Project Title: Promotion of green maritime technologies and new materials to enhance sustainable shipbuilding in Adriatic Ionian Region

Project Acronym: NEORION

PROJECT MAIN OUTPUT

T.1.1 Common strategy to enhance innovation capacities related to the sustainable shipbuilding sector

WP: T1 State of the art Analysis

Authors: NEORION PARTNERSHIP

Contents

1. Executive Summary

The current report presents the output T.1.1 of the project "NEORION - Promotion of green maritime technologies and new materials to enhance sustainable shipbuilding in Adriatic Ionian Region", and namely the "Common strategy to enhance innovation capacities related to the sustainable shipbuilding sector", as realized by the partnership of the project.

The output that NEORION intended to achieve was the **elaboration of a strategy focusing on the creation of the NEORION Cluster, to set the common design and implementation framework for all PPs**. This output was achieved through the implementation of all the deliverables of the WP T1: State of the art Analysis and namely the following deliverables:

- T.1.1.1 National reports on current state situation of shipbuilding/ship repair/ ship revision sector
- T.1.1.2 National and Macro-regional report on applications and maritime technologies industry
- T.1.1.3 Integrated report and identification of common challenges and opportunities in Adriatic-Ionian area
- T.1.2.1 Design of a common mechanism to be applied and boost the operation of the Green Shipbuilding Cluster
- T.1.2.2 Identification of main national actors and their needs
- T.1.2.3 Scientific Committee Working Group Evaluation

As a result, a common strategy for the creation of the NEORION cluster has been established.

The output/ common strategy was also discussed and validated within the 1st Scientific Committee Meeting working group evaluation, which was organized in November in Ljubljana, Slovenia.

The next steps, as the project progresses, include the testing of this strategy in the daily operation of the cluster through the pilot activities and contact with the cluster members within the WPT2.

2. Methodology for the realization of the Output

The methodology for the realization of the output was discussed and decided among the partners under the coordination of the Lead Partner (University of the Aegean).

The **first step** towards the elaboration of the strategy was the actual implementation of the foreseen deliverables under the WP T1, which laid the basis for this current output. The work was carefully monitored to follow quality procedures and achieve pre-defined results in order to allow the incorporation of the required information in the output document.

Under the coordination of each responsible PP, with the overall monitoring of the LP – who is also the WP Leader of the WP T1, the deliverables were implemented, check and revised where needed in order to fulfill the purpose of their implementation. The deadlines were respected or extended if more time was needed to achieve the work in a quality and meaningful manner.

The following table presents the distribution of the work among the partners for all the deliverables of the WP T1, as described in our project action plan:

Deliverables	Responsible PP	Comment / Contributions
T.1.1.1 National reports on current state situation of Shipbuilding/ Ship repair/ Ship revision sector	**UAEGEAN**	The National reports will be elaborated by: • Greece: **UAEGEAN** with the support of **PPA** • Italy: **CCIAA DL** with the support of **MoD - ITN** and **UNIBO** • Croatia: **BI** with the support of **UNIZAG FSB** • Slovenia: **TPLJ** under the coordination of **UAEGEAN**
T.1.1.2 National and Macro-regional reports on applications and maritime technologies industry	**UNIZAG FSB**	The National reports will be elaborated by: • Greece: **UAEGEAN** with the support of **PPA** • Italy: **UNIBO** with the support of **MoD - ITN** and **CCIAA DL** • Croatia: **UNIZAG FSB** with the support of **BI** • Slovenia: **TPLJ** under the coordination of **UNIZAG FSB**
T.1.1.3 Integrated report and identification of common challenges and opportunities in Adriatic Ionian area	**UNIBO**	The comparative report will be elaborated by the **UNIBO** with the support of **CCIAA DL**, **UNIZAG FSB** and **TPLJ.**
T.1.1.4 Policy Framework of Shipbuilding sector in ADRION Area	**MoD - ITN**	The policy framework will be elaborated by **MoD - ITN**, with the support of **UAEGEAN**, **PPA**, **UNIZAG FSB** and **TPLJ**.

T.1.2.1 Design of a common mechanism to be applied and boost the operation of the Green Shipbuilding Cluster	**BI**	The mechanism will be designed and developed by **BI** with the support and the approval of the **whole partnership**.
T.1.2.2 Identification of main national actors and their needs	**BI**	The National reports will be elaborated by: • Greece: **UAEGEAN** with the support of **PPA** • Italy: **UNIBO** with the support of **MoD - ITN** and **CCIAA DL** • Croatia: **UNIZAG FSB** with the support of **BI** • Slovenia: **TPLJ** under the coordination of **BI**
T.1.2.3 Scientific Committee Working Group Evaluation	**TPLJ**	The Scientific Committee Working Group Evaluation will be hosted by **TPLJ** (along with the 2nd project meeting). All PPs and ASPs will be invited to participate. Minutes will be prepared by the host.

Table 1: Responsibilities of Partners for WP T1, NEORION Action Plan

The **second step** involved the exchange of opinions within the partnership on the way the common strategy should be structured and elaborated. This was achieved through emails exchange, skype telecommunications and a physical meeting (Ljubljana, project meeting 1st day).

The partnership decided on the following structure that is basically laid out in the current document:

1. Overview of the current state situation of Shipbuilding sector among all participating countries
2. Overview on applications and maritime technologies among all participating countries
3. Conclusions on common challenges & opportunities in the area of interest
4. Overview of the governing policy framework of the ADRION area in shipbuilding and related sectors
5. Key points extracted from the common mechanism of the national clusters towards the enhancement of the cluster operation & the overall sector
6. Mapping of key national actors & their needs
7. Validation with the scientific committee
8. NEORION vision & Objectives
9. Priorities set out for a long-term perspective

The **third step** was the validation of the strategy concluded by a panel of experts that were invited at the Scientific Committee in Ljubljana. The experts invited were either associated partners or other experts that the partners wished to learn their insights because of their expertise either in the sector of shipbuilding either in the formulation & operation of a cluster, or both.

The experts that attended the meeting were:

- **Ivan Adum** (external expert from Croatia)

- **Prof. Peter Vidmar** (external expert from Slovenia, Faculty of maritime studies and transport, University of Ljubljana)

- **Dr. Nikolaos Liapis** (Hellenic Institute of Marine Technologies, associated partner form Greece)

- **Tomislav Uroda** (Croatian Maritime Industry Competitiveness Cluster, associated partner form Croatia)

The **final step** was actually the finalization of the strategy document, the revision & the setting of the project objectives upon a long-term perspective.

3. Overview of the current state situation of Shipbuilding sector among all participating countries

Before defining the situation in the 4 participating countries it would be relevant to present a few facts about the global shipbuilding industry.

The global shipbuilding industry is dominated by three giants in the sector; China, Japan and Korea, which represent almost 95% of the global orderbook by deadweight, each fighting fiercely to defend their market share every year. With 2017 data, China consolidated its top position recording a 44.8% market share, while Japan and Korea swapped positions again with Korea regaining its second place (24.7%) lost in 2016. Japan slipped back to third place in 2017 (23.8%). The 'rest of the world' (RoW) and Europe followed with 4.6% and 1.9% respectively.

