better acknowledge the fact that 'blue issues' are cross-cutting in nature, and it would allow for a better exploitation of land-sea integration as much knowledge, research and innovation for 'land' purposes can cross-fertilise 'sea purposes', and vice-versa.

However, this new 'tool' should operate in a context where its mandate and modus operandi is clearly established to allow for an optimal collaboration with the existing KICs. These and many other questions would very likely require adjusting the legal framework of the EIT and the KICs.

[55] Technopolis (2013), "Analysis of synergies fostered by the EIT in the EU Innovation landscape", August 013, p. 36.

4.2 SWOT-Analysis

Table 4.1 SWOT – Analysis of the three policy options

STRENGTHS *Policy Option A ('New KIC'):* • Most 'maritime' dedicated; • Easy to implement (building further on other KICs) *Policy Option B ('Existing KICs'):* • Easiest to implement ('adjusting the existing') • Takes into account "land-sea" aspects *Policy Option C ('Platform cross-KICs'):* • Very 'maritime' dedicated • Promotes & highlights cross-linkages between different "Blue Topics" • Takes into account "land-sea" aspects • Potentially highest geographic coverage	**WEAKNESSES** *Policy Option A ('New KIC'):* • Not realistic before 2020 *Policy Option B ('Existing KICs'):* • Weak visibility and transparency of maritime activities *Policy Option C:* • Most difficult to implement • Adjustment of legal framework may be required
OPPORTUNITIES *Policy Option A ('New KIC'):* • Very strong promotion of the 'Blue Economy' • Effects of scale, reduced redundancy, improved EU-wide coordination *Policy Option B ('Existing KICs'):* • Expanding collaborative networks to coastal or more 'maritime dedicated' clusters *Policy Option C ('Platform cross-KICs'):* • Very strong promotion of the 'Blue Economy' • Reduced redundancy, improved EU-wide coordination • Effects of scale, increased critical mass	**THREATS** *Policy Option A ('New KIC'):* • Risk of erosion of existing BG capacity within current KICs: is it only 'shifting' competencies to another KIC (instead of reinforcing)? *Policy Option B ('Existing KICs'):* • Fragmentation of BG capacity *Policy Option C ('Platform cross-KICs'):* • Ineffective coordination due to organisational complexity and competition (KICs >< platform)

5 Conclusions and Policy Recommendations

This study assessed to what extent the current KICs cover sufficiently the themes and activities related to the Blue Economy, and how the current situation could/should be adjusted to ensure a sufficient coverage in the future. Based on an extensive literature review of main economic activities in all sea basins of Europe, the study identified the key dimensions in research, education and innovation that should be covered by a 'maritime KIC'. These dimensions were grouped under five main 'Blue Growth KIC topics and their related main economic activities, i.e.:

- Maritime Transport and Shipping;
- Food, Nutrition and Health;
- Energy and Raw Materials;
- Coastal Protection and Development;
- Marine Data and Information Services (cross-cutting to the four previous ones).

The geographic location of a KIC's co-location centre to a large extent determines the geographic location of its members. These are predominantly the institutions from the same country or from the neighbouring regions that have close economic ties. This has a two-way implication for a possible maritime KIC or a maritime research component in the existing KICs.

The maritime research themes and challenges tend to be geographically localised or at least regionally specific. Therefore the geographic proximity of KIC members clustered around a particular CLC can, on the one hand, be considered as a positive factor facilitating more intensive collaboration (especially in CLCs with coastal location). On the other hand, such localised research clusters may face a danger of overlooking important knowledge and technological developments produced in other regions. A particular challenge for a maritime KIC would be the fact that members would be geographically rather dispersed (sometimes in peripheral locations not very accessible), and that geographic remoteness would prevent synergies from taking place.

It can, therefore, be advised to seek a proper balance between the local critical mass and affinity facilitated by the CLCs coastal location, and the open character of collaboration, where partners pro-actively seek knowledge and contribution from other maritime research and economic actors in other regions. The CLCs involved in the maritime related research activities should be well equipped for facilitating collaboration of partners from various European regions (e.g. significantly improving transparency and visibility of supported activities). This particular recommendation holds for all three scenarios of structural introduction of maritime research into the EIT KICs system.

Examining the current state of affairs regarding the maritime related research performed by the existing KICs, we observe that these maritime topics also tend to gravitate towards a smaller number of 'specialising' CLCs (which is the case for InnoEnergy and Climate KIC). In principle, this points at the existing potential critical mass of maritime research expertise in particular locations. At the same time one can become concerned about possible inertia forces that might slow down development of the maritime themes in other locations (either at the new or existing CLC).

The scorecard analysis of possible relevance of the KICs' projects and activities to the Blue Economy and maritime topics shows that in the first instance all three existing KICs touch upon these issues with equal intensity. Though, only the Climate KIC carries out projects which are more or less evenly spread across different maritime topics. The InnoEnergy KIC specialises heavily on issues of maritime energy

and raw materials, and ICT Labs leans strongly towards topics on marine data and information services. Furthermore, the maritime profile of partners also differs strongly between the existing KICs. Climate KIC has the highest proportion of partners (four fifths) which are open to Blue Growth topics, followed by InnoEnergy (about a half) and lastly ICT Labs (just slightly more than one third).

The gap analysis has demonstrated that a large part of the Blue Economy is still not covered by the existing KICs (all KIC projects together address less than 15% of the relevant Blue Growth KIC themes), and thus that additional attention to the maritime dimension of KICs is justifiable.

Given the dynamic and diverse nature of maritime topics, an open and flexible approach to KICs is to be preferred. A gradual integration of new activities would be favoured. However, this appear to be not so effective through 'within-KICs options' such as policy options 1 (maritime KIC) and 2 (using existing KIC activities).

Given the above, the third option (a cross-KIC maritime component) appears to be the most appropriate configuration as it will be able to utilise different types of expertise across different research domains and across different KICs. It is expected that this cross-cutting dimension would become even more important in the future, with new relevant KICs being established, and with coordination challenges within and between KICs increasing. The third policy option will allow for a gradual integration of activities from the new KICs and to expand the spectrum of maritime dimensions covered – thus benefiting the Blue Economy most.

Elaborating further on this option of a (cross-KICs) Maritime Platform (MP) in the framework of the existing KICs, it is evident that such a platform can be implemented in a variety of ways. On the one side of the spectrum of possibilities, we see a "soft" version of MP which is primarily implemented by the series of actions towards improving the transparency and visibility of the maritime related activities inside different KICs. The existing KICs could commit themselves to mutual disclosure and coordination of their research so to the best possible extent make use of synergies between different projects and to benefit from information exchange and joint exploitation of market opportunities. The control over the research priorities and actual project implementation would remain in the hands of the existing KICs and the actual performance of this "soft" MP will greatly depend on each individual KIC's commitment to this idea. From an operational point of view, this would boil down to improving the knowledge management systems of the KICs and to integrate or link them into one coherent IT-platform.

On the other side of the spectrum we see a "hard" (or "hardwired") version where a separate cross-KICs/EIT legal entity is created with a mandate to coordinate the maritime related activities of the KICs and provide a stable information and management platform for collaboration. This platform would have a mission and several objectives towards facilitating the maritime research in the framework of the existing KICs and will have to be able to communicate directly with the stakeholders responsible for implementation of the relevant projects and activities. Realisation of such a "hardwired" MP, however, presents its own challenges. First of all, establishing of the MP will require changes in the legal statutes of the KICs and, most likely, EIT itself. Secondly, the question arises about who will have the main authority regarding definition of key topics and priorities for maritime related research in the KICs. In our opinion, the most promising modus of the MP's implementation should be a combination of the "soft" and "hardwired" approaches, where the necessary balance between the different entities that are involved can be determined.

The Commission's Communication on Innovation in the Blue Economy[56] presents already several policies and local solutions that are expected to efficiently address the barriers in realisation of the Blue Economy's potential, such as:

- Gaps in knowledge and data about the current state of the oceans, seabed resources, marine life and risks to habitats and ecosystems;
- Diffuse research efforts in marine and maritime science that hinders interdisciplinary learning and slows the progress of technological breakthroughs in key technologies and innovative business sectors;
- Lack of scientists, engineers and skilled workers able to apply technologies in the marine environment.

The description of the first two barriers in this Communication matches to a large extent the challenges that are expected to be tackled by the cross-KIC maritime platform. Furthermore, the Marine Research Information Platform, which the Commission plans to put in place to make new research opportunities widely accessible and increase synergies between nationally funded research activities and Horizon 2020, represents a very good conceptual basis for the Maritime Platform as well. In particular, the EC is planning to launch from 2015 a "Blue Economy Business and Science Forum" (BEBS Forum) in order to examine further cross-fertilisation of ideas and research results between industrial sectors, NGOs and other stakeholders with common interest in the Blue Economy[57]. This BEBS Forum, which will be established as a large-scale, yearly conference would be an excellent tool to give publicity to new areas of RDI collaboration and it would therefore fit very well in the concept of a 'maritime platform'. In the context of this BEBS, the European Commission should pro-actively seek to consult and communicate the Blue components of the planned KICs (until 2020).

Moreover, such a Forum will only be 'the visible top of the iceberg'. Besides, an important feature of the cross-KIC Maritime Platform should be the presence of a continuously operating back-office whose role is to stimulate the Blue Economy by pro-actively monitoring, (where needed) supporting, coordinating, disseminating and promoting the results of the maritime research activities in the existing KICs (and even beyond). Its communication strategy must involve a broad set of stakeholders including but not limited to all organisations with a potential to participate in the Horizon 2020 framework. Moreover, it should pro-actively support the creation of related cross-cutting maritime KIC projects by receiving Blue project requests and channelling and coordinating them among the given KICs.

A number of interesting ideas for a cross-KIC MP setting can be found in the currently operational KETs Observatory[58] designed to provide EU and national policymakers and business stakeholders with information (quantitative and qualitative) on the performance of EU Member States and competing economies regarding the deployment of Key Enabling Technologies.

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[56] Communication from the Commission: Innovation in the Blue Economy: realising the potential of our seas and oceans for jobs and growth - COM(2014) 254/2 (13/05/2014)

[57] Ibidem, p.6.

[58] https://webgate.ec.europa.eu/ketsobservatory/

ANNEX I: Mapping collaborative linkages through Network Analysis

The methodology for the landscape and network analysis of the KIC-facilitated collaboration is based on the recent *"Study on the concept, development and impact of co-location centres using the example of the EIT and KIC"*, carried out in 2011-2012 on behalf of the European Commission, DG EAC by ECORYS[59]. This study followed on from the 2011 evaluation and impact assessment of the European institute for Innovation and Technology (EIT), specially exploring the approaches and activities the EIT/KIC co-location are adopting. The study included a network analysis and case study visits to ten co-location sites across Europe. For the current study we completed and updated project-level data for all projects from all three KICs. We reconstructed three exhaustive and up-to-date datasets with detailed descriptions of all projects.

Then we have imported in the network analysis software the data describing the nodes (the individual members of co-location centres CLC) and the linkages between them[60] (as presented in the example below). As a whole, these specific data describes the interactions between the CLC members (identified by partner names) in the framework of individual joint projects (identified by project titles) as reported in the databases supported by the corresponding KICs. As such, these data allow us to build up an inventory identifying membership and themes per activity and per project. Network analysis can then be implemented to visualise and rationalise information on linkages. Linkages can be presented as lines of colour depending on their type (i.e. reflecting the action line, topic of research or maritime dimension covered in which collaboration takes place). This data are then used to produce diagrams, for example for each KIC to show linkages between partners. The nodes of these graphs are colour coded according to their corresponding co-location centres, or according to their geographic location. The lines are colour coded according to their corresponding topic (i.e. maritime relevance).

Spring embedded network visualisation

The diagrams in the report present the so called spring embedded visualisations of the network created by the activity based interactions among the affiliated members of the EIT colocation centres. The spring-embedded layout is based on an idea of a "force-directed" network as implemented in Kamada and Kawai (1989)[61]. The network nodes are treated like physical objects that repel each other, such as electrons. The linkages between nodes are treated like metal springs attached to the pair of nodes. These springs repel or attract their end points according to a force function. The layout algorithm sets the positions of the nodes in a way that minimizes the sum of forces in the network. This algorithm can be applied to the entire network or a portion of it.

The final graph is laid out by repeated iterations of a procedure that calculates the repulsive and attractive forces acting on all nodes. In the course of iterative process the nodes in the network are moved according to the resulting forces applied to them.

59 ECORYS. (2012). Study on the concept, development and impact of co-location centres using the example of the EIT and KICs. Ecorys UK Ltd, February 28, [cited February 8 2013]. http://ec.europa.eu/education/eit/eit-studies_en.htm

60 'Individual member' should be understood at the level of the participation organization, and not for instance at the level of the research unit or researcher)

61 Kamada, Tomihisa; Kawai, Satoru (1989), "An algorithm for drawing general undirected graphs", Information Processing Letters (Elsevier) 31 (1): 7–15

The network diagrams in this report carry three main information layers: the colour of the network node corresponds to the CLC of the corresponding member, the colour of the link between nodes represents the corresponding thematic action line of the project, and, finally the position of an individual node in the network corresponds to its relative ‘importance’ in the member, where the most linked members naturally ‘gravitate’ towards the center of network.

ANNEX II: Detailed analysis of the EIT's KICs (general settings, topics, activities, partners and collaborative network)

II.1 General overview: EIT, KICs and co-location centres

The European Institute of Innovation and Technology (EIT) is charged with promoting and integrating higher education, research and innovation of the highest standards in order to reinforce the innovation capacity of the Member States and the EU. It represents a novel approach to stimulating innovation capacity within the EU, to promote sustainable long-term economic growth, which involves establishing autonomous and highly integrated partnerships of Higher Education (HE) institutions, research organisations, companies and other stakeholders, through competitive calls for application focused on identified priority themes. These partnerships (Knowledge and Innovation Communities or KICs) are intended to be long-lasting and, eventually, self-sustaining. The first calls for KICs were launched in April 2009 with the first three examples being designated in December 2009[62]:

- KIC InnoEnergy (sustainable energy)[63];
- EIT ICT Labs (future ICT)[64]; and
- Climate KIC (climate change mitigation and adaptation)[65].

Each KIC comprises a number of partners from the worlds of business, HE and research, joined together in a single structure. The focus of the KICs is, broadly, to stimulate entrepreneurial education, innovation activities, business creation and value formation through combining and integrating education, business and research activities. The KICs are each led by a full-time Chief Executive Officer (CEO). Each KIC is also organized around a small number of co-location centres (CLCs) which are intended to act as geographical hubs for the practical integration of the knowledge triangle. The diagram below presents a visualisation of the KICs/CLCs:

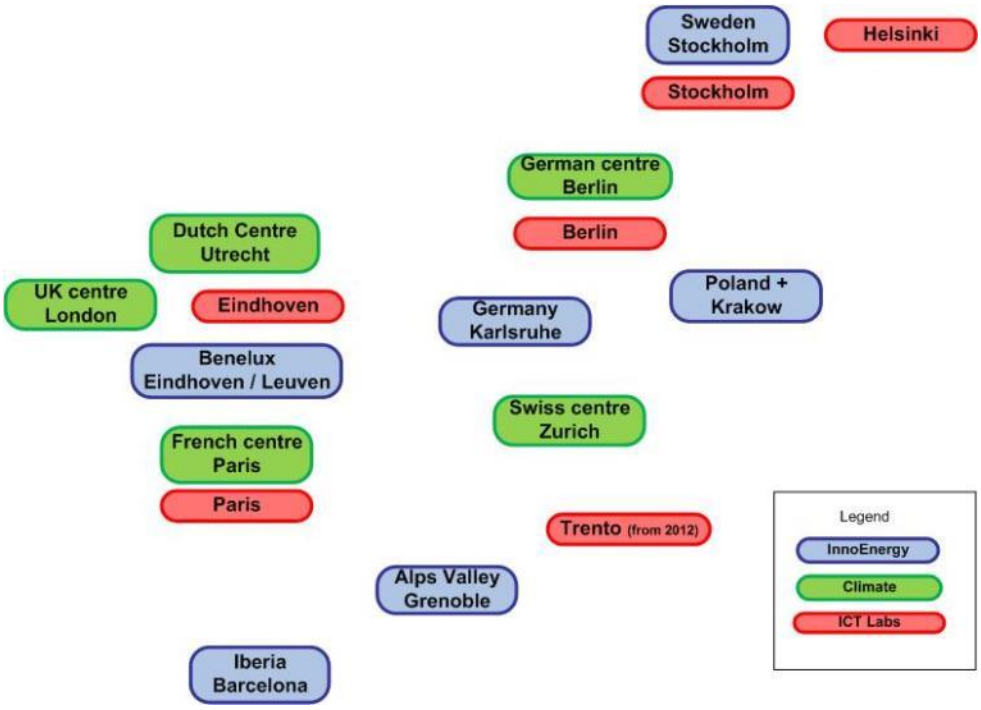
The **Climate-KIC** has 20 core, 68 affiliate and six public partners organised around five 'national' centres (CLCs), in Germany, the UK, France, the Netherlands and Switzerland. In addition, there are six Regional Innovation and Implementation Centres or RICs in: Central Hungary, Lower Silesia (Poland), the West Midlands (UK), Hessen (Germany), Emilia Romagna (Italy) and Valencia (Spain). The legal form of the Climate-KIC is a non-profit association, the "Association Climate-KIC". CLC Directors and RIC Coordinators are included in the Executive Team, reporting to the CEO, Governing Board (composed of the 20 core partners) and Assembly of Association[66]. RICs have a Steering Group and central coordinator.