The EU shipbuilding sector, currently strives to revive after the severe crisis in 2008 which is still reflected in the performance of the sector in terms of new orders and annual turnover. The high exchange value of Euro is a fact which also affects the EU orders, when even EU shipping fleet owners prefer placing their orders in the 3 dominant sectors, mainly due to cheap construction fees.

In general, there's a global economic shift towards the east and China's contribution to global GDP is expected to rise up to 20% by 2030. Global trade liberization & integration trends are expected to accelerate the economic growth & trade, which heavily relies on ships & cargos, the support service industries & security provided by navies. The underlying trend of increasing economic growth is closely tied to growing naval capability.

Regarding the technological aspect remote operation and artificial intelligence technologies are the new way to support and deliver naval capability. Disruptive technologies (KETs – key enabling technologies – sensors, actuators, micro-power systems and software platforms, behavioral algorithms, artificial intelligence) are expected to finally find their way towards the shipbuilding / ship repair or ship conversion

market while the advance of robotics and 3D printing will localize manufacturing – reducing container shipping demand (especially on longer routes). A new generation of naval ships are being designed for nearly autonomous operation.

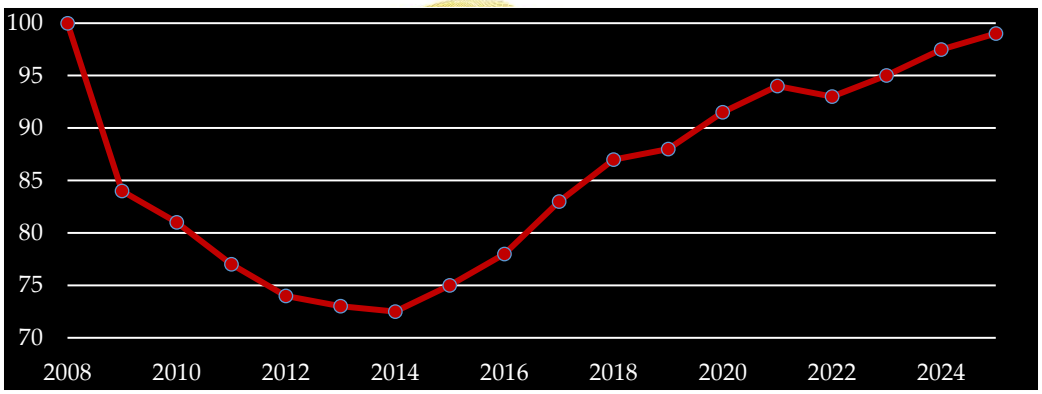
Another thing that is shaping the era we live in is the Internet of Things; it creates a new maritime ecosystem that brings together value added manufacturers, software developers and solutions vendors in an environment where they can optimize vessels performance via solutions such as e-navigation, cyber security and engine room data analytics.

It remains to see whether the 4 participating countries share a common sector profile, common challenges & obstacles to face.

In **Greece** the situation reflects the European status. The sector suffers from big structural changes, privatizations of large shipyards, technological and organizational outdated processes & models (obsolescence of equipment and especially of working methods), along with reduced employment (connected with an aging workforce & inflexible labor relations) & turnover and thus lower productivity. In addition, there's a lack of orientation and strategy on the part both of Greece's two main shipbuilding units and of the state and that is reflected in the crisis of confidence of investors and banks in the shipbuilding industry. The long absence, lasting about 15 years, of the big shipyards from the markets for building new merchant vessels appears to have majorly affected the Greek sector.

A major investment initiative is currently implemented that will exceed the amount of € 55.000.000. In March 2018, the Piraeus Port Authority announced the arrival, with the specialized cargo ship "XIN GUANG HUA" of COSCO Shipping, of the new "PIRAEUS III" floating dock of 22,000 tons lifting capacity, which can serve ships up to 240 m. length, 35 m. width, with transport capacity of 80,000 tons (PANAMAX) and disposes modern crane equipment. The new floating dock is expanding the existing infrastructure, aiming to attract more ships to the Ship Repair Zone of Perama from the wider region of Mediterranean and will contribute to the boosting of Ship Repair industry by creating new working positions, declaring the port of Piraeus into a ship repair hub in the Eastern Mediterranean.

Italy is also facing the results of the economic crisis however in 2016, Italian domestic market was able to recover to 2012 levels. While, since 2010 (with the only exception of 2012) Italian export market registered a regular increase. Export has a central role, since 2016 it has represented 81% of the turnover from domestic production, 77% of which are sold to EU countries and the remaining 23% to non-EU countries. The shipbuilding industry shows a loss in turnover in 2009 (referring to "big" and, particularly, "medium" and "small" enterprises), followed by seven years of substantial stagnation (until 2016). A new growth has been registered in the following two years, with strong and accelerated growth forecasts (*ref. Evolution graph below*).



Slovenia appears to face also the same problems and even at a slightly higher level since the industry currently does not include the so-far biggest shipyard of the country in operation (Shipyard in Izola, Ladjedelnica Izola d.d.). However data shows that the industry of production of pleasure and sport boats is alive and booming, especially in the aftermath of recession. Even more successful is the sector of repair and maintenance of boats and ships, showing a long tradition of Slovenia's shipbuilding industry and of Slovenia's strong nautical tourism.

The shipbuilding sector in **Croatia**, had more than 435 million EUR in shipbuilding and ship repair, according to data of 2015. Some of the Croatian shipyards are trying to adapt to the global trends and are trying to specialize in the construction of complex vessels. Croatian large shipyards are members of CESA (Central European Shipbuilding Association). CESA members produce 99% of EU vessels, and cover the maintenance and repairs segment. Findings claim that shipbuilding in Croatia should not be mainly oriented towards construction of simple and medium-sized ships, because there is a strong competition in South Korea, China and Japan, which offers highly competitive prices that Croatian shipyards cannot offer. Therefore, it is necessary to reorientate the construction of more complex, special types of ships. In such "market niches" competition is not so strong and the prices are generally higher. Future of Croatian shipbuilding will be strongly determined by ability to adopt such considerations.

Concluding the overview of the regional reports, the 4 countries possess similar profiles in terms of current situation, growth potential, threats and also sector business structure, which basically leads the NEORION partnership to one sole and common direction towards the strategy to be defined for the enhancement of the shipbuilding sector in those areas and the whole ADRION macro-region.

4. Overview on applications and maritime technologies among all participating countries

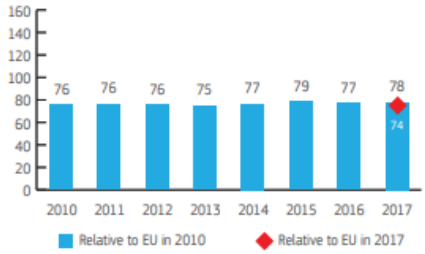
The current chapter aims to investigate the profile of the participating countries in terms of technological development, maritime technologies developed and the innovation profile of the countries.

According to the European Innovation Scoreboard 2018 Italy, Croatia & Greece are Moderate Innovators, while Slovenia is considered a strong innovator. The overtime innovation performance of the countries has evolved as follows:

- Italy & Slovenia have increased performance relative to that of the EU in 2010
- Greece has stable performance to that of the EU in 2010
- Croatia has declined performance relative to that of the EU in 2010.

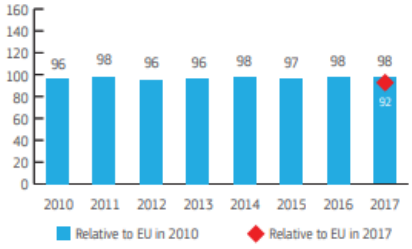
The following graphs are derived from the European Innovation Scoreboard 2018 reports and present the performance evolution of the countries for the period 2010 to 2017. Strongest & weakest innovation dimensions are pointed out for each country.

Italy is a **Moderate Innovator**. Over time, performance has increased relative to that of the EU in 2010.



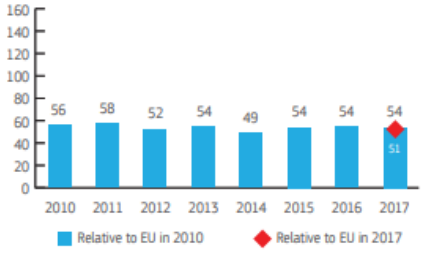
Innovators and Intellectual assets are the strongest innovation dimensions. Human resources and Finance and support are the weakest innovation dimensions.

Slovenia is a **Strong Innovator**. Over time, performance has increased relative to that of the EU in 2010.



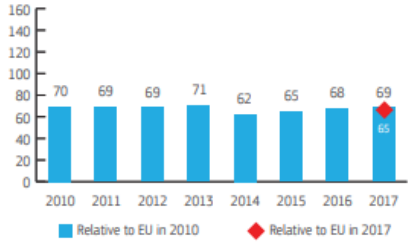
Human resources and Firm investments are the strongest innovation dimensions. Finance and support, Sales and Employment impacts are the weakest innovation dimensions.

Croatia is a **Moderate Innovator**. Over time, performance has declined relative to that of the EU in 2010.



Firm investments and Innovators are the strongest innovation dimensions. Sales impacts and Intellectual assets are the weakest innovation dimensions.

Greece is a **Moderate Innovator**. Over time, performance has remained the same relative to that of the EU in 2010.



Innovators, Linkages, and Attractive research systems are the strongest innovation dimensions. Intellectual assets and Finance and support are the weakest innovation dimensions.

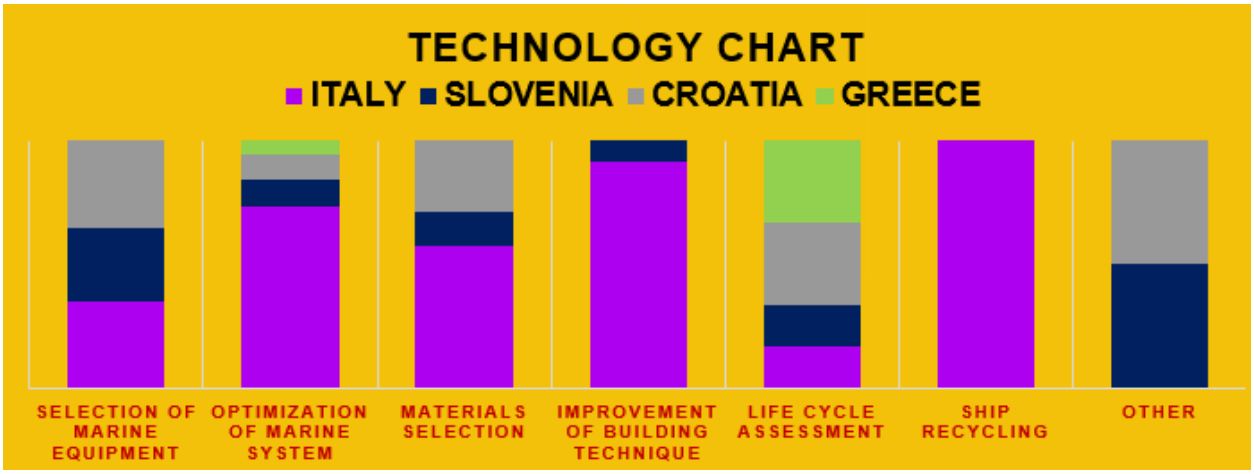
Looking at the above information, we can observe complementarities and opportunities for knowledge transfer among the countries. For example Slovenia is strong in Human resources dimension, while Italy is lacking behind on this aspect. On the contrary Italy appears strong in Intellectual Assets dimension, which are considered weak points for both Croatia & Greece.

In terms of technologies, the collection concerned seven main technology types:

1. Selection of Marine Equipment
2. Optimization of Marine System
3. Materials Selection
4. Improvement of Building Technique
5. Life Cycle Assessment
6. Ship Recycling
7. Other

Which have been further split into several subcategories each, in order to reflect the wide range of applications that are relevant to the shipbuilding / ship repair and ship conversion industries. The full range of technology types examined can be seen in the Annex 1.

The technologies collected at this stage were 69, however we can observe different number of technologies being collected by each country.



For example Italy collected 39 technologies, Slovenia 12, Croatia 14 and Greece 4. However the numbers aren't representative of the counties' technological profile because for example Greece did not consider the yachting or pleasure boats sector while many of the Italian technologies gathered belong to this subsector.

Possibly a more accurate picture of where the countries stand, can be given through the comparison matrix of the deliverable T.2.1.1 International Best Practices in Green Shipbuilding technologies & applications, where each country is compared to the best shipbuilding practices identified at international level.

Best Practice / Technology covered by each Country	GR	IT	HR	SI
No Ballast System	√		√	
LNG Fuel for Propulsion				√
LNG Fuel for Auxiliary engine				√
Sulphur Scrubber System			√	
Advanced Rudder and Propeller System		√		
Speed Nozzle				
Hull Paint	√	√		
Waste Heat Recovery System				
Exhaust Gas Recirculation				
Water in Fuel				
Improved Pump and Cooling Water System				
Sail and Kite Propulsion System		√		
Fuel and Solar Cell Propulsion				√
Electric Ships				√
Sandwich Plate System (SPS)		√		√
Usage of VFDs (Variable-frequency drives) on pumps and blowers				
3-D Printing Technology	√	√		
Shipbuilding Robotics				
Buckypaper				

Among 19 best practices, counties have adapted from 2 to 5 of them which basically translates to the fact that the overall ADRION region is more or less lacking progress in the latest technological developments in the shipbuilding sector.