Poland Plus (Katowice and Krakow). Each CLC is based on a KIC theme (clean coal technologies; European smart electric grids and electric storage; intelligent energy-efficient buildings and cities; energy from chemical fuels; renewable and sustainable nuclear and renewable energy convergence). The KIC is a commercial company (*Societas Europaea* with headquarters in the Netherlands) comprising 29 shareholders or 'formal partners'. In addition, there are 60 'associated partners' and

[62] From a shortlist of six candidates
[63] http://www.kic-innoenergy.com/
[64] http://eit.ictlabs.eu/
[65] http://www.climate-kic.org/
[66] Revised Business Plan, 10 February 2011.

'network partners'. Of the total of 89 shareholding and associated partners 44 are industrial, 15 are research centres, 28 universities and 2 business schools[67]. An Executive Board comprises the CEO, Chief Financial Officer, and the six co-location centre Managers and is supported by an IP Board, a Scientific Board and (potentially) an Industry Board. Each Co-Location Centre also has its own Board.

Figure II.1 Current Co-location Centres (CLCs) of existing KICs



Source: ECORYS

ICT Labs has six nodes (CLCs)[68]: Berlin, Eindhoven, Helsinki, Paris, Stockholm and Trento. There are 26 core partners comprising companies, research institutes and universities; 42 Affiliate Partners and two Associate Partners. The KIC has been established as a legal entity under Belgian Law (not for profit Association of all partners with limited liability. Like InnoEnergy the ICT Labs governance model has a 'general assembly' where all core members are represented and have voting rights. There is an Executive Steering Board and Management Committee.

II.2 Climate-KIC

II.2.1 General setting

Climate-KIC has been started as one of the initiatives of the EIT with a goal promote innovation in the area of climate change adaptation and mitigation through an integrated European network of global and regional partners from the private, public and academic worlds. The ClimateKIC aims to accelerate the innovation directed at transformation towards low carbon economy, and ensuring that Europe successfully benefits from new technologies, at the same time providing for economic growth and jobs. The Climate-KIC provides the support to innovation, entrepreneurship, and education, and also expert guidance needed to shape Europe's climate change agenda.

[67] http://www.kic-innoenergy.com/about-us/key-facts.html
[68] Six from January 2012 with the addition of Trento.

The vision of Climate-KIC is formulated in the following statements[69]

- to lead the world towards low-carbon prosperity: Climate-KIC will help innovators to capitalise on new business opportunities driven by Europe's first mover response to climate change;
- to create an emerging climate-change innovation space: Climate-KIC will build the critical mass and forge alliances among existing businesses and new businesses with the aim of creating partnerships that jointly cover all elements of emerging value chains;
- to capitalise on public-private synergies to boost innovation: Climate-KIC will help governments and public agencies to develop effective policy frameworks and to pioneer the early introduction of climate change products and services in collaboration with the private sector.

Climate-KIC has centres in France, Germany, The Netherlands, Switzerland and the UK and is represented in the regions of Valencia, Central Hungary, Emilia Romagna, Lower Silesia, Hessen and the West Midlands.

Main topics for collaborative activities:

- Greenhouse gas monitoring
- Adaptation services
- Making transitions happen
- Sustainable cities
- The built environment
- Land and water
- Resource efficiency/Industrial Symbiosis
- Developing a bio-economy

Greenhouse gas monitoring

The strategic action line Greenhouse Gas Measurement, Reporting and Verification (GHG MRV) combines activities to monitor and measure greenhouse gas to help climate change mitigation. In particular ClimateKIC addresses:

- **Scale**: through improved measurement, reporting and verification of greenhouse gas emissions within cities or sectors
- **Behavioural change**: promote the need for a change in behaviour through clear evidence and education around emissions and carbon footprints

The community enables the mitigation action through the provision of innovative GHG measurement, reporting and verification (MRV) services and associated financial tools. This is important in the context of a strongly increasing need for improved Monitoring, Reporting and Verification (MRV) in order to create trust in carbon markets, in instruments such as the large international programme REDD (Reducing Emissions through Degradation and Deforestation) and to ensure political commitment to mitigation at the international level.

According to ClimateKIC, the above trends drive new demand from a variety of actors: countries willing to assess the effectiveness of mitigation programs they fund, carbon market players, city and regional authorities who are increasingly driving mitigation action by setting up sub-national schemes, as well as individuals striving to reduce their own footprints. The ClimateKIC community has attracted several world leaders in this area (LSCE on the academic side, Astrium, Thalès and South Pole on the business side) which provides a good basis to take up a leading position in the integration of future GHG

[69] European Institute of Innovation & Technology (2011). Knowledge and Innovation Communities (KICs) Factsheet. November 2011, p. 2

emission measurement services in different sectors, in order to create value, and to define future standards for emissions services in Europe and elsewhere.

Adaptation services

The action line Adaptation Services (AS) aims to increase the capacity of society, cities and infrastructure to be able to adapt to climate change.

The following are being addressed:

- **Sectors**: developing markets for the different economic sectors
- **Climate information**: ensure the information available is used responsibly
- **Time**: influence decision makers to reduce the time taken to act and implement climate change adaptation strategies

The consortia in this KIC develop innovative tools and services to increase the adaptation capacity and resilience of societies, infrastructure, and cities to the anticipated climate change impacts.

These activities face particular challenges mostly due to the widely dispersed information, limited understanding of involved uncertainties, and the still underdeveloped expertise of translating climate data into concrete impact chains for different sectors. As Climate Services constitue a rapidly emerging field strongly influenced by WMO, ClimateKIC focuses on translating the developed knowledge to concrete services and solutions further downstream.

Making transitions happen

The main strategic goal for the Making Transitions Happen (MTH) action line is to create a low carbon culture that engages companies, communities and citizens to reduce their impact and connect globally on the climate change challenge. It focuses on:

- **Network**: the network includes demonstrators and living laboratories that pioneer innovative solutions
- **Scale-up**: develop financial tools and models to scale up innovation, such as procurement
- **Removing barriers**: identify and remove the barriers to innovation and help to bring products or services to market quickly.

The KIC acts as a cross-disciplinary platform and an enabler and an accelerator of the transition to a low carbon economy resilient to climate change. It addresses the non-technical barriers of social, institutional, financial, behavioural or regulatory nature and develop products aiming to deploy and scale-up innovations.

Sustainable cities

The main objective of Sustainable City Systems (SCS) action line is to move from centralised energy, waste and water utilities to decentralised, integrated systems and more sustainable transport systems. The main topics are:

- **Urban planning**: develop a market for planning and decision support tools aiming at creating sustainable cities.
- **Integrated utilities and mobility**: support the transition to better integrated services and utilities, including sustainable transport systems and such as ports and airports.
- **Resource efficiency**: connect cities and their environment to help make the best use of the resources available.

The consortia in this KIC help European businesses to develop high-value integrated and climate-friendly urban solutions for a global market. They focus on technical and market capabilities to support

new levels of systems integration and to join business, city governments and academia in a unique collaboration to support the development of products and services for climate mitigation and adaption in the urban context.

ClimateKIC Key relies on key business partners (IBM, Sainsbury, Arcadis, Berlin utilities) and public authorities in regions and national centres that have a lot of potential synergies to develop and deploy integrated innovations for future cities.

The built environment

The strategic goal of this platform is to accelerate the transformation of the built environment by targeting energy and resource efficiency and emission reduction measures in new and existing buildings. Buildings represent 40% of global anthropogenic greenhouse gases and about 10% of global gross domestic product and 8% of all global jobs. The KIC members aim at boosting the transitions needed to significantly cut the emissions by combining financial incentives, technological knowledge, and geographic and cultural particularities. In particular this action line look at the following issues:

- **Investment**: develop economic and financial models for investment in refurbishing existing buildings.
- **Technology**: promote technological developments that meet climatic criteria given the cultural and climatic background.
- **Market**: facilitate demand-supply connections and create new markets.

Many activities in this field are implemented at a local, national and international level, where the ClimateKIC platform together with other actors applies innovative approaches and technologies to decrease time-to-market for new products and services.

Land and water

The activities in Land and Water Engineering for Adaptation (LWEA) action line support the adaptation of water engineering and agriculture to climate change and link it to enhanced land use and ecosystem services delivery in the following aspects:

- **Extreme Events**: how to adapt to rising sea levels and extreme climate events through advanced and innovative land and water engineering.
- **Water security**: creating water security for agriculture, industry and cities.
- **Ecosystem services**: help to develop innovative value chains and markets for ecosystem services.

The community aims for innovation that increases the resilience of economies and societies to water related extreme events through smart services provided by land, water and natural infrastructure. In particular, the focus is on four subthemes: technologies for SMART operational management of physical and natural infrastructure and services, enhancing water use efficiency in agriculture, institutional (e.g financial) arrangements for the exploitation of ecosystem services, and systemic innovations for water in urban and rural areas.

Resource efficiency/Industrial Symbiosis

The strategic goal of the Industrial Symbiosis (IS) related activities is to increase resource efficiency and turn waste, including food waste and carbon dioxide (CO2), into a resource with a focus on:

- **Resource flows**: we aim to understand the flows of materials and energy to identify opportunities to reuse these resource.
- **Resource efficiency**: we develop tools to optimize resource efficiency in product manufacturing.
- **CO2 reuse**: we design and market new products from reusing CO2.

This community's consortia address climate change by bringing together traditionally separate industries, value chains and organisations, with the aims of improving cross industry resource efficiency and sustainability and of turning waste – including food waste and CO2- into resource.
This thematic community is led by two of corporate partners – the multinational company Bayer and the SME International Synergies mainly helping companies identify complementary resource flows.

Developing a bio-economy

The activities line in the sector of Bioeconomy (BIOE) aims to contribute to the transition of a bio-based economy to reduce our carbon footprint focusing on the following issues:

- **Sustainable feedstock production**: Develop sustainable and optimal feedstock production
- **Biorenewable products**: Develop and bring to the market biorenewable products from a variety of feedstocks – including waste – through integrated biorefining
- **Resource efficiency**: Accelerate the development and delivery to market of new biobased products with improved functionality

The activities involve development of processes and technologies to efficiently produce and use biomass resources, eliminating waste along the value chains and provide both adequate food and all of the non-food products that are required for modern societies.

II.2.2 Partners

In its membership policy ClimateKIC puts an accent on a long-term community which is transforming climate change ideas into commercial success. It brings together the most influential and commercially minded players in the climate change area.

Core Partners

The KICs core partners shape the community's strategic direction in the following ways:

- Business development
- Representation in the KIC governance structure
- Bring expertise into community
- Make a financial and/or in kind contribution

Table II.1 List of partners of ClimateKIC (only Core Partners)

CLC	Partner	Type
France	Commissariat à l'énergie atomique et aux énergies alternatives	**Core Partner**
France	GDF Suez	**Core Partner**
France	L'Institut national de la recherché agronomique	**Core Partner**
France	Université de Versailles Saint-Quentin-en-Yvelines	**Core Partner**
France	Université Pierre et Marie Curie (UPMC)	**Core Partner**
Germany	Bayer Technology Services	**Core Partner**
Germany	Forschungszentrum Jülich	**Core Partner**
Germany	German Research Centre for Geosciences	**Core Partner**
Germany	Potsdam Institute for Climate Impact Research	**Core Partner**
Germany	Technische Universität Berlin	**Core Partner**
Netherlands	Amsterdam Airport Schiphol	**Core Partner**

CLC	Partner	Type
Netherlands	Deltares	**Core Partner**
Netherlands	DSM	**Core Partner**
Netherlands	KLM	**Core Partner**
Netherlands	Netherlands Organisation for Applied Scientific Research (TNO)	**Core Partner**
Netherlands	Technische Universiteit Delft	**Core Partner**
Netherlands	Universiteit Utrecht	**Core Partner**
Netherlands	Wageningen University	**Core Partner**
Switzerland	ETH Zurich – Swiss Federal Institute of Technology	**Core Partner**
UK	Imperial College London	**Core Partner**
UK	Institute for Sustainability	**Core Partner**
Nordic	Grundfos A/S	**Core Partner**
Nordic	Core Partner	**Core Partner**
Nordic	Technical University of Denmark	**Core Partner**
Nordic	University of Copenhagen	**Core Partner**
Nordic	VELUX A/S	**Core Partner**
Spain	Valencian Institute of Business Competitiveness (IVACE)	**Core Partner**
Italy	ASTER	**Core Partner**
France	Fondation de Coopération Scientifique Campus Paris-Saclay	**Affiliate Partner**
France	Electricite de France	**Affiliate Partner**
France	Thales Alenia Space France	**Affiliate Partner**
France	ParisTech – Institut des sciences et technologies de Paris	**Affiliate Partner**
France	Advancity - L'Association pour le developpement du pôle de compétitivité	**Affiliate Partner**
France	ARIA Technologies SA	**Affiliate Partner**
France	Centre national de la recherche scientifique	**Affiliate Partner**
France	Météo-France	**Affiliate Partner**
France	Noveltis	**Affiliate Partner**
France	NUMTECH	**Affiliate Partner**
France	AgroParisTech – Institut des Sciences et Industrie du Vivant et de l'Envirronnement	**Affiliate Partner**
France	Climpact – Metnext SA	**Affiliate Partner**
France	Ecole Polytechnique	**Affiliate Partner**
France	Mines ParisTech	**Affiliate Partner**
France	Suez Environnement SA	**Affiliate Partner**
France	Fondaterra	**Affiliate Partner**
France	IncubAlliance	**Affiliate Partner**
France	ENPC – Ecole Nationale superieure des Ponts et Chaussées	**Affiliate Partner**
France	EPA Marne – Etablissement Public d'Aménagement de la Ville Nouvelle de Marne-la-Vallée	**Affiliate Partner**
France	EIVP – Ecole des Ingenieurs De La Ville De Paris	**Affiliate Partner**
France	Astrium	**Affiliate Partner**
France	Association Airparif	**Affiliate Partner**
France	Veolia Envionnement	**Affiliate Partner**
France	CDC Climat	**Affiliate Partner**
France	Laborelec	**Affiliate Partner**
France	TEC Conseil - Tourisme, Transpors, Territoires Environnement Conseil	**Affiliate Partner**

CLC	Partner	Type
France	SAFEGE	**Affiliate Partner**
Germany	Bayer CropScience AG	**Affiliate Partner**
Germany	Bayer MaterialScience AG	**Affiliate Partner**
Germany	Berliner Stadtreinigungsbetriebe (BSR) – AöR -	**Affiliate Partner**
Germany	Berliner Verkehrsbetriebe (BVG) – AöR -	**Affiliate Partner**
Germany	Chalmers University, Gothenburg, Sweden	**Affiliate Partner**
Germany	GASAG Berliner Gaswerke AG	**Affiliate Partner**
Germany	Ingenieurgesellschaft Prof. Dr. Sieker GmbH	**Affiliate Partner**
Germany	RWTH Aachen	**Affiliate Partner**
Germany	Solar Valley GmbH	**Affiliate Partner**
Germany	Technical University of Munich	**Affiliate Partner**
Germany	TU-Campus EUREF GmbH	**Affiliate Partner**
Germany	University of Hamburg	**Affiliate Partner**
Germany	UnternehmerTUM GmbH, München	**Affiliate Partner**
Germany	Vattenfall Europe AG	**Affiliate Partner**
Germany	Vattenfall Europe Innovation GmbH	**Affiliate Partner**
Germany	CDP (former Carbon Disclosure Project)	**Affiliate Partner**
Germany	Climate Media Factory	**Affiliate Partner**
Netherlands	Bosch Slabbers	**Affiliate Partner**
Netherlands	Carthago Consultancy	**Affiliate Partner**
Netherlands	City Port of Rotterdam	**Affiliate Partner**
Netherlands	Climate-KIC Alumni Association	**Affiliate Partner**
Netherlands	Çornelissen Consultancy Services	**Affiliate Partner**
Netherlands	Future Water	**Affiliate Partner**
Netherlands	Philips Group Innovation	**Affiliate Partner**
Netherlands	Province of Utrecht	**Affiliate Partner**
Netherlands	Royal Haskoning DHV	**Affiliate Partner**
Netherlands	St. Dienst Landbouwkundig Onderzoek	**Affiliate Partner**
Netherlands	Stichting Historie der Techniek	**Affiliate Partner**
Netherlands	SkyNRG	**Affiliate Partner**
Netherlands	StartLife foundation	**Affiliate Partner**
Netherlands	Studio Exter	**Affiliate Partner**
Netherlands	5.1.2 TU Delft Vastgoed BV	**Affiliate Partner**
Netherlands	Twijnstra Gudde	**Affiliate Partner**
Netherlands	Tygron	**Affiliate Partner**
Netherlands	Yes!Delft	**Affiliate Partner**
Netherlands	YesDelft Students	**Affiliate Partner**
Switzerland	Agolin SA (Switzerland)	**Affiliate Partner**
Switzerland	BlueLion	**Affiliate Partner**
Switzerland	Climate Neutral Investments Ltd. (CNI)	**Affiliate Partner**
Switzerland	ElectricFeel	**Affiliate Partner**
Switzerland	Empa	**Affiliate Partner**
Switzerland	Esri procedural	**Affiliate Partner**
Switzerland	Esri Switzerland	**Affiliate Partner**
Switzerland	greenTEG	**Affiliate Partner**