5. Conclusions on common challenges & opportunities in the area of interest

In this section the S.W.O.T analyses prepared by the responsible partners are provided:

GREECE

STRENGTHS	**WEAKNESSES**
- Ideal Geographical Location - Extensive experience and highly coherent network - Big size of Greek Shipping sector – many Greek fleet owers	- Cost levels (wage levels) - Access to skilled labor / aging workforce - access to finance (lack of confidence to invest in the industry) - Many structural changes to Greek economy - low productivity (organizational rigidities) - Lack of coherent governmental policy to support the sector - outdated facilities & obsolete equipment
OPPORTUNITIES	**THREATS**
- New market segments, move towards building vessels not easily built in low-labour-cost countries (complex vessels) - Many SMEs under-exploited - Prospects of specialization on green shipbuilding - EU programmes and actions that support innovation in relevant sectors such as LeaderSHIP or Seaborne 2020 - Enhanced requirements regarding shipping standards - Cosco investments in the Perama Shipbuilding Zone	- Greek shipowners are not willing to change the flag under which they operate - Price competition - Financial Crisis - Limited national funds - Greek investments to foreign markets

STRENGTHS	WEAKNESSES
- Strategic position in the ADRION area; - Presence of enterprises operating in the fields of shipbuilding, ship repair and ship revision, in each of the regions considered; - Presence of large, medium and small enterprises; - Numerous amount of enterprises; - Multifunctional harbours (activities' diversification); - Presence of high-profile brands; - Strong integration of the maritime cluster with national economy.	- Small/medium sized shipping sector; - Not fully open and competitive market; - Strong influence of non-economic factors; - Crisis of European predominance in shipbuilding market to the advantage of other world regions (e.g. Asia); - High costs for naval services; - High labour costs; - Difficulties in adapting to increased international competition and growth levels; - Loss of global markets quota; - Decline in shipbuilding employment.
OPPORTUNITIES	**THREATS**
- Provide cost-competitive services; - Improve services' quality; - Increase general levels of richness for the sector; - Presence of foreign investors; - Increase the competences and experience of entrepreneurs, workers and public authorities; - Cooperation with research centers to increase competitiveness.	- Inadequate/underdeveloped infrastructures; - Negative effects of global economic crisis; - Economic crisis mainly affecting SMEs; - Chaotic organization of harbours; - Fragmented responses from local authorities; - Increased competition from Italian and foreign operators; - Ageing workforce; - Urban congestions affecting also maritime sector; - Delocalization in other European and extra-European regions.

STRENGTHS	WEAKNESSES
– tradition & knowledge – professional & technical expertise – higher education institutions – established research activities in the field of ship component production – "in-house" research division present in companies – subcontractors are a part of the production process – high adaptability & quick response to market changes – world-renowned design solutions & technical innovations (yacht sector)	– only 1 large enterprise in shipbuilding – fragmented production & research – insufficient protection of intellectual rights – insufficient industrial capacities for production of boats & ships – no tertiary education programme on shipbuilding – research activities are not (always) in line with market needs
OPPORTUNITIES	**THREATS**
– develop new training & education programmes – stimulate private-sector based research activities – stimulate entrepreneurship ecosystem with new grants and financial schemes – establish a maritime cluster – niche specialization of SMEs	– lack of a national strategy on shipbuilding – lack of a national shipyard – brain-drain – (too) high taxes on vessels' production & ownership – limited penetration of international markets

CROATIA

STRENGTHS	WEAKNESSES
– Strong and long-term shipbuilding tradition – Fully developed infrastructure at coastal region – Available specialists – three universities in Croatia – Labor costs cheaper compared to some EU countries – Versatile production programme	– Opening to global market with better strategies – Recognizing R&D potential and importance – Improving management (professional versus political) – Fostering of research and development by own demands (maritime country)

OPPORTUNITIES	THREATS
– Difficulties with financing schemes – Overall low industrial level in Croatia (suppliers) – Technological development not up to date – Organizational weaknesses inherited from EXYU system – National strategies and regulatives not clear enough and not supportive – Marketing strategies – Low level of interrelationships – R&D activities not supported	– Labour costs more expensive compared to eastern countries – Weak national strategies and regulations – Financial schemes not improved – R&D not developed – technology transfer is not possible

Taking a good look mainly to the threats identified by all countries we can derive the conclusion that the challenges faced by all are common and can basically be summarized to the following:

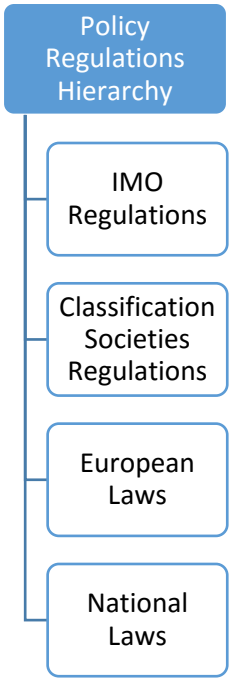
1. Expensive labor costs compared to eastern countries
2. Limited or non-existence national support framework
3. Limited R&D activity
4. Weak presence of actors (individually) in the global markets
5. Economic crisis
6. Obsolete Infrastructure & equipment
7. Strict organizational rigities in the shipyards

NEORION partnership aims to support the countries involved by defining this common strategy to tackle the issues in ADRION area. Looking at the challenges identified and the foreseen activities of NEORION, we can pinpoint activities that address each of the specific challenges indicated above. For example the formulation of the cluster in the ADRION area aims to improve the positioning of the actors in the international markets, while the technical seminars to be implemented address the issue of lower R&D activities as they aspire to transfer knowledge & leading technologies to the cluster members. As we work on the objectives of this current strategy, we will be able to determine specific actions drawn up from their strengths & the opportunities, for each common challenge that the countries are facing.

6. Overview of the governing policy framework of the ADRION area in shipbuilding & related sectors

As far as the governing regulations are concerned, the project identified all the relevant policy framework that is applicable to all four countries, as well as national regulations that apply to each individually.

In general, the hierarchy of the obligatory policy framework in the ADRION area is depicted in the following graph:



Naturally by definition, the first three in the hierarchy of policy regulations are applicable to all countries, while the national laws apply only to each nation separately.

As first we should define which are the laws that regulate the shipbuilding sector in all participating areas.

IMO (International Maritime Organization) is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships. IMO's work supports the UN SDGs.[1] The member states of the International Maritime Organization (IMO) have over the years agreed to articles, protocols, annexes and unified interpretations of the International Convention for the Prevention of Pollution from Ships (MARPOL), originally from 1973 and modified by the Protocol of 1978, in short form MARPOL 73/78.The six Annexes cover the following areas:

[1] http://www.imo.org/en/About/Pages/Default.aspx

Annex I: prevention of pollution by oil.

Annex II: control of pollution by noxious liquid substances in bulk.

Annex III: prevention of pollution by harmful substances carried by sea in packaged form.

Annex IV: prevention of pollution by sewage from ships.

Annex V: prevention of pollution by garbage from ships.

Annex VI: prevention of air pollution from ships.

A classification society is a non-governmental organization that establishes technical standards for the construction and operation of ships. A classification society is an independent legal entity, usually assuming the corporate form that establishes basic minimum standards for the design, construction and maintenance of the principal hull and machinery components of vessels. A classification society composes and publishes a set of rules and standards setting forth the minimum requirements and criteria to be followed for the design and construction of vessels. In developing the rules, the classification society's staff relies upon prudent marine engineering principles, theoretical research and experience. A vessel owner seeking to enrol its vessel in a particular classification society must satisfy the classification society that the vessel has been designed, constructed and maintained in accordance with those rules. When these standards and rules are applied, the classification society issues a classification certificate, used by the ship-owner to be able to register the ship and obtain a marine insurance.

The more prominent classification societies are:

- the American Bureau of Shipping, based in the United States;
- Lloyds, based in the United Kingdom;
- DNV-GL (DetNorske Veritas - Germanischer Lloyd), based in Germany and Norway;
- Nippon (NKK), based in Japan;
- Bureau Veritas, based in France;
- Registro Italiano Navale (RINA), based in Italy;
- Polski Rejester Statkow (PRS), based in Poland.

The rules for shipbuilding are subdivided into five parts, from A to E:

- Part A: Classification and Surveys
- Part B: Hull and Stability
- Part C: Machinery, Systems and Fire Protection
- Part D: Service Notations
- Part E: Additional Class Notations

The Commission is addressing issues affecting the shipbuilding industry through a variety of policy measures, in particular **LeaderSHIP 2015** and **LeaderSHIP 2020** (1 MB). The European Legislation for shipbuilding is also focused in the safety of the ships on sea and the control of environmental pollution.

As of 1 January 2015, EU Member States have to ensure that ships in the Baltic, the North Sea and the English Channel use fuels with a sulphur content of no more than 0.10%. This is the so called SOx-Emission Control Area (SOx-ECA) requirement which applies also under international law in virtue of the designation of those sea areas as SOx-ECAs under the MARPOL Convention.

As of 1 January 2020, EU Member States will also have to ensure that ships in all EU waters except SOx-ECAs use fuels with a sulphur content of no more than 0.5%. The same requirement, also called the global sulphur cap, will also enter into force globally as decided in October 2016 by the IMO.

The codified legislation addressing sulphur oxides emissions from shipping in the EU is Directive (EU) 2016/802 regulating the sulphur content of certain liquid fuels. It contains the latest limits for marine fuels mentioned above which were introduced by Directive 2012/33/EU amending Directive 1999/32/EC, and is the result of a sustained period of legislative development. Directive 1999/32/EC was amended in 2005 by Directive 2005/33/EC to reflect the provisions of Annex VI of IMO's Marine Pollution Convention, MARPOL 73/78.

In October 2016, the IMO introduced two new NOx Emission Control Areas: the Baltic Sea and the North Sea. As of 1 January 2021, all ships passing through these NOx Emission Control Areas must use defined mandatory engine standards or equivalent NOx emission reduction technologies to respect the stricter NOx emission levels (Tier III of the IMO NOx regulations – aiming to reduce nitrogen oxide emissions by approximately 70 per cent compared with the Tier II standards).

In recent years, the European Union and its Member States have been at the forefront of improving maritime safety legislation and promoting high-quality standards. The aim is to eliminate substandard shipping, increase the protection of passengers and crews, reduce the risk of environmental pollution, and ensure that operators who follow good practices are not put at a commercial disadvantage compared to those prepared to take short cuts with vessel safety.

Whilst many flag States and owners are meeting their international obligations, their efforts are constantly undermined by those who do not play the game according to the rules. When operators break the rules on safety and environmental protection, they put crews and the environment at risk, and in addition benefit from unfair competition. Shipping is of strategic importance to the EU’s economy: every year, 2 billion tonnes of cargo are loaded and unloaded at EU ports, while one billion tonnes of oil transits through EU ports and EU waters. This is why the EU is constantly developing and intensifying its maritime safety policy to eradicate substandard shipping, essentially through a convergent application of internationally agreed rules.

EU action in the field of maritime safety and protection of the environment generates significant added value to the international legal framework, such as SOLAS and MARPOL. Furthermore, the transposition of IMO rules into the EU legal system ensures their "harmonized application" across the entire EU. In addition, EU plays an important role in improving international standards by initiating and contributing directly to their development and adoption at international level. The European Commission can rely on the technical and scientific assistance of the European Maritime Safety Agency (EMSA)

Relevant EU regulations:

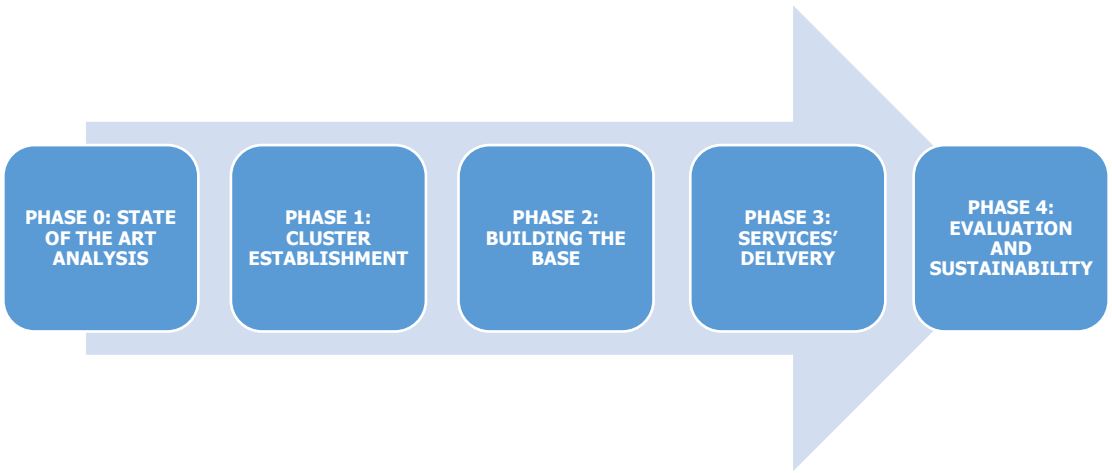
- Regulation (EU) 2018/608
- Directive 2009/16/EC of the European Parliament and of the Council of 23 April 2009 on port State control (Recast)
- Ship Safety Legislation
- Directive 2009/45/EC
- Regulation (EC) No 336/2006
- Directive 2003/25/EC
- Directive 2001/96/EC
- Directive 1998/34/EC
- Directive 1997/70/EC

At national levels, the legislation is mainly adopting the EU rules for all 4 countries.

7. Key points extracted from the common mechanism of the national clusters towards the enhancement of the cluster operation & the overall sector

The aim of the mechanism was to allow the partners to work in a defined, common, accepted way through the implementation of the next steps of NEORION that involve the cluster formulation & the service provision to the members. The objective of a Cluster is to bring together independent companies and institutions in order to act together and gain benefit in business. Vital part of establishing Cluster within NEORION project are innovators and researchers who develop green technologies applicable in shipbuilding. Triple Helix Concept (private sector companies, research and development community, government ministry and agencies) presents main framework of establishing this Cluster.