CLC	Partner	Type
Switzerland	HUB Zurich	**Affiliate Partner**
Switzerland	IBM Research	**Affiliate Partner**
Switzerland	Seif (Swiss Social Entrepreneurship Foundation and Initiative)	**Affiliate Partner**
Switzerland	SmarterBetterCities AG (SBC)	**Affiliate Partner**
Switzerland	South Pole Carbon Asset Management Ltd.	**Affiliate Partner**
Switzerland	Startzentrum	**Affiliate Partner**
Switzerland	World Wide Fund for Nature (WWF)	**Affiliate Partner**
UK	Aberystwyth University	**Affiliate Partner**
UK	Imperial Innovations Ltd.	**Affiliate Partner**
UK	Plaxica Ltd.	**Affiliate Partner**
UK	Process Systems Enterprise Ltd.	**Affiliate Partner**
UK	The University of Reading	**Affiliate Partner**
UK	Rothamsted Research Ltd.	**Affiliate Partner**
UK	Naked Energy	**Affiliate Partner**
UK	Sainsbury's supermarkets limited	**Affiliate Partner**
UK	Knight Frank LLP	**Affiliate Partner**
UK	National Physical Laboratory	**Affiliate Partner**
UK	Poplar HARCA	**Affiliate Partner**
UK	LCA Works Limited	**Affiliate Partner**
UK	The Climate Group	**Affiliate Partner**
UK	Hiflux	**Affiliate Partner**
UK	CRESS Carbon Reducing Energy Storage Systems Limited	**Affiliate Partner**
UK	E4tech (UK) Ltd.	**Affiliate Partner**
UK	Department of Energy and Climate Change	**Affiliate Partner**
UK	Antaco UK Ltd	**Affiliate Partner**
UK	IVeridis UK Limited	**Affiliate Partner**
UK	Computational Modelling Cambridge Limited	**Affiliate Partner**
UK	Select Innovation Limited	**Affiliate Partner**
UK	National non-food crops centre	**Affiliate Partner**
UK	Oasis Palmtree Ltd	**Affiliate Partner**
UK	The Ecological Sequestration Trust	**Affiliate Partner**
UK	Aqdot Ltd	**Affiliate Partner**
UK	Cogent Heat Energy Storage Systems Ltd	**Affiliate Partner**
Nordic	Chalmers University of Technology	**Affiliate Partner**
Nordic	City of Copenhagen	**Affiliate Partner**
Nordic	COWI	**Affiliate Partner**
Nordic	Novozymes	**Affiliate Partner**
Nordic	Realdania	**Affiliate Partner**
Nordic	ROCKWOOL	**Affiliate Partner**

Affiliate partners

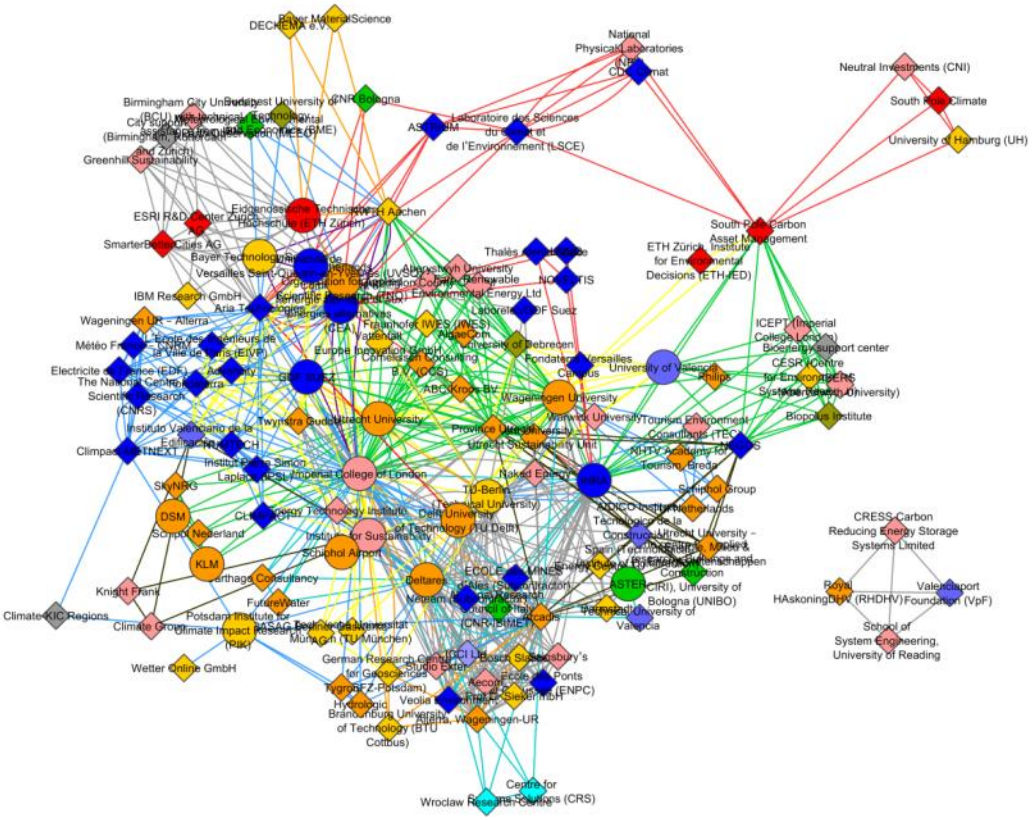
The affiliate partners participate in the KIC's activities in the following ways:

- Development of education and entrepreneurial offerings
- Involvement in innovation, education and entrepreneurial activities

- Bring specific knowledge into the community
- Make a financial and/or in kind contribution

II.2.3 Activities and Cooperation Landscape

Figure II.2 The project based interactions in ClimateKIC with partner nodes color coded per affiliated CLC.



Legend:

Dot color – Country of the Partner	Link color – Thematic action line
France	Adaptation services
Germany	Developing a bio-economy
Hungary	Greenhouse gas monitoring
International	Industrial symbiosis
Italy	Land and water
Netherlands	Making transitions happen
Poland	Resource efficiency
Spain	Sustainable cities
Sweden	The built environment
Switzerland	
UK	

As this KIC membership overview shows, the geographic location of an individual KIC directly determines the geographic location of its members. These are predominantly the institutions from the same country or from the neighbouring regions that have close economic links (such as Benelux).

The diagram, presented in Figure II represents a so-called spring embedded network visualisation of the cooperation links among the ClimateKIC members in the framework of the joint projects. As it was mentioned in the methodological section, this diagram provides information about the members' CLC affiliation (node colour), the thematic action line of the project linking two partners (line colour) and the relative overall weight of the institution in the network (relative position to other members).

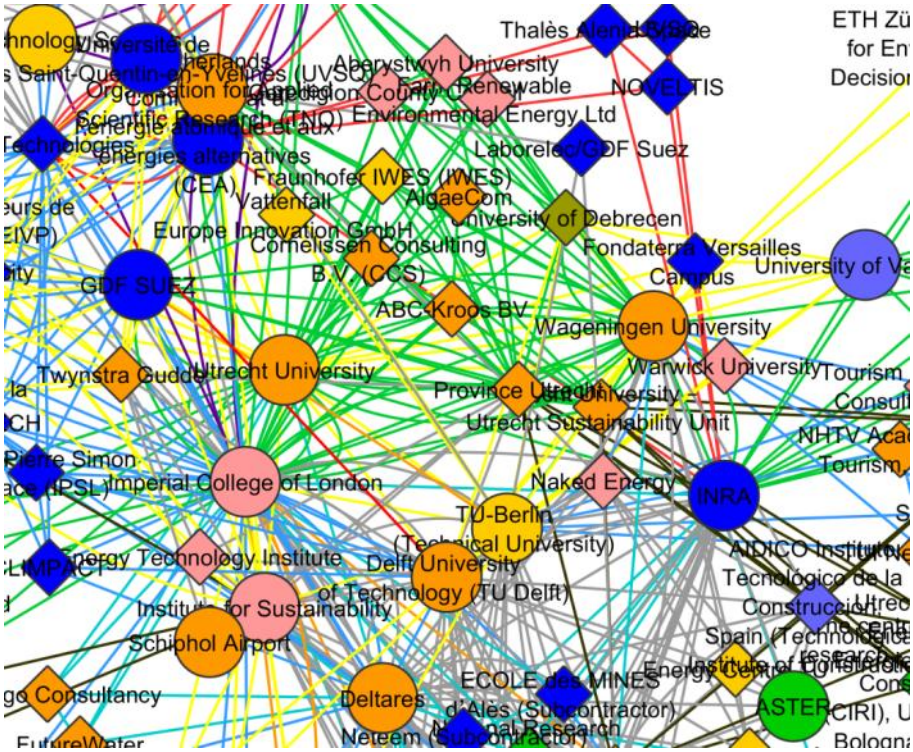
Geographic features of the ClimateKIC collaboration network

Looking at the network diagram in Figure II we observe that to a considerable extent the projects in the framework of an individual action line are likely to be performed by partners belonging to the same CLC, and thus be geographically localised. For example, the members belonging to the Dutch CLC clearly specialize in project along the action line on Developing a Bio Economy. The French CLC's members are much more active in two lines, Adaptation Services and Greenhouse Gas Monitoring, than in other topics.

There are several action line themes that are followed up more internationally. The projects on the Sustainable Cities topic involve international participants from Germany, France, UK and Switzerland. In the action line Making Tran
sition Happen we observe quite active participation of both French and German members.

Looking at the general patterns of cooperation occurring in the ClimateKIC network we note the existence of several relatively distanced clusters, some of which are geographically centered (such as the French cluster in Adaptation Services) and some originating around a particular action line (the international cluster in Sustainable Cities in the bottom part of the diagram). Further, there are several smaller clusters at the periphery of the network and one cluster in Sustainable Cities which appears to be isolated from the rest of the network.

Figure II.3 **The 'core' of the ClimateKIC network of project-related interactions.**



Legend: Same as in Figure II.2

The core of the ClimateKIC network is currently formed by institutions coming from four European Countries: Netherlands, France, Germany and United Kingdome. In this core we see both core members of the KIC (larger circle shapes) as the affiliate and associate members (smaller diamond shapes). This observation points at less hierarchical construction of the network as a whole with partners at different levels of the KIC affiliation being equally active participants in joint projects.

II.3 KIC InnoEnergy

II.3.1 General setting

KIC InnoEnergy is organised as a company that performs activities towards the integration of education, technology, business and entrepreneurship and strengthening the culture of innovation. Its strategic objective is to become the leading engine of innovation in the field of sustainable energy. It has been designated as a one of the first three Knowledge and Innovation Communities by the EIT's Governing Board and addresses sustainable energy as its priority area.

KIC InnoEnergy is an alliance of top European players with a proven track record. The Consortium consists of 27 shareholders and more than 100 additional partners, among which companies, research institutes, universities and business schools covering the whole energy mix.

Each of the six KIC InnoEnergy co-location centres (CC) coordinates one important energy topic for all partners:

- CC Alps Valley: Sustainable Nuclear and Renewable Energy Convergence
- CC Benelux: Intelligent Energy-efficient Buildings and Cities
- CC Iberia: Renewables (Wind, CSP, Photovoltaics, Wave and Tidal Energy)
- CC Germany: Energy from Chemical Fuels

- CC Poland Plus: Clean Coal Technologies
- CC Sweden: European Smart Electric Grid and Electric Storage

The main thematic fields addressed by the InnoEnergy community are:

- Energy Storage
- Energy from Chemical Fuels
- Sustainable Nuclear and Renewable Energy Convergence
- Smart and Intelligent Cities and Buildings
- Clean Coal Technologies
- Smart Electric Grid
- Renewable Energies

Energy from Chemical Fuels

The thematic field 'Energy from Chemical Fuels' is strongly focused on supporting the objectives of the SET plan. Europe needs mutual efforts to establish a sustainable, secure and competitive energy supply. The inter-related challenges of climate change, security of energy supply and competitiveness are multifaceted and require a coordinated response. The targets of the EU for 2020 are 20% less greenhouse gas emissions, 20% reduction in the use of primary energy by improving energy efficiency, 20% share of renewables in energy mix of total energy consumption and 10% biofuels in transport.

Toward achieving the above obejctives the InnoEnergy KIC focuses on the following major drivers:

- Establish load and product flexible fuel / energy conversion systems (poly-generation technologies) to balance transient RES power production
- Establish technologies for production of chemical energy carriers from RES surplus power for transport and storage (Power to Gas, PtG)
- Substitute fossil fuel by biomass based energy resources
- Utilize a wide range of biomass based materials (fuel flexibility) in high-efficiency energy conversion systems
- Utilize low-cost biomass resources (residues / waste)
- Establish low-cost / high efficiency fuel conversion technologies
- Reduce power generation costs (€/MWh) and costs of fuel conversion technologies
- Improve efficiency and fuel flexibility of energy conversion technologies
- Reduce fuel cost from biomass utilization technologies by reduction of transport costs, improvement of storage capability and energy density of biogenic feedstock
- Recycle nutrients from biomass based fuels

The bioenergy related technologies are in general close to becoming commercial viable. None the less a lot of applications are still depending on subsidies. Therefore most European countries have subsidizing schemes for renewable energy like bioenergy (for example Germany has feed-in tariffs for renewable energy, EEG).[70]

Sustainable Nuclear and Renewable Energy Convergence

Thematic field "Sustainable nuclear and renewable energy convergence" is a wide, multipolar thematic. The strategy of the KIC is to focus on the most promising and most impacting topics of "convergence". The roadmaps presented in this document will therefore focus on four topics:

- Advanced Materials and Processes for the European energy challenges.
- Energy Storage for the integration of renewable energy production.
- Energy Efficiency in the industry.

[70] KIC InnoEnergy (2014), Thematic Field Energy from Chemical Fuels, Strategy and Roadmap

- Instrumentation, Measurement, and Control/Command for nuclear industry.

Smart and Intelligent Cities and Buildings

The main technical and market challenges addressed within the theme 'Intelligent Energy Efficient Buildings and Cities' are:

- Reduction of energy demand: new energy efficient and cost-effective components and systems need to be developed and integrated into buildings and energy systems (building shell, HVAC, lighting, energy management). Especially focusing on the existing building stock.
- To enable an effective and wide implementation of renewable energy sources, new integrated and compact storage systems are essential for bridging the gap between demand and supply.
- Integration of electric vehicles and other urban vehicles into the urban and building energy networks.
- Upgrade of the aging energy infrastructure and integration of the different energy carriers at city level.
- To enable an effective and efficient integration of the single components and systems (products and services) developed, test-beds at different scale-levels are needed: component – system – building –network-district – city level. Especially on city level, strong end-user involvement in the concept of living labs is crucial.

Furthermore, in terms of technological solutions, the theme 'Intelligent Energy Efficient Buildings and Cities' is structured along four program lines:

1. Local energy supply, conversion and storage
2. Energy Efficient Buildings
3. Local energy networks within the city

Intelligent Energy Efficient Cities

Clean Coal Technologies

Technological development in heat and electric energy production, chemicals and liquid fuels from coal, seems to be unavoidable due to the growing worldwide demand for electricity. Coal is currently the only global energy source allowing relatively stable needs satisfaction in the long time perspective. The rate of new energy technologies development will depend on several factors, of which - apart from the growing demand for energy - the most important are fast growing environmental requirements to reduce emissions of NOx, SOx and particulate matter (in the European Union imposed by the Directive - Industrial Emissions Directive) and to reduce CO2 emissions under the Kyoto Protocol and the CCS Directive.

The priorities of Clean Coal & Gas Technologies have been defined in the five sectors where its impact is the most important, in terms of lower energy costs, market volume, CO2 emission savings, and network integration in period 2013-2020:

- Development of advanced energy and syngas production technologies enabling optimized use of available fossil fuel resources, biomass, wastes, and unconventional gases;
- Enabling coal power plants adaptation to the time specific technology options (advanced super and ultra-super critical, IGCC) with regard to efficiency, CO2 capture potential and operational effectiveness;
- Development of widely accepted and economically justified strategy for CCS and distributed energy production based on fossil fuels and waste with cooperation of renewable and chemical fuels thematic areas;
- Preserving secure clean energy supply for Europe by delivery prospective extension of natural resources – unconventional gas with special emphasis placed on shale gas;

- Increasing operational efficiency and safety, apart from power production also for industrial processes.