The set-up process of a cluster initiative varies substantially according to the purpose it is to fulfil and the circumstances under which the involved members are supposed to cooperate. Nevertheless, within the NEORION project, NEORION Shipbuilding Cluster development process may be broken down into five broad phases, containing nine steps:



PHASE 0: STATE OF THE ART ANALYSIS

PHASE 1: CLUSTER ESTABLISHMENT

- Step 1: Establishment of NEORION Cluster Governance (Cluster Coordinator, Cluster Management Team, Cluster Advisory Board)
- Step 2: Definition of clear objectives for the Cluster
- Step 3: Establishment of National clusters' Teams (Coordinators)

PHASE 2: BUILDING THE BASE

- Step 4: Monitoring of national clusters
- Step 5: Identification of key actors and potential members of national clusters

PHASE 3: SERVICES' DELIVERY

- Step 6: Provision of national clusters' services
- Step 7: Provision of Cluster services (matchmaking etc)

PHASE 4: EVALUATION AND SUSTAINABILITY

- Step 8: Evaluation
- Step 9: Sustainability

Key actors to be involved in Cluster are:

· Industry (SMEs, Large Firms, Startups, Entrepreneurs)

· Research Bodies (Researchers, RTOs)

· Public Authorities (Policy makers, Agencies, Local, Regional, National Authorities)

As to the members, it is important to know partner profile and capacity (economic, organizational and innovative). Benefits which will partner get from a cluster have to be well known as well as the benefits which particular partner will bring to the cluster.

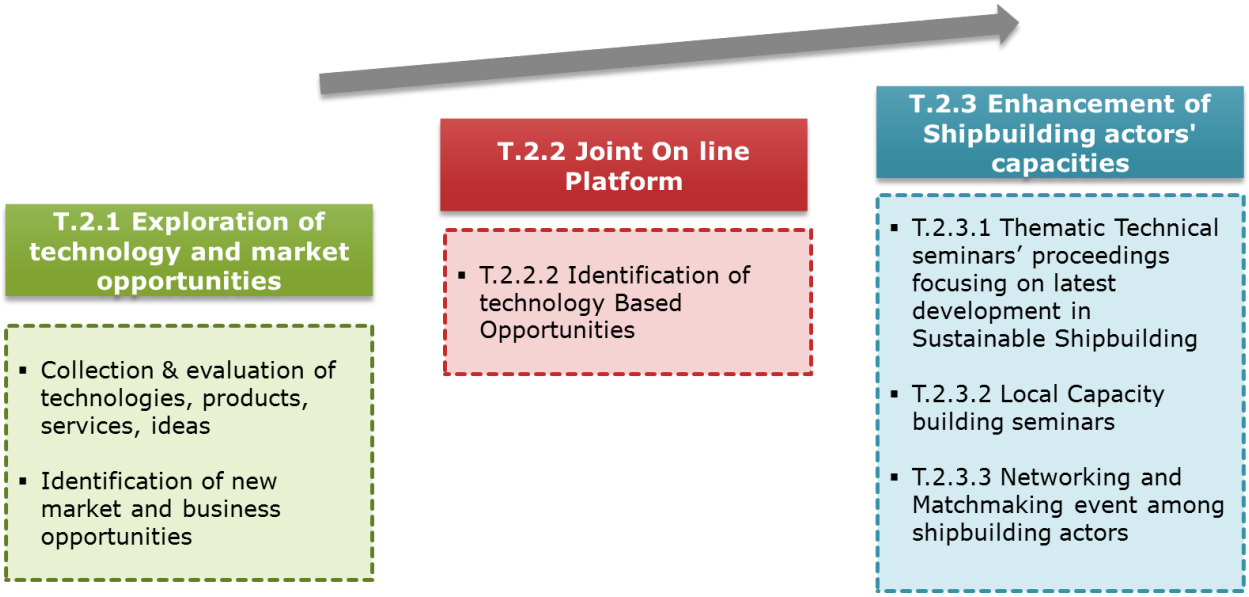
In order to enable alliance within Cluster following guidelines have to be obeyed:

- Establish trust

- Project members are there voluntarily and retain their independence
- Dynamic and flexible organization
- Recognize from the beginning that participants are competitors
- Avoid influence of outside business or public authorities

ENHANCING INNOVATION CAPACITY THROUGH SERVICE DELIVERY

The foreseen services of NEORION cluster to members, as described also in the application form are:



On the basis of past experience and recent research on national level, the above services can provide:

- Education in the area of green ship technology – knowledge exchange within Cluster

- Promotional activities of green ship technologies

- Marketing approach

- Fostering of research activities in this area

- Joint efforts towards national policies

- Monitoring of tenders and funding opportunities applicable for green ship technologies

- Preparation of joint projects – applications for funding or similar.

The benefits of the members

On the basis of past experience and recent research on national level, following benefits are recognized as main focus:

- Promotion of Cluster Members through the Cluster activities (visibility, market access)

- Easier access to capital and funding options (joint applications, help in application process)

- Easier access to government agencies and public bodies

- Strengthening skills – knowledge exchange in the area of green ship technologies

The benefits that NEORION will offer through the common strategy set, are:

SMEs

- Access to advanced information and expertise
- Strengthening skills
- Innovation through strategic partnerships
- Promotion of technologies
- Targeted technology transfer activities
- Participation in networking events
- Promotion through the Cluster
- Access to the international market

Large Firms

- New Opportunities for Open Innovation and Strategic Partnerships
- Opportunities to attract and develop know-how at regional, national and cross-border level
- Participation in a strong network in the Adriatic Ionian

Research Bodies

- Collaboration and exchange of scientific knowledge and information

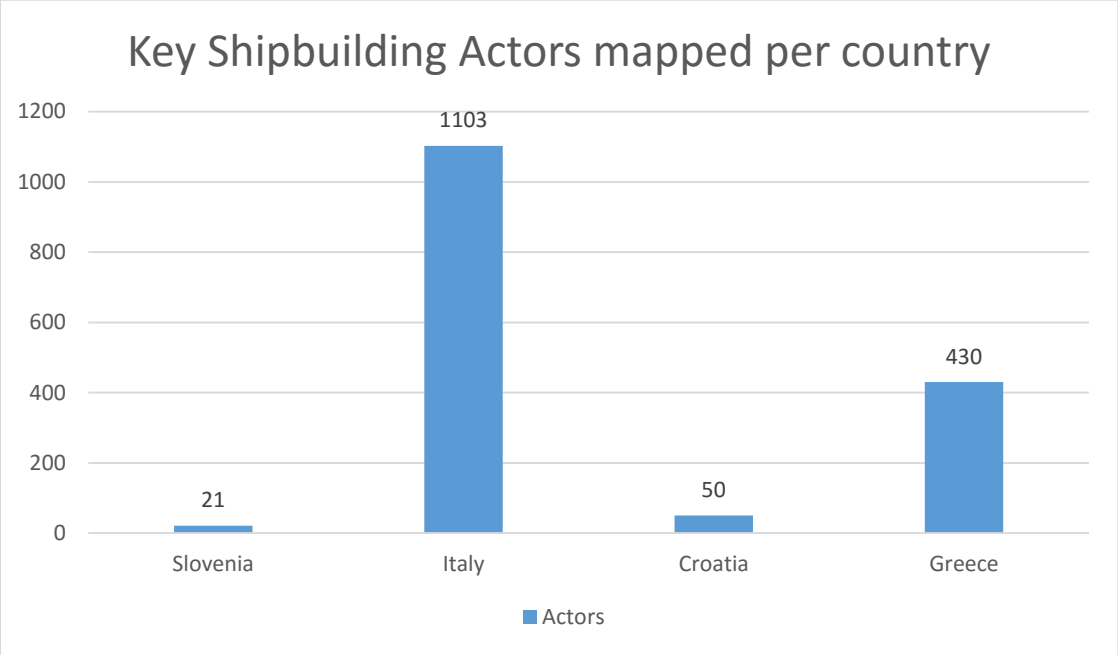
- Exploitation of relevant R & T results
- Common academic opportunities for open innovation
- Facilitating spin-offs or developing existing ones

Public Bodies

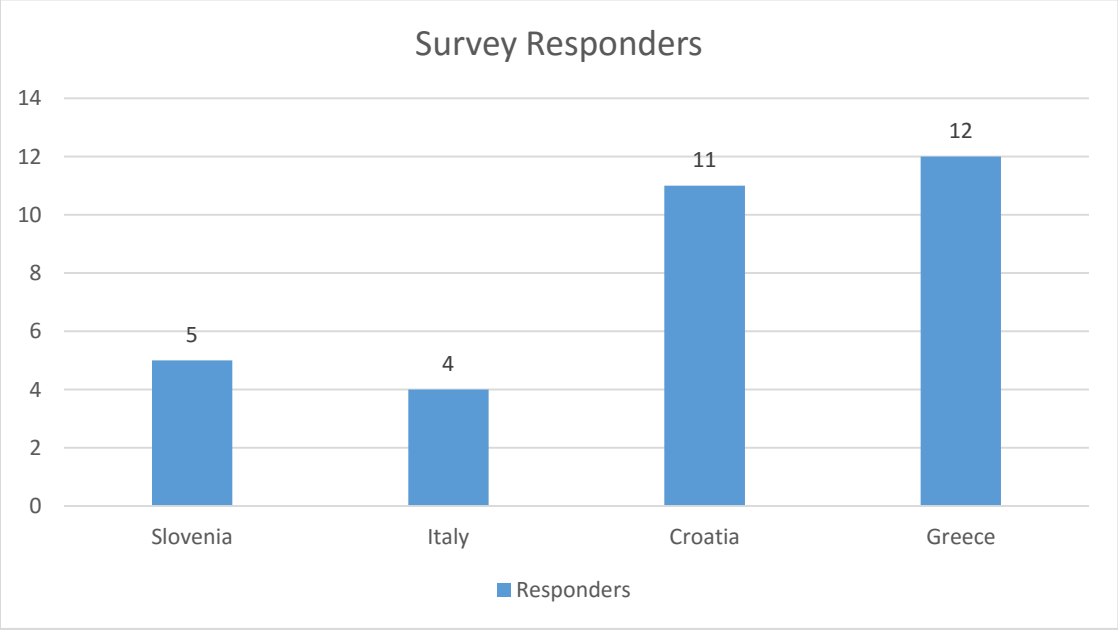
- Exchange experiences and challenges with other countries
- Better understanding of regional and national capabilities and policy plans for economic development
- Promote efforts to accelerate economic growth and the attractiveness of the region
- Validating the EU's Blue Growth Strategy and Smart Specialization Strategies

8. Mapping of key national actors & their needs

So far mapped actors among the countries – concluding from all relevant data up to now & in some cases updated – are depicted in the following graph:



The NEORION Partnership constructed a survey in order to identify the needs of the main actors of the shipbuilding / ship repair and ship conversion industry in the four participating countries (Slovenia, Italy, Croatia and Greece).



The questionnaire was structured around the following issues:

- General info on the Actors
- Info regarding current and past usage of green ship technologies
- Info of projected future needs in the domain of green ship technologies
- Expectations from Cluster

The general conclusions from the whole procedure by all partners were that there was poor reply rate overall which upon feedback collected by the partners was mainly due to:

- Lack of time – companies struggling for every day existence
- Lack of interest – companies strive for every day goals, future not of such interest,
- Lack of interested in green technologies, don't have need for support
- small market, small number of enterprises in total – this one for Slovenia
- extremely difficult time for shipbuilding (largest Shipyard near bankropcy in Croatia)

Challenges for NEORION identified:

- Basic idea does not draw much attention!
- Green technologies not widely recognized as interesting topic
- Communication channels with potential main Actors needs to be adapted

General Info on the participants' Organizations:

GREECE: micro, SME and large companies included

SLOVENIA: SMEs and one large company

CROATIA: SMEs and large companies, research bodies included as well

ITALY: SMEs

Large companies not interested (too strong for Cluster)
Small companies have problems with understanding benefits of the clusters

CROATIA

In Croatia the Majority of the responders were manufacturers of marine equipment, who saw regulatory and industry bottleneck as current challenges faced by the sector in the country. They claim that they do not invest to green technologies due to the limited availability of financial resources, the lack of personnel and the high costs for the investments. They were mostly interested in Financial Support services & support on research activities. Their major expectations from the NEORION cluster are new market opportunities, access to the database with shipbuilding technologies and consulting on financial resources.

SLOVENIA

In Slovenia the responders are hesitant to invest in green technologies mainly due to limited availability of financial resources. They were mostly interested in information services to support their growth and they identified management of team-working and project management as a training need. They saw industry and regulatory bottleneck as current challenges faced by the sector in the country and they were mainly interested for advice on available funding resources, networking & matchmaking events & new market opportunities to be offered by NEORION cluster.

ITALY

In Italy, the majority of the participants were companies that deal with the improvement of the building technique for ships and the optimization of the marine system. Their main expectations from the cluster were funds research, networking & matchmaking events, the database with the relevant technologies & training seminars.

GREECE

In Greece the responders identified R&D as their main weak point which basically translates to the shortage in innovative technologies for the sector. They saw environmental and regulatory bottlenecks as current challenges faced by the sector in the country and their main reason for not investing in green technologies is mostly the high risk associated with it. The participants to the survey were mostly interested for new business opportunities, technical seminars on the latest developments & access to the database information about technologies.

As a conclusion we can derive that the main actors of all countries are falling behind in technological developments, are restricted by the regulatory framework, are afraid to proceed to green investments and are in need of new collaborations and business opportunities.