Smart Electric Grid and Energy Storage

The general objective of the Smart Grids and Electrical Storage thematic area is to support the 20-20-20 target of the SET-Plan by providing innovative product and services for the development of European electrical transmission and distribution networks.

Apart from utilizing traditional technologies, the InnoEnergyKIC focuses on regulatory regimes and standards that need to be adopted to facilitate development of the smart grids and energy storage systems. In addition it aims at developing new solutions in the following areas:

- Energy storage in both local and centralized locations.
- Flexible transmission and distribution systems with access to large amounts of real-time data, IT support to use these data and controllable devices that can react fast and accurate on control signals.
- New market models that will give full benefit to traditional actors in the energy market as well as users.
- New standards

Renewable Energies

The priorities of renewable energies technologies have been defined in the four sectors where its impact is most important, in terms of lower energy costs, market volume, CO2 emission savings, and network integration in period 2013-2017: Wind, Solar Photovoltaic, Solar Thermal, and Ocean energies.

Commercial wind energy exist since about 25 years and is relative mature in onshore. The Offshore wind farms in shallow waters are the current challenge with still a lot of necessary improvements: huge investment, high risk, very expensive O&M and deployment. In contrast, generally speaking they have higher wind speeds and less social impact. The shallow water is limited on the North and Baltic Sea; deepwater with floating wind turbines is one future solution with a new and global market. The general problem in wind energy is the still high levelized energy cost LEC. Until now just onshore wind energy and in windy sites is really cheaper than fossil energy

In a short – medium term, the market challenge is the cost reduction and improved performance c-Si, and thin film PV (TFPV) to achieve the grid parity for retail electricity. Grid parity would be the key for the strong deployment of the Building Integrated PV (BIPV) applications for both technologies. In the case of TFPV, cost and life-time effective use of new substrates will result in new products and business opportunities related to BIPV and other new applications. In a long term, advanced materials and processes will be the challenges.

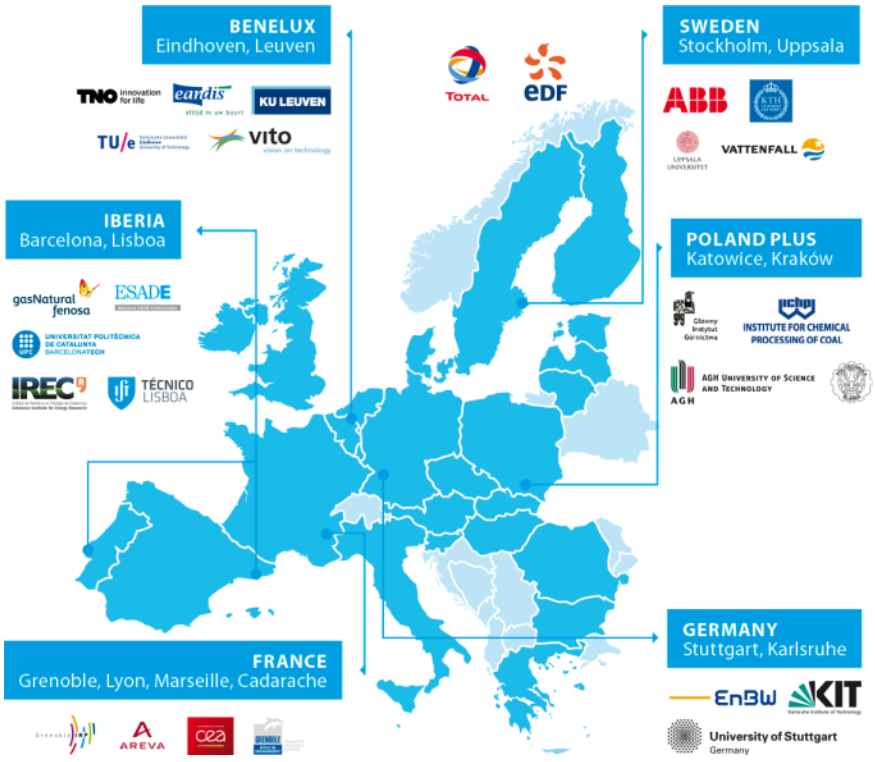
The market challenge in Solar Thermal Electricity (STE), also known as Concentrated Solar Power (CSP), is to reach effective levelized energy cost (LEC) that make it possible to install STE plants without subsidies (feed-in tariffs or tax credits). The main issues are: increasing efficiency, cost reduction on the components and O&M, and energy management by improved storage.

Ocean energy comprises a number of sources, including wave, tidal stream and salinity gradient. Macroalgae (seaweed) for the production of bio-combustibles whist not normally considered as an ocean energy source may also be included here. Macroalgae allow addressing the energy sector and not only the electrical energy sector.

II.3.2 Partners

KIC InnoEnergy is a commercial company, with 27 shareholders and with headquarters in The Netherlands. KIC InnoEnergy activities in education, technology and innovation & entrepreneurship are designed, developed and implemented by a very reasonable balance of top rank industries, research centres, universities and business schools, the actors of the knowledge triangle. The 27 shareholder partners have committed to a 7 years industrial plan, where they will mobilise 700M€ of resources only for the period 2011-2015.

Figure II.4 Location of the Core InnoEnergy partners



The partners are regionally mapped in six offices across Europe. They are either Formal (Core), Associated or Network, depending on their contribution to the industrial plan, and resulting in different participation in the equity in the different legal structures (KIC or its office).

Table II.2 List of partners of the KIC InnoEnergy (state of affairs by the end of 2011)

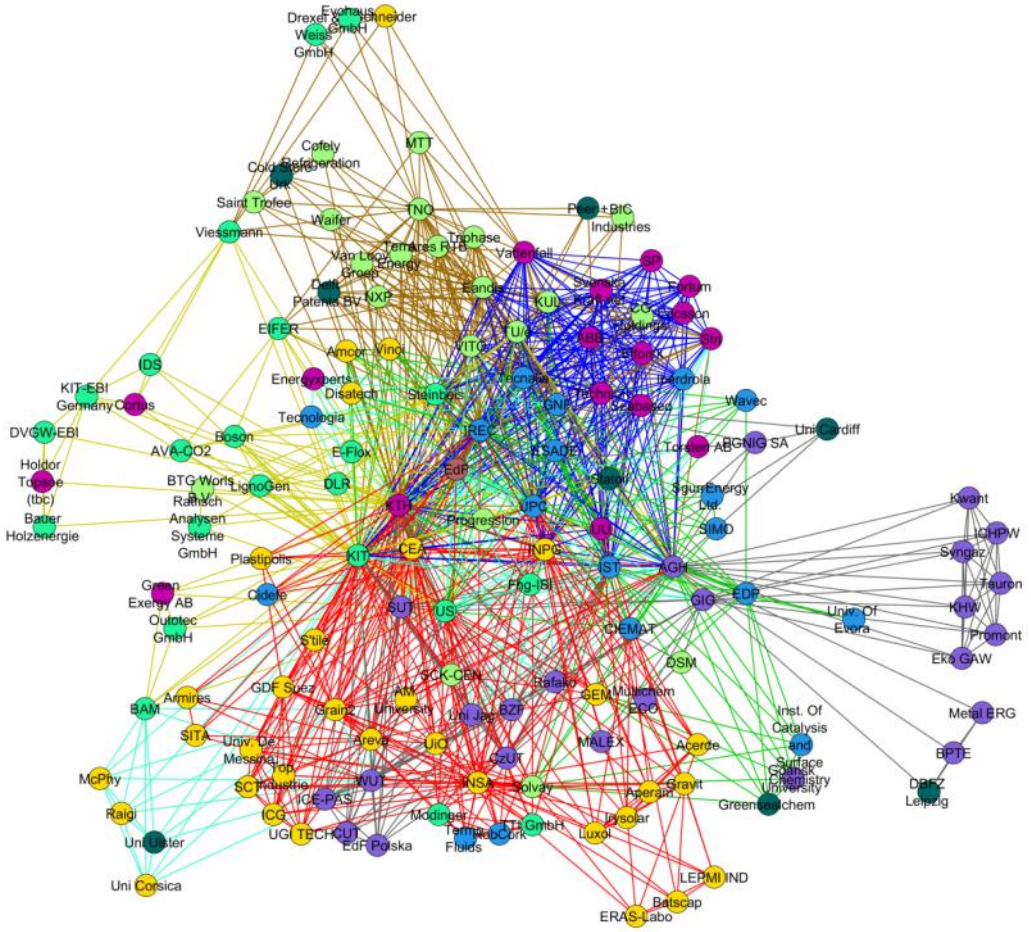
CLC	Partner	Type
Benelux	TU/e Technische Universiteit Eindhoven	**Core partner**
Benelux	KU Leuven	**Core partner**
Benelux	TNO	**Core partner**
Benelux	VITO	**Core partner**
Benelux	Eandis	**Core partner**
France	AREVA	**Core partner**
France	CEA	**Core partner**
France	Grenoble INP	**Core partner**
France	Grenoble Ecole de Management	**Core partner**

CLC	Partner	Type
Germany	EnBW	**Core partner**
Germany	University of Stuttgart	**Core partner**
Germany	Karlsruhe Institute of Technology (KIT)	**Core partner**
Germany	Steinbeis Europa Zentrum	**Core partner**
Iberia	ESADE	**Core partner**
Iberia	Gas Natural Fenosa	**Core partner**
Iberia	Institut de Recerca de l'Energia de Catalunya – IREC	**Core partner**
Iberia	Instituto Superior Técnico de Lisboa	**Core partner**
Iberia	Universitat Politècnica de Catalunya	**Core partner**
Poland	AGH University of Science and Technology	**Core partner**
Poland	Central Mining Institute	**Core partner**
Poland	Institute for Chemical Processing of Coal	**Core partner**
Poland	Silesian University of Technology	**Core partner**
Sweden	KTH Royal Institute of Technology	**Core partner**
Sweden	Uppsala University	**Core partner**
Sweden	ABB	**Core partner**
Sweden	Vattenfall	**Core partner**
Benelux	Laborelec	Associate partner
Benelux	MTT	Associate partner
France	Schneider Electric	Associate partner
France	GDF Suez	Associate partner
France	INSA Lyon	Associate partner
France	Paristech	Associate partner
France	S'Tile	Associate partner
France	Université d'Aix Marseille	Associate partner
Germany	Fraunhofer Institute for Systems and Innovation Research (ISI)	Associate partner
Germany	Landesbank Baden-Württemberg	Associate partner
Iberia	Ciemat	Associate partner
Iberia	Energías de Portugal	Associate partner
Iberia	Iberdrola	Associate partner
Iberia	Tecnalia Research and Innovation	Associate partner
Poland	Jagiellonian University	Associate partner
Poland	MetalERG	Associate partner
Poland	TAURON	Associate partner
Poland	Wroclaw University of Technology	Associate partner
Sweden	Cortus Energy	Associate partner
Sweden	Elforsk	Associate partner
Sweden	Ericsson	Associate partner
Sweden	Fortum	Associate partner
Sweden	Power Circle	Associate partner
Sweden	Seabased	Associate partner
Sweden	Sting – Stockholm Innovation and growth	Associate partner
Sweden	STRI	Associate partner
Poland	Bay Zoltán Foundation for Applied Research – Institute for Logistics and Production Systems	Network partner

CLC	Partner	Type
Poland	Cracow University of Technology	Network partner
Poland	Czestochowa University of Technology	Network partner
Poland	EKO-GAW	Network partner
Poland	KHW	Network partner
Poland	Kwant	Network partner
Poland	Lotos	Network partner
Poland	PGNiG	Network partner
Poland	RaFAko	Network partner
Poland	Syngaz	Network partner
Poland	ZAK	Network partner

II.3.3 Activities and Cooperation Landscape

Figure II.5 The project based interactions in the Innoenergy KIC with partner nodes color coded per affiliated CLC.



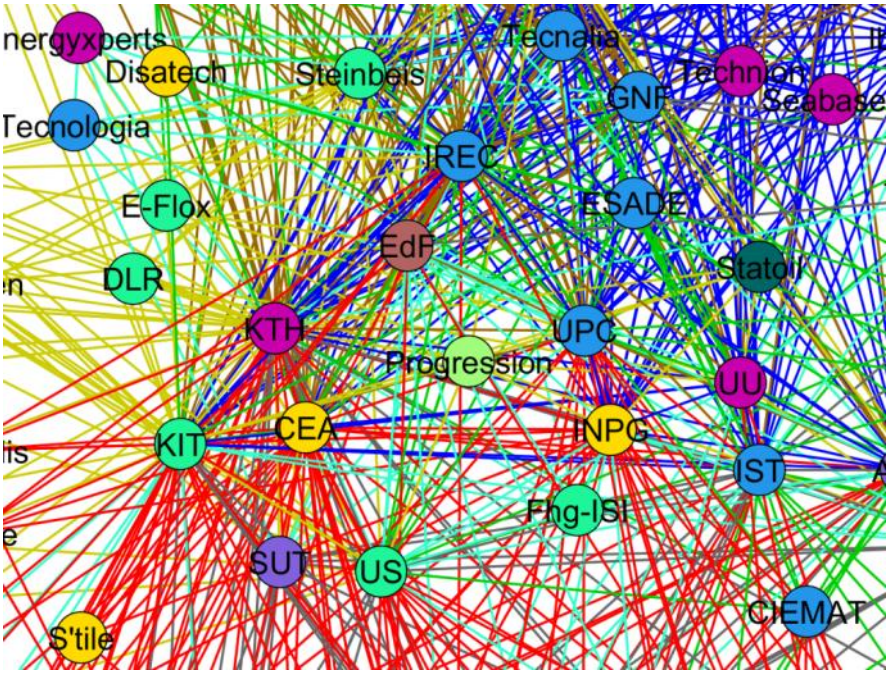
Legend:

Dot color – CLC Affiliation of the Partner		Link color – Thematic action line	
CC Alpes Valley		Clean coal technologies	
CC Benelux		Energy from Chemical Fuels	
CC Germany		Lighthouse projects	
CC Iberia		Renewables	
CC Poland		Smart & Intelligent cities and buildings	
CC Sweden		Smart Grid and Storage	
KIC level		Sustainable Nuclear and Energy Convergence	

The collaboration network in the InnoEnergy KIC exhibits the same patterns of thematic and geographic clusterisation as in the case of ClimateKIC. The action line on sustainable Nuclear and Energy Convergence is dominated by the KIC members from CC Alps Valley (France) and the issues of Smart Grid and Storage are concentrated around the members from CC Sweden and CC Iberia. The organisations from Benelux tend to specialise on projects in Smart and Intelligent Cities and Buildings, while the projects in the Clean Coal Technologies action line are strongly concentrated around CC Poland.

The collaborative projects in thematic action line on Renewables appear to be more international involving participants from CC Iberia (Spain/Portugal), CC Alps Valley (France) and some members of CC Benelux.

Figure II.6 The 'core' of the InnoEnergy network of project-related interactions.



Legend: Same as in Figure II.5

In the core of the InnoEnergy network we see a number of very strong and intensively connected players from different CCs: Most of the core members of the network are active in projects covered by multiple thematic action lines. For example, KTH - Royal Institute of Technology of Sweden is mostly involved in three thematic action lines: Sustainable Nuclear and Energy Convergence, Energy from

Chemical fuels and Smart Grid and Storage. EDF - Électricité de France has even broader involvement across various InnoEnergy's action lines. Such core players, as Utrecht University (UU) and Catalonia Institute for Energy Research (IREC) appear to be in particular interesten in Renewables and Smart Grid and Storage thematic lines.

II.4 KIC ICTLabs

II.4.1 General setting

The mission of EIT ICT Labs is to drive European leadership in ICT Innovation for economic growth and quality of life. It aim at boosting significantly the innovation pace of core European ICT players by exploiting their relative strengths in deploying ICT in various application domains, and also through the creation of fast growing ICT players in new markets and the breeding and deployment of entrepreneurial ICT talents by close interaction between the Education, Research, and Business actors.

The key elements of the ICTLabs strategy are activities that bring the unique characteristics of EIT ICT Labs' community members into play. In particular, it maintains a close and pragmatic linkage between Education, Research, and Business making it possible to tap into new pools of entrepreneurial talents and give them opportunities to excel. The ICTLabs Co-location Centres contribute to local innovation ecosystems by linking them to a European network of ICT hot spots for rapid scaling-up of innovations. The KIC's industrial base provides access to problem domains and markets where the innovations can be exploited both for economic impact and for bringing added value to European economy and abroad.

Figure II.7 Location of the ICTLabs CLCs

The EIT ICT Labs builds upon 6 nodes:

- Berlin (Germany)

- Eindhoven (Netherlands)
- Helsinki (Finland)
- Paris (France)
- Stockholm (Sweden)
- Trento (Italy)

Each Node has its unique profile within EIT ICT Labs but encompasses all aspects of the knowledge triangle. Each Action Line is coordinated through a specific Node.

These six focus areas of the ICTLabs KIC are:

- Smart Spaces
- Smart Energy Systems
- Health & Wellbeing
- Digital Cities of the Future
- Future Media and Content Delivery
- Intelligent Mobility and Transportation Systems

Smart Spaces

Smart Spaces action line creates the so called 'fifth' screen to the digital world after TV, computer, smartphone, and the tablet. One of the focus areas of the Smart Spaces research is to bring mobile users situationally relevant information from the Internet much faster than possible today. The practical business areas for the smart space applications include digital signage, mobile marketing, business analytics for shopping areas, analytics of places in general, information services in public buildings and at events, and convenience solutions in smart offices and homes.

In the recent years the community concentrated in four applications areas and two major technical challenges. The application areas included:

- Public spaces like exhibition areas, travel and waiting areas, and games in public areas - including applications using user generated content in public areas.
- Retail environments – solutions supporting the retail business and providing new services for the customers.
- Office environments – creating the level of standard and complete solutions for the smart office once and for all.
- Home and households – solutions easing the every-day life of different kinds of users and user groups.

The two major technical challenges were:

- Enabling technologies for human-centred interaction in smart spaces, which help to use the digital info without looking down (to a device or doing typing).
- Generic positioning technologies supporting applications, which help to locate people or items indoor at a sufficient accuracy.

Smart Energy Systems

Meeting EU's climate change and energy policy objectives for 2020 and beyond will require a major transformation of our electricity infrastructure addressing the following challenges:

- Integrating an increasing amount of renewable energy generation
- Realising energy savings and efficiency
- Enhancing grid security
- Developing the internal energy market focus

The ICTLabs KIC aims to involve smart users to make life easier and come up with technologies for optimizing energy efficiency. This is done by stimulating deployment of ICT technologies in the energy domain enabling the future smart energy infrastructures and to accelerate implementation of results in daily life.

Major activities in this action line's focus areas are user involvement and ICT infrastructures for smart grid are the Smart Energy user experience labs and the European Virtual Smart Grid Lab respectively. Specific targeted ICT infrastructure activities include smart energy security and value modelling highlighting the business values of a smart grid. The well-established Smart Energy Summer School boosts the education focus of the action line

Health & Wellbeing

Ageing is likely to affect economies of all EU member states. In the Eurozone expenditure related to the ageing population is expected to grow from 0.9% of the GDP in 2010 (about 9,000B euros) to 1.7% in 2050. According to EU and WHO, this increase can be reduced by 40% to 60%. With the Action Line Health & Wellbeing, EIT ICT Labs contributes to the EU goal to tackle the major issues affecting the health and wellbeing of European citizens, by increasing quality of life and working towards a reduction of the expected expenditure.

Traditional research in the health domain has the tendency to focus on specific problems, targeting specific groups in a specific context. Often, these health-related solutions get slowed down by non-functional barriers such as country-specific legal issues, different economical models, reimbursement schemes, privacy, security rules or differences in social and cultural systems. At the same time, global and societal trends like the ageing population and the growing consumer empowerment call for an innovative and entrepreneurial ICT-enabled approach towards health and wellbeing.

Digital Cities of the Future

New polices in the context of Citizen-Centric Cities (CCC) aim in particular at increasing the citizens' awareness of their individual and collective capabilities, both in the decision making process and in the implementation of these decisions. The ultimate goal is to realise a migration from a customer-centric to a user-centric model.

Citizen participation can take different forms: (i) Collection of data to be broadcast to the other citizens, or used to analyse and "sense" the dynamic status of the city; (ii) Participation in the decisions for the evolution of the environment of the city; and (iii) Execution of actions to improve the city performance and sustainability

Future Media and Content Delivery

The media industry is in the midst of a digitalisation that is transforming broadcasting, photos, music and printed matter merging telecommunications, broadcasting, publishing and entertainment. The digitalisation also provides a change in consumer behaviour as consumers are no longer only consumers, but can easily also become producers and are doing this at an increasing pace.

To meet these challenges this action line contains activities addressing a) cross-layer optimisation for efficient resource utilisation resulting in enhanced user experience for a given network, b) heterogeneous mobile networks addressing cost effective ways towards network densification and capacity increase, and c) understanding the needs and opportunities offered by selected media applications and their implications for the network optimization.

Intelligent Mobility and Transportation Systems

By declaring its goal of becoming absolutely safe (zero accident) and sustainable (zero emission), “New Mobility” comes with additional challenges with respect to ICT. The activities in the Intelligent Mobility and Transportation Systems action line have laid the ground for innovations by applying grading-up instruments on research results (open-source, technology transfer, test-sites, living labs) and creating business on the European scale (patents, entrepreneurship support, business creation).
The goal of this sub-programme is to increase safety and security for individuals by broader deployment of: ICT for active safety in cars, cooperative vehicles, data and communication security, safety and security of mobility systems. This also includes, for example, improving networking between different modes of transport through integrated solutions for trip planning and real-time access to information on available transport modes (online information at home, in vehicles, train stations, bus stops, on smart phones).

II.4.2 Partners

EIT ICT Labs’ partners represent some of Europe’s and the world’s leading organisations, universities, research institutes, and companies in the field of ICT. Three different complementary categories of partners are brought together within the EIT ICT Labs KIC. Decision powers of these partners, i.e. formal voting rights, are based on their contributions to KIC activities.

The Core partners are members of the KIC Association. They represent world class excellence and they are fully committed to the KIC application and will raise the necessary co-funding for the EIT ICT Labs execution. Core Partners control and manage EIT ICT Labs through their membership in the Association and the Executive Steering Board (ESB) elected by the General Assembly (GA). They have equal voting rights at the GA, can participate in activities at any Co-location Centre and are organized through the Nodes and responsible for the operation of their respective Node. They must fulfil minimum criteria regarding contributions to EIT ICT Labs to remain Core Partner.

Affiliate Partners are further organizations participating in and contributing to the activities of EIT ICT Labs. They are usually active on action line level and are typically universities, SMEs or venture capital funds and companies. They have a contract with the EIT ICT Labs KIC Association and a mandate with a specific Node through which they supply competence and human resources to its Co-location Centre. Affiliated partners obtain general information from EIT ICT Labs and have access to all activities of EIT ICT Labs, but are not members of the Association and have no voting rights in the GA.

Associate Partners have specific tasks at the EIT ICT Labs KIC level that are not addressed by the Nodes. These organisations are not linked to a specific Node due to their geographical location. They have a contract with the EIT ICT Labs KIC Association, obtain general information from EIT ICT Labs and have access to all EIT ICT Labs activities, but are not members of the Association and have no voting rights in the GA.

Table II.3 List of partners of the KIC ICTLabs

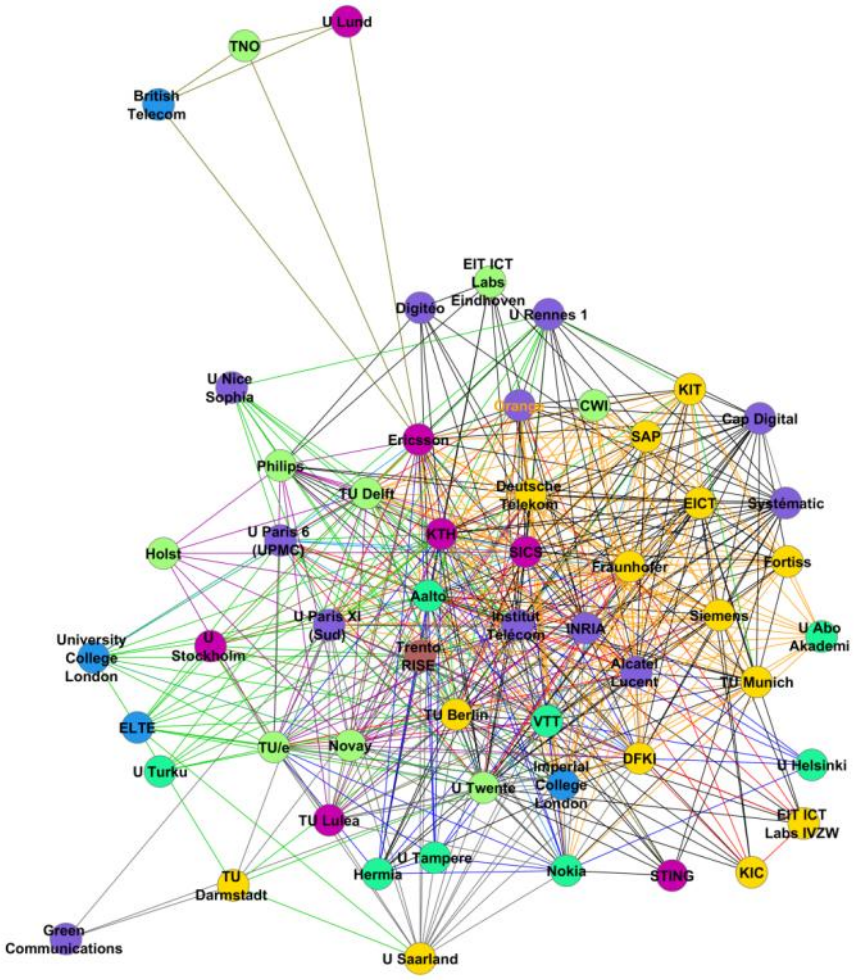
CLC	Partner	Type
Berlin	DFKI	**Core partner**
Berlin	Fraunhofer Gesellschaft (FHG)	**Core partner**
Berlin	SAP AG	**Core partner**
Berlin	SIEMENS	**Core partner**
Berlin	T-Labs	**Core partner**

CLC	Partner	Type
Berlin	TU Berlin	**Core partner**
Eindhoven	3TU /NIRICT	**Core partner**
Eindhoven	CWI - Center Wiskunde & Informatica	**Core partner**
Eindhoven	Océ	**Core partner**
Eindhoven	Philips	**Core partner**
Eindhoven	TNO ICT	**Core partner**
Helsinki	Aalto University	**Core partner**
Helsinki	NOKIA	**Core partner**
Helsinki	VTT	**Core partner**
London	Imperial College London	**Core partner**
London	University College London	**Core partner**
London	Inteland BT	**Core partner**
Paris	Alcatel Lucent	**Core partner**
Paris	INRIA	**Core partner**
Paris	Institut Mines-Télécom	**Core partner**
Paris	Orange-France Telecom	**Core partner**
Paris	Paris-Sud XI University	**Core partner**
Paris	Thales	**Core partner**
Paris	UPMC	**Core partner**
Stockholm	Ericsson	**Core partner**
Stockholm	KTH	**Core partner**
Stockholm	SICS	**Core partner**
Trento	Engineering	**Core partner**
Trento	Telecom Italia	**Core partner**
Trento	Trento RISE	**Core partner**
Berlin	fortiss	Affiliate partner
Berlin	KIT - Karlsruhe Institute of Technology	Affiliate partner
Berlin	Saarland University	Affiliate partner
Berlin	Technische Universität Darmstadt - CASED	Affiliate partner
Berlin	Technische Universität München	Affiliate partner
Eindhoven	High Tech NL	Affiliate partner
Eindhoven	Holst Centre	Affiliate partner
Eindhoven	iMinds	Affiliate partner
Eindhoven	NXP	Affiliate partner
Eindhoven	Utrecht University	Affiliate partner
Helsinki	CSC - IT Center for Science Ltd	Affiliate partner
Helsinki	Forum Virium Helsinki	Affiliate partner
Helsinki	Futurice	Affiliate partner
Helsinki	Hermia	Affiliate partner
Helsinki	Tampere University of Technology	Affiliate partner
Helsinki	Technopolis	Affiliate partner
Helsinki	Turku Centre for Computer Science (TUCS)	Affiliate partner
Helsinki	University of Helsinki	Affiliate partner
Helsinki	University of Oulu	Affiliate partner
Helsinki	University of Tampere	Affiliate partner

CLC	Partner	Type
London	Vodafone	Affiliate partner
London	IBM	Affiliate partner
London	University of Edinburgh	Affiliate partner
London	Institute for Sustainability	Affiliate partner
Paris	Alfstore	Affiliate partner
Paris	Cap Digital	Affiliate partner
Paris	Cassidian	Affiliate partner
Paris	Data Publica	Affiliate partner
Paris	Digitéo	Affiliate partner
Paris	Eurecom	Affiliate partner
Paris	Green Communications	Affiliate partner
Paris	Images & Reseaux	Affiliate partner
Paris	JCP Consult SAS	Affiliate partner
Paris	Milpix	Affiliate partner
Paris	Missions Publiques	Affiliate partner
Paris	Nice-Sophia-Antipolis University	Affiliate partner
Paris	Rennes 1 University	Affiliate partner
Paris	Secured Communication Systems	Affiliate partner
Paris	System@tic	Affiliate partner
Paris	Telecom Saint-Etienne	Affiliate partner
Stockholm	Acreo	Affiliate partner
Stockholm	EICT	Affiliate partner
Stockholm	Electrum Foundation /Kista Science City	Affiliate partner
Stockholm	LTU - Luleå University of Technology	Affiliate partner
Stockholm	LU - Lund University	Affiliate partner
Stockholm	Stockholm Innovation & Growth	Affiliate partner
Stockholm	Stockholm University, DSV	Affiliate partner
Trento	Centro Richerche FIAT	Affiliate partner
Trento	Cooperazione Trentina	Affiliate partner
Trento	National Research Council of Italy	Affiliate partner
Trento	Politecnico di Milano	Affiliate partner
Trento	Politecnico di Torino	Affiliate partner
Trento	Poste Italiane	Affiliate partner
Trento	Reply	Affiliate partner
Trento	Scuola Superiore Sant'Anna di Pisa	Affiliate partner
Trento	ST	Affiliate partner
Trento	Università di Bologna	Affiliate partner

II.4.3 Activities and Cooperation Landscape

Figure II.8 The project based interactions in the ICTLabs KIC with partner nodes color coded per affiliated CLC



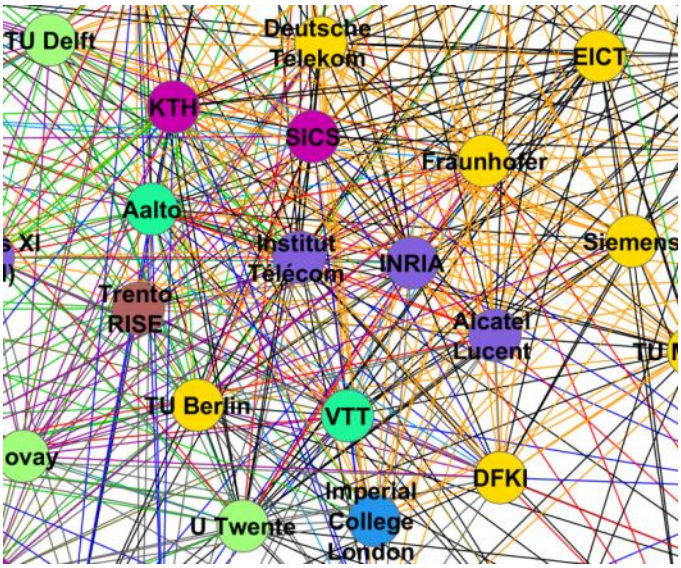
Legend:

Dot color – CLC Affiliation of the Partner	Link color – Thematic action line
Berlin	ACLD - Computing in the Cloud
Eindhoven	ADCT - Digital Cities of the Future
Helsinki	ADSL - Doctoral School
London	AHWB - Health & Well-being
Paris	AIMS - Intelligent Mobility and Transport Systems
Stockholm	AITA - Internet Technologies and Architectures
Trento	AMSL - Master School
	ASES - Smart Energy Systems
	ASSP - Smart Spaces
	CBDV - Business Catalyst Development

Compared to two previous KIC examples, the ICTLabs KIC presents the least fragmented collaboration network among the existing communities. This network appears to be rather uniforms (with an exception of one strongly outstanding cluster in the field of Intelligent Mobility and Transport Systems). The network as a whole exhibits a specific feature that, while the core members are involved in projects

covering a variety of action lines (definitely more than three action lines at the same time), the network members at the periphery are involved mostly in projects covering one particular theme. For example, University College London and Truku University contribute mostly to doctoral and Master Schools, University of Helsinki works in Smart Spaces, and Frenc firms Cap Digital and Systematic are involved almost exclusively in Business Catalyst Development.

Figure II.9 **The 'core' of the ICTLabs network of project-related interactions.**



Legend: Same as in Figure II.8

As the ICTLabs network is rather uniform, its core is not that distinctively visible as in previous KIC-cases. Figure shows a snapshot of the network's center part, where the most connected organisation are located. As we can see, the members of the German Berlin co-location center are the most numerous, followed by Eindhoven and Paris. As it was mentioned above, these core participants are involved in a rather wide variety of thematic action lines both in terms of type of activities (education, research, commercialisation) and in research themes.

ANNEX III: Analysis of Future Potential and/or Most Promising Maritime Economic Activities (MEAs) by Sea Basin

The Blue Growth Sea Basin studies[71] provide the context for the sea basin analysis of future potential and/or most promising MEAs. Country experts evaluated the top 7 most promising MEAs for each Member State. These assessments were aggregated on a sea basin level to provide a regional context to the most promising MEAs. Note that no score for an MEA does not imply that the MEA is not important for that Member State but rather that it did not make the top 7 most promising MEA shortlist according to the assessment of the country experts.

Table III.1 Analysis of Future Potential and/or Most Promising Maritime Economic Activities – Baltic Sea Countries

Blue Growth Sea Basin	Baltic Sea Countries								
MEAs	PL	LT	LV	EE	FI	SE	DK	DE	ALL
0.1 Shipbuilding & ship repair	1	1	1	1	1			1	75%
0.2 Water projects		1		1	1				38%
1.1 Deep-sea shipping		1		1					25%
1.2 Short-sea shipping		1	1	1	1	1	1	1	88%
1.3 Passenger ferry services			1		1	1	1		50%
1.4 Inland waterway transport			1			1			25%
2.1 Fish for human consumption		1	1	1			1		50%
2.2 Fish for animal feeding									
2.3 Marine aquaculture	1					1	1	1	50%
2.4 Blue biotechnology	1					1		1	38%
2.5 Agriculture on saline soils									
3.1 Offshore oil & gas	1								13%
3.2 Offshore wind	1				1	1	1	1	63%
3.3 Ocean renewable energy						1			13%
3.4 Carbon capture & storage									
3.5 Aggregates mining									
3.6 Marine minerals mining									
3.7 Securing fresh water supply									
4.1 Coastal tourism	1	1	1		1	1	1	1	88%
4.2 Yachting & marinas	1	1	1	1	1				63%
4.3 Cruise tourism		1	1			1		1	50%
5.1-5.2 Coastal protection									
5.3 Protection of habitats	1								13%
6.1 Traceability & security of goods supply chains		1	1						25%
6.2 Prevent & protect against illegal movement of people & goods		1							13%
6.3 Environmental monitoring	1	1	1			1			50%

Legend

F: Future potential	
P: Most promising	
F&P: Both	
>= 50 % Individual Basins; >= 40% All Sea Basins	

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Table III.2 Analysis of Future Potential and/or Most Promising Maritime Economic Activities – North Sea Countries

Blue Growth Sea Basin	North Sea Countries								
MEAs	BE	DE	NL	NO	DK	SE	UK	FR	ALL
0.1 Shipbuilding & ship repair			1	1			1	1	50%
0.2 Water projects	1		1						25%
1.1 Deep-sea shipping	1			1					25%
1.2 Short-sea shipping	1	1	1		1	1			63%
1.3 Passenger ferry services		1		1	1	1			50%
1.4 Inland waterway transport	1		1						25%
2.1 Fish for human consumption		1		1	1				38%
2.2 Fish for animal feeding									
2.3 Marine aquaculture		1		1	1	1			50%
2.4 Blue biotechnology	1						1	1	38%
2.5 Agriculture on saline soils									
3.1 Offshore oil & gas			1	1			1	1	50%
3.2 Offshore wind	1	1	1		1	1	1		75%
3.3 Ocean renewable energy							1	1	25%
3.4 Carbon capture & storage									
3.5 Aggregates mining									
3.6 Marine minerals mining								1	13%
3.7 Securing fresh water supply									
4.1 Coastal tourism		1		1	1	1			50%
4.2 Yachting & marinas									
4.3 Cruise tourism	1					1	1		38%
5.1-5.2 Coastal protection			1						13%
5.3 Protection of habitats									
6.1 Traceability & security of goods supply chains								1	13%
6.2 Prevent & protect against illegal movement of people & goods								1	13%
6.3 Environmental monitoring							1	1	25%

Legend

F: Future potential	
P: Most promising	
F&P: Both	
>= 50 % Individual Basins; >= 40% All Sea Basins	

Table III.1 Analysis of Future Potential and/or Most Promising Maritime Economic Activities – Atlantic Arc Countries

Blue Growth Sea Basin	Atlantic Arc Countries					
MEAs	UK	FR	IE	PT	ES	ALL
0.1 Shipbuilding & ship repair	1	1		1		60%
0.2 Water projects						
1.1 Deep-sea shipping						
1.2 Short-sea shipping						
1.3 Passenger ferry services						
1.4 Inland waterway transport						
2.1 Fish for human consumption						
2.2 Fish for animal feeding						
2.3 Marine aquaculture						
2.4 Blue biotechnology	1	1	1	1	1	100%
2.5 Agriculture on saline soils						
3.1 Offshore oil & gas	1	1		1		60%
3.2 Offshore wind	1		1	1	1	80%
3.3 Ocean renewable energy	1	1	1	1	1	100%
3.4 Carbon capture & storage						
3.5 Aggregates mining						
3.6 Marine minerals mining		1		1	1	60%
3.7 Securing fresh water supply					1	20%
4.1 Coastal tourism						
4.2 Yachting & marinas			1			20%
4.3 Cruise tourism	1		1			40%
5.1-5.2 Coastal protection			1			20%
5.3 Protection of habitats						
6.1 Traceability & security of goods supply chains		1			1	40%
6.2 Prevent & protect against illegal movement of people & goods		1			1	40%
6.3 Environmental monitoring	1	1	1	1	1	100%

Legend

F: Future potential	
P: Most promising	
F&P: Both	
>= 50 % Individual Basins; >= 40% All Sea Basins	

Table III.2 Analysis of Future Potential and/or Most Promising Maritime Economic Activities – Mediterranean Countries

Blue Growth Sea Basin	Mediterranean Sea												
MEAs	AL	BA	CY	ES	FR	EL	HR	IT	ME	MT	SI	TR	ALL
0.1 Shipbuilding & ship repair			1		1		1		1	1		1	50%
0.2 Water projects			1			1			1	1			33%
1.1 Deep-sea shipping			1	1		1		1			1		42%
1.2 Short-sea shipping						1	1	1	1	1	1	1	58%
1.3 Passenger ferry services	1						1	1	1				33%
1.4 Inland waterway transport								1					8%
2.1 Fish for human consumption	1		1				1	1	1	1	1		58%
2.2 Fish for animal feeding		1					1						17%
2.3 Marine aquaculture	1	1	1	1		1	1	1	1	1		1	83%
2.4 Blue biotechnology				1	1					1	1		33%
2.5 Agriculture on saline soils											1		8%
3.1 Offshore oil & gas			1	1									17%
3.2 Offshore wind					1	1				1			25%
3.3 Ocean renewable energy				1	1					1			25%
3.4 Carbon capture & storage													
3.5 Aggregates mining													
3.6 Marine minerals mining					1								8%
3.7 Securing fresh water supply			1	1				1					25%
4.1 Coastal tourism	1	1	1			1	1		1	1	1	1	75%
4.2 Yachting & marinas					1	1	1		1			1	42%
4.3 Cruise tourism	1		1	1		1	1	1	1		1	1	75%
5.1-5.2 Coastal protection								1		1	1		25%
5.3 Protection of habitats								1		1	1		25%
6.1 Traceability & security of goods supply chains					1			1					17%
6.2 Prevent & protect against illegal movement of people & goods					1			1					17%
6.3 Environmental monitoring			1		1			1		1			33%

Table III.3 Analysis of Future Potential and/or Most Promising Maritime Economic Activities – Black Sea Countries

Blue Growth Sea Basin	Black Sea Countries			
MEAs	BG	RO	TR	ALL
0.1 Shipbuilding & ship repair		1	1	67%
0.2 Water projects	1	1		67%
1.1 Deep-sea shipping				
1.2 Short-sea shipping	1	1	1	100%
1.3 Passenger ferry services				
1.4 Inland waterway transport	1	1		67%
2.1 Fish for human consumption	1	1	1	100%
2.2 Fish for animal feeding				
2.3 Marine aquaculture			1	33%
2.4 Blue biotechnology				
2.5 Agriculture on saline soils		1		33%
3.1 Offshore oil & gas	1	1		67%
3.2 Offshore wind		1		33%
3.3 Ocean renewable energy				
3.4 Carbon capture & storage				
3.5 Aggregates mining				
3.6 Marine minerals mining				
3.7 Securing fresh water supply				
4.1 Coastal tourism	1	1	1	100%
4.2 Yachting & marinas			1	33%
4.3 Cruise tourism	1		1	67%
5.1-5.2 Coastal protection				
5.3 Protection of habitats				
6.1 Traceability & security of goods supply chains				
6.2 Prevent & protect against illegal movement of people & goods				
6.3 Environmental monitoring	1			33%

Legend

F: Future potential	
P: Most promising	
F&P: Both	
>= 50 % Individual Basins; >= 40% All Sea Basins	

ANNEX IV: Details of Blue Growth KIC Topics underpinning the 'Model' Marine/Maritime KIC

Table IV.1 Details of Blue Growth KIC Topics underpinning the 'Model' Marine/Maritime KIC - Maritime Transport and Shipping

Scope

The Sea-ERA-Net[72] identifies the *Greening of Maritime Transport* as a key science agenda item to support society and the economy. The concept adopts a cradle-to-grave approach (e.g. design-construction-operation-decommissioning and dismantling) and includes the incorporation of eco-design and the development of ambitious technical and innovative solution for cleaner, more efficient and sustainable ships and maritime operations[73]. It combines shipping and maritime transport with maritime safety, security and surveillance with an emphasis on safe, green, competitive and sustainable transport across the seas and oceans.

The WATERBORNE Technology Platform[74] argue that given the high-technology nature of the European Shipping sector, and the high Europe-wide priority for safety and environmental quality, research, development and innovation, high global standards and effective international control are essential.

Relevant MEAs

- Shipbuilding and ship repair
- Water projects
- Deep-sea shipping
- Short-sea shipping
- Passenger ferry services
- Inland waterway transport
- Yachting and marinas
- Cruise tourism
- Traceability and security of goods supply chain
- Prevent and protect against illegal movement of people and goods

Emerging Maritime KIC Issues

Pertinent S&T disciplines:

- Naval architecture and ship design
- Marine and civil engineering and electronics
- Marine Information and Communications Technology
- e-learning tools

Education Needs:

- International Masters in Shipping.
- Recruiting and retaining skilled workforce.
- Curricula emphasizing niche design markets.

Cutting Edge Research:

- E-maritime solutions to providing a means to improve flow of information from ship-to ship and ship–to-shore.
- Improved safety and monitoring services to minimise impact of shipping and maritime transport infrastructure on the environment.
- Improving the energy efficiency of ships and vessels, reducing emissions;
- Safe, more efficient waterborne operations through new technologies and smarter traffic management.
- System modelling and life-cycle cost and performance optimisation of waterborne assets.
- Research on compliance checking, onshore electricity.

Innovation Potential:

- Increasing competitiveness and specialisation in niche markets.

[72] Towards a Strategic Research Agenda/Marine Research Plan for the European Atlantic Sea Basin, http://www.seas-era.eu/np4/%7B$clientServletPath%7D/?newsId=19&fileName=SEAS_ERA_D_6.1.4_Atlantic_Report_FINAL_2.pdf

[73] Ocean Energy Association, 2013

[74] www.waterborne-tp.org

- Innovation in engineering and design of cleaner ship technology driven by new environmental regulations, opening up of Arctic route, growth in cruise tourism and yachting.
- Innovation in deep sea / offshore technologies (i.e. supporting offshore renewable energies, fossil fuels and raw materials and fisheries and aquaculture). The shipbuilding industry plays a key role in meeting the demand for offshore-based energy through its provision of specialised vessels and structures such as rigs, supply vessels, and anchor-handling tugs. Already, construction of this type of vessel/structure has increased in importance for the industry – measured by CGT, offshore vessels/structures were the 4th largest item in the global order book at the end of 2011, whereas in 2002 they did not even feature in the top 8. Looking ahead, Lloyd's scenarios suggest the number of floating platforms for oil and gas could more than double by 2030, to serve areas such as West Africa and the Arctic (Lloyd's Register et al. 2013, pp. 118-19).[75]
- Further demand from LNG technology, port reception facilities, reduction in shipping noise, compliance checking systems, e-navigation solutions.
- Link to Blue Biotech: provision of alternatives to anti-fouling hull coatings (e.g. nano-skins).

Scope of Marine Data and Information Services

- Maritime Spatial Planning: design of "motorways of the sea", safe shipping lanes, defining zones with no shipping and/or shipping guides, etc.
- Marine Knowledge: develop integrated ocean services for safe navigation, ship routing and risk assessment.
- Marine Knowledge: develop satellite-based maritime tracking, container screening and monitoring systems and biometric ID port perimeter security.
- Marine Knowledge: develop a better understanding of the oceans through environmental monitoring and data analysis.
- Develop a marine forecasting and reanalysis skill base (i.e. mapping, modelling, forecasting, GIS).
- Support compliance and surveillance through application of ICT including data analytics.
- Improving products and services for marine monitoring, i.e. sensors, robotics, communications.
- Increasing direct collaboration with other marine sciences.
- New ways of "marketing/labeling" clean shipping (i.e. clean shipping index).

Link to existing and planned KIC themes

- ICTLabs

Profile of actors (to be refined to distinguish between those important for KIC and existing EU initiatives addressing the theme)

- SEAS-ERA NET[76]
- WATERBORNE Technology Platform[77]
- Maritime, Naval and Coast Guard Academies
- Naval Architecture, Ship Design, Marine Engineering, Marine Electronics, ICT Universities
- Marine Institutes
- Ship yards
- Marine engineering and electronics companies
- Investors in ICT research, i.e. IBM, Microsoft, Fujitsu
- Shipping industry, collaboration with Asian shipyards, develop Europe as engineering laboratory/component industry, SMEs are important here.

Regional dimensions, what is important where

All sea basins.

Added value for a KIC, cross-fertilisation, value chain

A KIC could bring together the cross-disciplinary skills and teams required for the engineering and fabrication of a new generation of marine vessels and structures, incorporating advances in materials and robotics.

[75] OECD Council Working Party on Shipbuilding (WP6)

[76] http://www.seas-era.eu/np4/homepage.html

[77] www.waterborne-tp.org

Table IV.2 Details of Blue Growth KIC Topics underpinning the 'Model' Marine/Maritime KIC - Food, Nutrition and Health

Scope

Innovation to support sustainable and environmentally friendly fisheries and aquaculture, based on the ecosystem approach, and to provide a range of quality, healthy and value-added seafood products and a livelihood to dependent coastal communities. Innovation to develop full potential of blue biotechnology.

Relevant MEAs

- Fish for human consumption and animal feeding
- Marine aquaculture
- Blue biotechnology

Emerging Maritime KIC Issues

Pertinent S&T disciplines:

- Fisheries science, marine biology, genomics, microbiology
- Biological, physical and chemical oceanography
- Meteorology
- Applied mathematics, statistical modelling, ocean modelling and forecasting/hindcasting
- Marine engineering, naval architecture
- Economics
- Information and communications technology

Education Needs:

- Training fisheries scientists, mathematical modellers and related Earth Science disciplines to address scientific, management and economic dimensions of the fisheries and aquaculture sectors.
- Requirement for critical mass of highly skilled workers in research and innovation for all sectors.
- e-learning tools

Cutting Edge Research:

- **Fish:** Data collection (CFP), stock assessment, sustainability of the resource, multi-species modelling to support mixed fisheries advice and management; understanding climate change induced changes on biogeography and physiology of commercially important species; fishing gear, reduction of discards, fishing vessel design, energy efficiency; traceability of product; socio-economic assessment and evaluation of management regulations, regional management plans, market development and technological advancements on dependent fishing and coastal communities.
- **Marine aquaculture for food**: disease control, sustainable feed source, combating disease, reduce/minimise organic and chemical waste, new species; recirculating aquaculture systems, innovation in energy source, offshore aquaculture systems including multi-purpose platforms; traceability of product; streamlining environmental and regulatory interactions.
- **Blue biotech / related upscaling processes**: discovery & bioprospecting, process & product development, up-scaling & commercialisation with consideration of sub-sectors, Health, Cosmetics, Food, Energy, Aquaculture, Marine Environmental Health, Bio-refineries; traceability of product.

Innovation Potential:

- **Fish**: sustainability of the resource, stock assessments, dealing with discards, innovative technology, vessel and equipment design and compliance, business innovation in retail aspect of fishing; promotion of safe, nutritious, healthy European seafood, including certification and branding.
- **Marine aquaculture for food:** Innovation in stock enhancement, disease prevention, new species, new production technologies including multi-purpose structures (servicing energy, aquaculture and marine biotech activities), improved cultures and feeding techniques; promotion of safe, nutritious, healthy European seafood, including certification and branding.
- **Marine aquaculture for other purposes**: development of biorefinery concept (technology & economic combinations) using combined innovation in e.g. bio-energy, environmental remediation, high value blue biotechnology products
- **Blue biotech**: huge potential for innovation and spill-over effects on other industries (e.g. cosmetic, pharma, food, chemical). Marine biotechnology can be an important source of products to combat bio-fouling on ships and marine structures, or stimulate natural habitats through bio-remediation or produce food compounds to supplement fish feed.

Scope of Marine Data and Information Services

- **Marine Knowledge:** develop a better understanding of the oceans through environmental monitoring and data analysis (new / integrated nutrient calculations)

- **Marine Knowledge:** develop a marine forecasting and reanalysis skill base / develop a fisheries modelling and stock assessment skill base (i.e. mapping, modelling, forecasting, GIS)
- **Marine Knowledge:** invest in recruitment databases; high value blue biotechnology product DNA databases.
- **Combined economics:** develop financial models for biorefinery concept covering products & services with "market value" as well as non-market value
- **Marine Knowledge, Compliance, Traceability:** develop ICT to support vessel and equipment compliance; traceability of product.
- **Maritime Spatial Planning:** define spatial site selection criteria / new spatial opportunities for aquaculture including offshore/deepwater and on-shore aquaculture.

Link to existing and planned KIC themes

- Food4Future
- ICTLabs
- Climate
- Innovation for healthy living and active ageing
- Added Value Manufacturing

Profile of actors (to be refined to distinguish between those important for KIC and existing EU initiatives addressing the theme)

- SEAS-ERA[78]: Towards Integrated Marine Research Strategy and Programmes
- MARTEC II[79]: Maritime Technologies II
- BiodivERsA[80]: Biodiversity Research ERA-NET
- COFASP ERA-NET[81]: Strengthening cooperation in European research on sustainable exploitation of marine resources in the seafood chains ERA-NET
- ICES[82]: Intergovernmental Council for the Exploration of the Sea
- Marine Biotech CSA – ERA-NET[83]: Preparatory action in Marine Biotechnology
- BS ERA-NET[84]: Networking on science and technology in the Black Sea region
- Susfood[85]: Sustainable Food ERA-NET
- Network of Excellence Marine Genomics Europe[86], Framework Programme
- JPI Oceans[87]: Joint Programming Initiative Healthy and Productive Seas and Oceans
- Investors in ICT, Biotechnology

Regional dimensions, what is important where

- **Fish**: all sea basins
- **Marine aquaculture for food:** Mediterranean Sea, North Sea, Baltic Sea, Black Sea, Atlantic Arc[88]
- **Marine aquaculture for other purposes (e.g. biorefinery concept)**: Baltic Sea, North Sea
- **Blue biotech**: Atlantic Arc, Baltic Sea, North Sea, Mediterranean Sea

Other dimension

- **Blue biotech:** not many people employed, so far not much money, but potentially big impact. Main players are found in Spain, France, UK and Germany.

Added value for a KIC, cross-fertilisation, value chain

Effective partnerships between education, research, business innovation and stakeholders will play a major role in finding solutions to sustainable fisheries and aquaculture and to developing marine biotechnology by translating new scientific and technological knowledge into social and economic benefits.

[78] http://www.seas-era.eu/np4/homepage.html
[79] http://www.martec-era.net/
[80] http://www.biodiversa.org/
[81] http://cordis.europa.eu/projects/index.cfm?fuseaction=app.details&TXT=cofasp&FRM=1&STP=10&SIC=&PGA=&CCY=&PCY=&SRC=&LNG=en&REF=106875
[82] http://www.ices.dk/Pages/default.aspx
[83] http://www.marinebiotech.eu/
[84] http://www.bs-era.net/main/index.php?we=9bfdbe988abcff430168e60524a69c11&wchk=c1960ad06e70dbaee80ab8641db51532
[85] https://www.susfood-era.net/
[86] http://www.euromarineconsortium.eu/fp6networks/marinegenomics
[87] http://www.jpi-oceans.eu/servlet/Satellite?c=Page&pagename=jpi-oceans/Hovedsidemal&cid=1253960389368
[88] Marine aquaculture is not highlighted in Atlantic Arc sea basin analysis but is included here based on scale and forecast of salmon farming industry in the region.

Table IV.3 Details of Blue Growth KIC Topics underpinning the 'Model' Marine/Maritime KIC - Energy and Raw Material

Scope

Sustainably harvest of mineral, oil and gas resources, taking into account environmental impacts, the use of marine space, appropriate governance and dealing with safety and hazards. Sustainable development and competitiveness of Europe's marine renewable energy sector.

Relevant MEAs

- Offshore oil & gas
- Offshore wind
- Ocean renewable energy
- Carbon capture and storage
- Marine minerals
- Aggregates mining

Emerging Maritime KIC Issues

Pertinent S&T disciplines:

- Marine engineering
- Geology/Geophysics
- Physical, chemical, biological oceanography, meteorology
- Applied mathematics, statistical modelling

Education Needs:

- North Sea important hub of knowledge and expertise in oil and gas sector, sharing of knowledge important factor for advancing innovation potential and adapting existing expertise to other sectors.
- Requirement for critical mass of highly skilled workers in geology, geophysics, oceanography and marine engineering to support research and innovation.
- Metocean modelling forecasting/hindcasting.
- Retraining of fishermen to work in offshore sector (e.g. North Sea example)
- e-learning tools

Cutting Edge Research:

- Improved resource assessment techniques, novel 2D/3D seismic imaging, risk analysis particularly deep sea environments.
- Cabling and grid infrastructure.
- Novel approaches to electricity storage.
- Improve cost competiveness.
- Materials and engineering: application of innovative materials to increase the reliability of technology.
- Design tools for different components to allow for an integrated design approach (multi-physics modelling).
- Adapting existing expertise/approaches (e.g. Oil and Gas sector) to other sectors (e.g. Offshore wind, Ocean renewable energy, …).
- Sensors, remote condition monitoring and adequate data management, to record specific environmental conditions and important machinery health metrics.
- Electrical and physical device connection and disconnection methods, optimising processes and procedures to allow installation and retrieval in short weather windows.
- Marine forecasting, improving weather window forecasting, particularly through improved availability of wind, tidal current and wave forecasting for met-ocean conditions at relevant wave and tidal sites.
- Critical assessment of carbon capture and storage in the oceans, its potential environmental impacts and long-term monitoring and management requirements.
- Assessment of environmental impacts of deep sea mining and mitigation techniques.
- Impacts of increased off-shore sand and gravel extraction for beach nourishment and to counteract sea level rise impacts.

Innovation Potential:

- Innovation in design and engineering (i.e. offshore structures, robotics).
- New generation of turbines, less maintenance.
- Steep learning curve in installation and logistics.
- North Sea important hub of knowledge and expertise in oil and gas sector, sharing of knowledge important factor for advancing innovation potential.
- Improved methods for enhanced oil recovery.

- Improved exploration techniques for identifying and quantifying marine gas hydrates and assessing their economic potential.
- Developing innovative techniques for exploration and production of natural gas from hydrate-bearing sediments, including economic evaluation and risk assessment of each technique.
- Research and innovation could potentially make new reserves accessible.
- Developing sub-seabed carbon storage and sequestration techniques, including economic evaluation and risk assessment of each technique.
- New acoustic monitoring technologies and systems.
- Synergistic development of offshore energy/aquaculture/observation and associated technologies.

Scope of Marine Data and Information Services

- Environmental Monitoring including acoustics;
- **Marine knowledge:** developing a marine forecasting and reanalysis skill base (i.e. mapping, modelling, forecasting, GIS)
- ICT to support operations, inc. integrated Digital Ocean service, Robotics and Control Systems
- **Maritime Spatial Planning:** improved site selection / grid connections based also on cross-border solutions (allowing for balancing differences in energy production) / combined solutions of energy sites with other maritime uses (i.e. aquaculture) – spatial efficiency.

Link to existing and planned KIC themes

- InnoEnergy
- Climate
- ICTLabs
- Added Value Manufacturing
- Raw materials – sustainable exploration, extraction, processing, recycling & substitution

Profile of actors (to be refined to distinguish between those important for KIC and existing EU initiatives addressing the theme)

- JP EERA Ocean Energy[89]: coordination of ongoing Marine Renewable Energy research
- ERA NET Ocean Energy: coordination of funding of Marine Renewable Energy research
- Marine Renewable Energy Scottish Cluster: universities, agencies and 3rd level institutions
- Energies Marine (France), Technalia (Spain), SEAI (Ireland), Fraunhofer – Wind Systems (Germany) and others
- Portugal and Macronesian archipelago
- Atlantic Power Cluster[90]

Regional dimensions, what is important where

- **Offshore oil & gas:** North Sea, Atlantic Arc, Black Sea, Mediterranean Sea[91]
- **Offshore wind:** Atlantic Arc, North Sea, Baltic Sea, Mediterranean Sea[92]
- **Ocean renewable energy:** Atlantic Arc
- **Carbon capture and storage:** North Sea
- **Marine minerals:** Atlantic Arc
- **Aggregates mining:** North Sea, Atlantic Arc

Added value for a KIC, cross-fertilisation, value chain

- Can help meet requirement for multidisciplinary teams in order to ensure expertise across a range of skills
- Can accelerate knowledge exchange, cross-border, and cross-sector collaboration.
- Meets need for industry to pool resources and work together more effectively.
- Provides focus, and gives confidence, for projects and actions to promote synergies and technology transfer across maritime sectors (e.g. shipbuilding / maritime transport (freight and passengers) / offshore energy / fisheries / aquaculture/oil and gas/carbon capture), particularly in respect to large-scale novel offshore technologies.
- Enables experience and knowledge transfer, for example from North Sea, Atlantic Arc to Baltic and Mediterranean sea basin.

[89] http://www.eera-set.eu/index.php?index=29
[90] www.atlantic-power-cluster.eu
[91] Cyprus, Turkey and Israel
[92] France, Italy and Greece investigating combined platforms for wind and aquaculture

Table IV.4 Details of Blue Growth KIC Topics underpinning the 'Model' Marine/Maritime KIC - Coastal Protection and Development

Scope

Sustainable development of coastal tourism underpinned by the protection of the coastal environment through implementation of Marine Strategy Framework Directive, Floods Directive, Integrated Coastal Zone Management and Maritime Spatial Planning Directives.

Relevant MEAs

- Protection against flooding and erosion
- Preventing salt water intrusion
- Protection of habitats
- Coastal tourism
- Securing fresh water supply

Emerging Maritime KIC Issues

Pertinent S&T disciplines:

- Environmental Science, Hydrology, Biological, Physical, Chemical Oceanography, Meteorology
- Civil engineering
- Environmental economics
- e-learning tools

Education Needs:

- Improving education and training: increasing environmental sustainability of the coastal tourism industry (also against the background of (existing) regulatory measures).
- Encouraging ocean literacy and recognizing the potential for a broad range of marine/maritime leisure and tourism opportunities.
- Requirement for curricula that address fundamentals and implementation of Maritime Spatial Planning, Integrated Coastal Zone Management, Marine Strategy Framework and Floods Directives.
- Requirement for curriculum that addresses economics of ecosystems and the environment.

Cutting Edge Research:

- Research on the implementation of Maritime Spatial Planning, Integrated Coastal Zone Management, Marine Strategy Framework and Floods Directives and sustainable ICZM practices.
- Impact of climate change on coastal regions (i.e. sea level rise, extreme weather events, flooding, droughts).
- Forecasting, mapping, risk assessment.
- Strengthen sustainability of maritime and coastal tourism through integrated regional approaches, increase income for local groups as opposed to "big" companies.
- Innovative approaches to environmental remediation: clean water, beaches.
- Research on social innovation to address seasonality of coastal tourism, including volatility of demand and improve accessibility and visibility.
- Better understanding of economics of ecosystems and environmental monitoring needed.
- Methods to assess economics and monetary valuation of ecosystem services.

Innovation Potential:

- Innovative business models, enhance competitiveness and strengthen response capacity.
- Application of ICT to promote skills, innovation, access to resources and innovative marketing.

Innovative mapping, valuation and finance tools to assess economics of ecosystem services.

Scope of Marine Data and Information Services

- Environmental Monitoring and better use of national/Member State monitoring and resource assessment programmes.
- **Marine knowledge:** developing a marine forecasting and reanalysis skill base (i.e. mapping, modelling, forecasting, GIS)
- Better communication, including ICT tools.

Maritime Spatial Planning: integration of MSP with ICZM and integration of MSP / coastal planning with territorial planning; improved tools to facilitate consideration of coastal protection / future climate change requirements into MSP / ICZM

Link to existing and planned KIC themes

- Innovation for healthy living and active ageing
- Climate

- ICTLabs
- Added Value Manufacturing

Profile of actors (to be refined to distinguish between those important for KIC and existing EU initiatives addressing the theme)

- Competence Centre for Good Environmental Status, to be developed within the Joint Research Centre (JRC)
- EEA[93], European Environment Agency
- ECTAA[94], European Travel Agents' and Tour Operators' Associations
- European Boating Industry[95]
- NECSTouR[96], Network for European Regions for Sustainable and Competitive Tourism
- HOTREC[97], Association of Hotels, Restaurants and Cafes in Europe
- Other … e.g. attract adventure leisure sport companies with interest in coastal protection

Regional dimensions, what is important where

- All sea basins.

Other dimension

Coastal tourism large, important, mature sector particularly in Mediterranean but so far not innovative (strong need) due to strong competition, lack of finance by high number of micro-enterprises.

Added value for a KIC, cross-fertilisation, value chain

KIC can help build improved mechanisms for knowledge-transfer from science to policy to support implementation of MSFD, MSP and coastal protection methods and technologies all the while providing for sustainable development of coastal tourism and leisure sector.

[93] http://www.eea.europa.eu/
[94] http://www.ectaa.org/
[95] http://www.europeanboatingindustry.eu/
[96] http://www.necstour.eu/necstour/necstour.page
[97] http://www.hotrec.eu/

Table IV.5 Details of Blue Growth KIC Topics underpinning the 'Model' Marine/Maritime KIC - Marine Data and Information Services

Scope

The application of Marine Information and Communications Technology to support the development of technology and services related to Environmental Monitoring, Marine Knowledge, economic & monetary valuation of marine ecosystems; Surveillance, Compliance, Traceability and Maritime Spatial Planning. It includes sensors (in-situ and remote), communications, data management, processing, analysis and modelling, and effectively enables the development of all other Blue Growth KIC themes.

Relevant MEAs

- Environmental Monitoring
- Traceability and security of goods supply chain
- Prevent and protect against illegal movement of people and goods

Other:

- Marine Knowledge
- Maritime Spatial Planning
- Surveillance
- Compliance

Emerging Maritime KIC Issues

Pertinent S&T disciplines:

- Information and Communications Technology
- Environmental science, biological, physical, chemical oceanography, meteorology
- Marine and civil engineering
- Marine electronics
- Applied mathematics, statistical modelling
- Economics
- e-learning tools

Education Needs:

- Applied Marine ICT curricula
- Developing core skills in data analytics, ocean modelling forecasting/hindcasting
- Marine mapping, GIS, data management
- Environmental economics

Cutting Edge Research:

- Ocean Observing Systems: sensors, platforms and cyber infrastruture.
- New materials, instruments.
- Multidisciplinary data integration techniques, product development
- Socio-economic modelling & interdisciplinary decision-support tools ?

Innovation Potential:

- Integration of multiple data sources and data analytics for ocean monitoring, modelling and forecasting.
- Product development.
- Intelligent sensors and robotics to support work in remote and offshore locations.
- Development of 'Digital Ocean' capability.
- Incorporation of the fishing sector into real-time monitoring and forecasting system.
- Eco-genomic sensors linked to ocean observation systems.
- Downscaling of global climate models to predict the climate change impact at regional, sub-regional seas and local areas.
- Improve monitoring of economic data.

Link to existing and planned KIC themes

- ICTLabs
- Climate
- Added Value Manufacturing

Profile of actors (to be refined to distinguish between those important for KIC and existing EU initiatives

addressing the theme)

- MyOcean[98]
- EMODNET[99]
- Trans-Atlantic Cooperation: Atlantic Arc Marine Institutes, NOAA and Canadian agencies

Regional dimensions, what is important where

- All sea basins in the context of global monitoring for environment and security (Copernicus[100]). Atlantic Arc additionally driven by cross-Atlantic cooperation intergovernmental agreements[101].

Added value for a KIC, cross-fertilisation, value chain

- Provides an effective platform/mechanism for trans-Atlantic Marine Observation
- Supports sustainable development in all existing MEAs
- Accelerates development of novel marine technologies

98 http://www.myocean.eu/

99 http://emodnet.eu/

100 http://www.copernicus.eu/

101 http://www.marine.ie/NR/rdonlyres/89AC763E-9DCC-4D84-AF34-1EF363B3994B/0/SignedGalwayStatement24MAY2013.pdf

ANNEX V: Details of the KIC Scoreboards

V.1 Climate KIC Scoreboard

Table V.1 Overall Scoreboard – Climate KIC

	Indicator	Overall Score	Maritime Transport & Shipping	Food, Nutrition & Health	Energy & Raw Material	Coastal Protection & Development	Marine Data & Information Services
Maritime Topics	Number of BG KIC topics addressed at topic level	28%	25%	38%	38%	25%	13%
Maritime Projects	Number of BG KIC topics addressed at project level	50%	42%	33%	58%	58%	58%
Relevance of Projects	Relevance of projects to model KIC issues	30%	19%	25%	33%	41%	33%
			Education	Research	Innovation		
	Distribution of projects across KT		8%	42%	50%		
Maritime Partners	Maritime profile of partners	81%	Education	Research	Innovation		
	Distribution of maritime partners across KT		45%	27%	27%		
	Number of patents	10	0	3	3	4	0
	Number of publications	544	5	164	253	15	107
Geographic Dimension	Marine/maritime network analysis						
	Geographic distribution of maritime partners						

Table V.2Number of BG KIC topics addressed at topic level - Climate KIC

Climate KIC Topics (8)	Score	No. of times BG KIC topics addressed under Climate KIC topics	Maritime Transport & Shipping	Food, Nutrition & Health	Energy & Raw Material	Coastal Protection & Development	Marine Data & Information Services
Greenhouse Gas Monitoring							
Adaptation Services	1	18	3	2	3	5	5
Making Transitions Happen							
Sustainable Cities	0,4	2	1		1		
The Built Environment							
Land and Water	0,2	1				1	
Resource Efficiency/Industrial Symbiosis	0,4	2		1	1		
Developing a Bio-Economy	0,2	2		2			
No. of Climate KIC Topics by BG KIC Theme	2,2		2	3	3	2	1
Percentage of Whole	28%	28%	25%	38%	38%	25%	13%

Table V.3Number of BG KIC topics addressed at project level – Climate KIC

Climate KIC Maritime Projects (12)	Percentage of BG KIC topics addressed by Project	Maritime Transport & Shipping	Food, Nutrition & Health	Energy & Raw Material	Coastal Protection & Development	Marine Data & Information Services
Delivering sustainable energy solutions for ports (SUSPORTS)	40%	1		1		
Working with nature	40%	1			1	
Open access catastrophe model (OASIS)	40%				1	1
Microalgae biorefinery	40%		1	1		
Implementation & adoption of carbon footprint in tourism travel packages (IMPACT)	40%				1	1
Horizon scanning in the European bioeconomy (Biohorizons)	40%		1	1		
Extreme events for energy providers (E3P)	60%	1		1		1
Interface applications and serious games (I-Apples)	40%				1	1
Investments need to bridge the climate induced water gap (Water2Invest)	40%				1	1
Climate impact expert systems (CIES)	100%	1	1	1	1	1
Climate data factory (CDF)	100%	1	1	1	1	1
Carbon-neutral, low emission gas turbine using steam injection	20%			1		
Percentage Maritime Projects addressing BG KIC topics	50%	42%	33%	58%	58%	58%

Table V.4 Relevance of maritime projects to model KIC issues – Climate KIC

Climate KIC Maritime Projects (12)	Relevance by Project	Maritime Transport & Shipping	Food, Nutrition & Health	Energy & Raw Material	Coastal Protection & Development	Marine Data & Information Services	Knowledge Triangle Line
Delivering sustainable energy solutions for ports (SUSPORTS)	40%	+++		+++			I
Working with nature	27%	+			+++		R
Open access catastrophe model (OASIS)	26%				++	++	I
Microalgae biorefinery	33%		+++	++			R
Implementation & adoption of carbon footprint in tourism travel packages (IMPACT)	27%				+++	+	R
Horizon scanning in the European bioeconomy (Biohorizons)	20%		++	+			R
Extreme events for energy providers (E3P)	33%	+		+++		++	I
Interface applications and serious games (I-Apples)	26%				++	++	E
Investments need to bridge the climate induced water gap (Water2Invest)	13%				+	+	I
Climate impact expert systems (CIES)	53%	+	++	+	++	++	I
Climate data factory (CDF)	53%	+	++	+	++	++	R
Carbon-neutral, low emission gas turbine using steam injection	7%			+			I
Percentage Relevance by BG Theme	30%	19%	25%	33%	41%	33%	6I:5R:1E

Table V.5 Maritime profile of partners, distribution across KT – Climate KIC

	Type			Maritime		
Country	Education	Research	Business	Education	Research	Business
France	2	2	1	2	1	1
Germany	1	3	1	1	3	
Netherlands	3	1	4	3	1	2
Switzerland	1			1		
UK	1	1		1	1	
Denmark	2		2	2		1
Spain			1			1
Italy			1			1
Total	10	7	10	10	6	6
Percentage	37%	26%	37%	45%	27%	27%
Total	27			22	81%	

Table V.6 Number of patents & publications – Climate KIC

Partner Institute	Overall Total		Offshore oil and gas		Marine aquaculture		Blue biotechnology		Offshore wind		Ocean renewable energy		Marine minerals mining		Desalination		Coastal protection		Traceability		Environmental monitoring	
	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB
Imperial College	4	33		24			3		1					7		2						
Univ. Utrecht	0	61		17						5		36						3				
Univ. Paris 6	0	206		16		16		44		7				11						5		107
Delft Univ. Tech.	5	61		14					1	17		27			4	3						
ETH	0	26		14										10				2				
Tech. Univ. Denmark	1	72		14		10		33	1	15												
Wageningen Univ.	0	36		13		18										2		3				
Univ. Copenhagen	0	43				22		21														
Tech. Univ. Berlin	0	6								6												
Total	10	544	0	112	0	66	3	98	3	50	0	63	0	28	4	7	0	8	0	5	0	107

	Aggregated partner scores	Maritime Transport & Shipping	Food, Nutrition & Health	Energy & Raw Material	Coastal Protection & Development	Marine Data & Information Services
Total Publications	544	5	164	253	15	107
Total Patents	10	0	3	3	4	0

V.2 InnoEnergy Scoreboard

Table V.7 Overall Scoreboard – InnoEnergy

	Indicator	Overall Score	Maritime Transport & Shipping	Food, Nutrition & Health	Energy & Raw Material	Coastal Protection & Development	Marine Data & Information Services
Maritime Topics	Number of BG KIC topics addressed at topic level	26%	0%	0%	86%	0%	43%
Maritime Projects	Number of BG KIC topics addressed at project lev	27%	0%	0%	100%	0%	36%
Relevance of Projects	Relevance of projects to model KIC issues	19%	0%	0%	65%	0%	32%
	Distribution of projects across KT		Education	Research	Innovation		
			9%	32%	59%		
Maritime Partners	Maritime profile of partners	56%	Education	Research	Innovation		
	Distribution of maritime partners across KT		36%	29%	36%		
	Number of patents	127	0	0	127	0	0
	Number of publications	110	5	12	59	34	0
Geographic Dimension	Marine/maritime network analysis						
	Geographic distribution of maritime partners						

Table V.8Number of BG KIC topics addressed at topic level - InnoEnergy

	InnoEnery KIC Topics (7)	Score	No. of times BG KIC topics addressed under InnoEnergy KIC topics	Maritime Transport & Shipping	Food, Nutrition & Health	Energy & Raw Material	Coastal Protection & Development	Marine Data & Information Services
	Energy Storage	0,2	6			6		
	Energy from Chemical Fuels	0,4	3			2		1
Sustainable Nuclear & Renewable Energy Convergence		0	0					
	Smart & Intelligent Cities & Buildings	0,2	1			1		
	Clean Coal Technologies	0,2	1			1		
	Smart Electric Grid	0,4	6			5		1
	Renewable Energies	0,4	8	0	0	7	0	1
	No. of InnoEnergy Fields by BG KIC Theme	1,8		0	0	6	0	3
	Percentage of Whole	26%	26%	0%	0%	86%	0%	43%

Table V.9 Number of BG KIC topics addressed at project level – InnoEnergy

InnoEnergy KIC Maritime Projects (22)	Percentage of BG KIC topics addressed by Project	Maritime Transport & Shipping	Food, Nutrition & Health	Energy & Raw Material	Coastal Protection & Development	Marine Data & Information Services
Active sub-stations	20%			1		
Energy balanced buildings & districts	20%			1		
Electrical energy storage device for cold stores	20%			1		
Roll-out of electric vehicles in cities	20%			1		
Hydrogen hybrid storage	20%			1		
Advanced combustion unit for biomass	20%			1		
Polymer electrolyte nanocomposite for advanced lithium batteries	20%			1		
INDIPACK	20%			1		
Energy system analysis agency (ESAA)	40%			1		1
Neptune 1	40%			1		1
Neptune 2	40%			1		1
Kastrion	40%			1		1
AFOSP	20%			1		
Offshore test station 1	40%			1		1
Offshore test station 2	40%			1		1
New materials for energy systems (NewMat)	20%			1		
Integration of CO2 sequestration with EGOR-CO2 technology (EGOR-CO2)	40%			1		1
Controllable & intelligent power components (CIPOWER)	20%			1		
Electric energy storage	20%			1		
ICT solutions for active distribution networks & customer interaction (INSTINCT)	40%			1		1
Smart grids materials technology	20%			1		
Smart grids from power producers to consumers (SMART POWER)	20%			1		
Percentage Maritime Projects addressing BG KIC topics	**27%**	**0%**	**0%**	**100%**	**0%**	**36%**

Table V.10 Relevance of maritime projects to model KIC issues – InnoEnergy

InnoEnergy KIC Maritime Projects (22)	Number of BG KIC topics addressed by Project	Maritime Transport & Shipping	Food, Nutrition & Health	Energy & Raw Material	Coastal Protection & Development	Marine Data & Information Services	Knowledge Triangle Line
Active sub-stations	7%			+			ERI
Energy balanced buildings & districts	13%			++			ERI
Electrical energy storage device for cold stores	7%			+			I
Roll-out of electric vehicles in cities	7%			+			I
Hydrogen hybrid storage	7%			+			R
Advanced combustion unit for biomass	7%			+			I
Polymer electrolyte nanocomposite for advanced lithium batteries	13%			++			I
INDIPACK	13%			++			I
Energy system analysis agency (ESAA)	40%			+++		+++	I
Neptune 1	40%			+++		+++	I
Neptune 2	40%			+++		+++	I
Kastrion	40%			+++		+++	I
AFOSP	20%			+++			RI
Offshore test station 1	40%			+++		+++	RI
Offshore test station 2	40%			+++		+++	R
New materials for energy systems (NewMat)	13%			++			ERI
Integration of CO2 sequestration with EGOR-CO2 technology (EGOR-CO2)	13%			++		++	RI
Controllable & intelligent power components (CIPOWER)	7%			+			I
Electric energy storage	13%			++			RI
ICT solutions for active distribution networks & customer interaction (INSTINCT)	7%			+		+	RI
Smart grids materials technology	7%			+			RI
Smart grids from power producers to consumers (SMART POWER)	13%			++			I
Percentage Maritime Projects addressing BG KIC topics	**19%**	**0%**	**0%**	**65%**	**0%**	**32%**	**20I:11R:3E**

Table V.11 Maritime profile of partners, distribution across KT – InnoEnergy

	Type			Maritime		
Country	**Education**	**Research**	**Business**	**Education**	**Research**	**Business**
Benelux	2	1	2	1		1
France	1	2	1		1	1
Germany	1	1	2		1	1
Iberia	1	2	1		2	1
Poland	2	2		2		
Sweden	1	1	2	2		1
Sub-total	**8**	**9**	**8**	**5**	**4**	**5**
Percentage	**32%**	**36%**	**32%**	**36%**	**29%**	**36%**
Total	**25**			**14**	**56%**	

Table V.12 Number of patents & publications – InnoEnergy

Partner Institute	Overall Total		Offshore oil and gas		Marine aquaculture		Blue biotechnology		Offshore wind		Ocean renewable energy		Marine minerals mining		Desalination		Coastal protection		Traceability		Environmental monitoring	
	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB
Uppsala University		60				12				8		33		7								
Catholic University of Louvain		31												6		2		23				
University of Stuttgart		10								5										5		
Silesian University of Technology		9														9						
ABB Group	127		115						5				7									
Total	127	110	115	0	0	12	0	0	5	13	0	33	7	13	0	11	0	23	0	5	0	0

	Aggregated partner scores	Maritime Transport & Shipping	Food, Nutrition & Health	Energy & Raw Material	Coastal Protection & Development	Marine Data & Information Services
Total Publications	110	5	12	59	34	0
Total Patents	127	0	0	127	0	0

V.3 ICTLabs Scoreboard

Table V.13 Overall Scoreboard – ICTLabs

Table 1. Scoreboard	Indicator	Overall Score	Maritime Transport & Shipping	Food, Nutrition & Health	Energy & Raw Material	Coastal Protection & Development	Marine Data & Information Services
Maritime Topics	Number of BG KIC topics addressed at topic level	33%	33%	17%	33%	17%	67%
Maritime Projects	Number of BG KIC topics addressed at project lev	32%	17%	8%	25%	8%	100%
Relevance of Projects	Relevance of maritime projects to model KIC issu	17%	11%	6%	14%	6%	50%
			Education	Research	Innovation		
	Distribution of projects across knowledge triangle		21%	71%	7%		
Maritime Partners	Maritime profile of partners	37%	Education	Research	Innovation		
	Distribution across knowledge triangle		64%	9%	27%		
	Number of patents	112	12	9	34	17	40
	Number of publications	281	6	60	72	2	141
Geographic Dimension	Marine/maritime network analysis						
	Geographic distribution of maritime partners						

Table V.14 Number of BG KIC topics addressed at topic level - ICTLabs

	ICTLabs KIC Topics (6)	Score	No. of times BG KIC topics addressed under ICTLabs KIC topics	Maritime Transport & Shipping	Food, Nutrition & Health	Energy & Raw Material	Coastal Protection & Development	Marine Data & Information Services
	Smart Spaces							
	Smart Energy Systems	0,4	4			2		2
	Health & Wellbeing							
	Digital Cities of the Future	0,2	1					1
	Future Media & Content Delivery	1	12	1	1	1	1	8
	Intelligent Mobility & Transportation Systems	0,4	2	1				1
	No. of ICTLabs KIC Topics by BG KIC Theme	2		2	1	2	1	4
	Percentage of Whole	33%	33%	33%	17%	33%	17%	67%

Table V.15 Number of BG KIC topics addressed at project level – ICTLabs

ICTLabs KIC Maritime Projects (12)	Percentage of BG KIC topics addressed by Project	Maritime Transport & Shipping	Food, Nutrition & Health	Energy & Raw Material	Coastal Protection & Development	Marine Data & Information Services
European Virtual Smart Grid Laboratory (EVSGL)	40%			1		1
SOWISO	100%	1	1	1	1	1
Tracking, Senoring Platform (TSP)	40%	1				1
Smart Networks at the Edge	20%					1
Future Internet of Things (FITTING)	20%					1
Information Centric Networking	20%					1
Software Defined Networking	20%					1
Europa	20%					1
Towards a Mobile Cloud	20%					1
Resource Management across Clouds	20%					1
Data Bridges	20%					1
Peer Energy Cloud Project	40%			1		1
Percentage Maritime Projects addressing BG KIC topics	32%	17%	8%	25%	8%	100%

Table V.16 Relevance of maritime projects to model KIC issues – ICTLabs

ICTLabs KIC Maritime Projects (12)	Relevance by Project	Maritime Transport & Shipping	Food, Nutrition & Health	Energy & Raw Material	Coastal Protection & Development	Marine Data & Information Services	Knowledge Triangle Line
European Virtual Smart Grid Laboratory (EVSGL)	13%			+		+	R
SOWISO	66%	++	++	++	++	++	E
Tracking, Senoring Platform (TSP)	26%	++				++	I
Smart Networks at the Edge	13%					++	RI
Future Internet of Things (FITTING)	7%					+	R
Information Centric Networking	7%					+	R
Software Defined Networking	7%					+	R
Europa	13%					++	R
Towards a Mobile Cloud	7%					+	R
Resource Management across Clouds	7%					+	R
Data Bridges	13%					++	R
Peer Energy Cloud Project	26%			++		++	RI
Percentage Relevance by BG Theme	17%	11%	6%	14%	6%	50%	3I:10R:1E

Table V.17 Maritime profile of partners, distribution across KT – ICTLabs

	Type			Maritime		
Country	Education	Research	Business	Education	Research	Business
France	3		4	2		2
Germany	2	1	3	1	1	1
Netherlands	1	2	2			
Finland	1	1	1	1		
UK	2		1	2		
Sweden	1	1	1	1		
Italy		1	2			
Total	10	6	14	7	1	3
Percentage	33%	20%	47%	64%	9%	27%
Total	30			11	37%	

Table V.18 Number of patents & publications – ICTLabs

Partner Institute	Overall Total		Offshore oil and gas		Marine aquaculture		Blue biotechnology		Offshore wind		Ocean renewable energy		Marine minerals mining		Desalination		Coastal protection		Traceability		Environmental monitoring	
	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB	PT	PB
Siemens	59	0	13						12		7				12				6		9	
Univ. Paris 6	0	206		16		16		44		7				11						5		107
University College London	0	61		11						7				7		2						34
Fraunhofer Gesellschaft (FHG)	15	0			6						1				5				1		2	
Imperial College London	4	7					3		1					7								
Tech. Univ. Berlin	0	6								6												
Thales	25	0																	5		20	
Aalto University	0	1																		1		
Alcatel	9	0																			9	
Total	112	281	13	27	6	16	3	44	13	20	8	0	0	25	17	2	0	0	12	6	40	141

	Aggregated partner scores	Maritime Transport & Shipping	Food, Nutrition & Health	Energy & Raw Material	Coastal Protection & Development	Marine Data & Information Services
Total Publications	281	6	60	72	2	141
Total Patents	112	12	9	34	17	40

ANNEX VI: Detailed Project-level Information (all KIC projects, including maritime ones) ➔ See separate, Excel file

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