9. Validation with the scientific committee

The abovementioned results were presented to the scientific committee meeting of the NEORION project, which met in Ljubljana, Slovenia in November 2018 to discuss, revise & validate the results. The experts that attended the meeting were:

- **Ivan Adum** (external expert from Croatia)
- **Prof. Peter Vidmar** (external expert from Slovenia, Faculty of maritime studies and transport, University of Ljubljana)
- **Dr. Nikolaos Liapis** (Hellenic Institute of Marine Technologies, associated partner form Greece)
- **Tomislav Uroda** (Croatian Maritime Industry Competitiveness Cluster, associated partner form Croatia)

The image below is a screenshot of the agenda of the meeting.

Scientific Committee Working Group Evaluation Meeting Agenda

NEORION - Promotion of green maritime technologies and new materials to enhance sustainable shipbuilding in Adriatic Ionian Region

Adriatic-Ionian Programme INTERREG V-B Transnational 2014-2020

20 November 2018

Technology Park Ljubljana, Tehnološki park 19 (building B), SI - 1000 Ljubljana, Slovenia

09:30 – 09:45	Registration and Reception
09:45 – 10:00	Opening Welcome speech – TPLJ
	NEORION WP T1: State of the Art Analysis - Overview of Technical Activities
10:00 – 10:10	D-T.1.1.1 National Reports on Industry & Actors – Overview of findings - UAEGEAN
10:10 – 10:20	D-T.1.1.2 National Reports on Technologies – Overview of findings - UNIZAG FSB
10:20 – 10:30	D-T.1.1.3 Integrated Report – Common Challenges and Opportunities in ADRION – Overview of findings – UNIBO
10:30 – 10:40	D-T.1.1.4 Policy Framework – Overview of findings – MoD ITN
10:40 – 11:15	D-T.1.2.1 Design of a common mechanism for the operation of the green shipbuilding cluster – BI
11:15 – 11:30	D-T.1.2.2 Identification of Main National actors and their needs – Overview of findings – BI
11:30 – 12:00	*Coffee Break*
12:00 – 12:30	Evaluation of Methodology – each associate partner presents its comments
12:30 – 13:00	Moderated discussion on comments– moderated by BI
13:30 – 14:00	Final evaluation report – moderated by BI
14:00 – 15:00	*Networking buffet*

The advisory committee validated the NEORION progress and common results as presented in their Evaluation report (Annex 2 – Scientific Committee Meeting Evaluation report).

As per their assessments our next forthcoming activities will be aimed at the definition of a Joint Action Plan for a further improvement of the strategic results achieved and for a better exploitation of common initiatives and activities among the regional key actors for the improvement of RTD (Research Technology Development) investments and regional capacities and for boosting European competitiveness in the sector.

10. NEORION vision & Objectives

NEORION mission & vision were set based both on the goals of the project as derived by the application form, as well as incorporating the feedback received by the mapping of the state-of-the-art WP activities, which provided a better understanding of the 4 markets and the ADRION macro-region.

Our research has shown that our countries are similar in terms of sector structure, regulatory framework, existing competition, common challenges & skill capacity. This leads us to the definition of a common mission that can be applicable to all 4 countries and relevant for all other European countries with the same profile.

Our mission is therefore defined as such:

NEORION MISSION

Link and synthesize needs and priorities of stakeholders based on development and demands of Green Technologies. Through such approach, the NEORION Cluster will contribute to raising the competitiveness of Shipbuilding Industry & enhancing the skills of the involved actors and stakeholders in the participating countries.

Through aggregation of different actors in maritime field in Adriatic region, Cluster should be recognized as unique player & should create a strong brand name globally, showcasing the countries' competences & the benefits that cooperation will enable.

And our vision is:

NEORION VISION

Increase the economic growth in Adriatic Ionian Region through increased competitiveness of shipbuilding sector and reduced environmental impact of shipbuilding technologies.

The objectives set in the strategy are addressing the common challenges described in this document in a way to exploit the strengths & support the weak points of the countries.

1. Expensive labor costs compared to eastern countries

The labor costs in our countries are a given fact and it is not a factor that could be potentially altered. Thus, our objective will be to aim our manufacturing base to the construction & repair of more complex vessels that would justify the higher costs compared to those of the eastern countries. The 4 participating countries possess long expertise & tradition in shipbuilding & shipping which can be exploited towards the design of more complex ships as suggested above.

2. Limited or non-existence national support framework

The NEORION project is a bright example of financial support to the sectors of shipbuilding / ship repair / ship conversion. While national initiatives are possibly scarce, the actors could exploit funding support schemes of the European Union that lately address the Blue Growth sectors in their vast majority. The Cluster of NEORION aims to inform and educate key actors in the participating countries on funding instruments and support them to apply by enhancing their business skills through the capacity building seminars.

3. Limited R&D activity

This concept will be addressed through the Thematic Seminars of NEORION that will educate actors on newest developments & technologies that could – and potentially should according to IMO rules – be applied to the sector to foster growth and create competitive advantage. In addition, the database of the technologies collected will be shared & synergies will be indicated among transnational actors to potentially collaborate on manufacturing & R&D activities to reduce costs, share knowledge and appear stronger to the international market.

4. Weak presence of actors (individually) in the global markets

The NEORION cluster by itself will address this issue, since its main goal is to create a strong brand of the cluster members to enhance their presence to the international market. Quoting the words of an expert in the advisory board of the scientific committee meeting *"Collaboration is the key towards fighting the competition of China, Japan & Korea. An ADRION cluster which could be potentially a EUROPEAN cluster as it progresses is the solution and we should target the whole Europe to join us. 740 million people (EU population) cannot be considered weak".*

5. Economic crisis

The economic crisis of 2008 still affects and will potentially affect for the forthcoming years the EU actors of all industries. However signs of recovery exist and NEORION aims to inform the main actors of shipbuilding about funding opportunities relevant to them, in order to move the sector forward both in terms of training the workforce but also in creating a strong base sector that can be sustainable and competitive in the long-term.

6. Obsolete Infrastructure & equipment

The collaborations among shipbuilding actors across the participating countries in R&D activities could tackle this issue. Knowledge & technology transfer as well as training & specialization towards the construction of complex vessels can be the right focus for the EU sector to modernize their equipment, through financial schemes that NEORION will inform them about, and be competitive at global level.

7. Strict organizational rigities in the shipyards

Cooperation & focus on one strategic aim can be a key to solve this issue. As young people will be targeted to be trained within the NEORION project, modernization can move the sector ahead in terms of efficiency in the organizational structure & a more favorable investment framework could soften the existing rigities, since the investment risks will be lower in a way.

11. Conclusions

The Common strategy to enhance innovation capacities related to the sustainable shipbuilding sector defined has been elaborated within the project NEORION. The output directly contributes to the Programme Indicator **OI_1b.1_2 Number of strategies and action plans developed by transnational innovation networks and clusters**, as indicated by the partnership also in the Application Form.

The Strategy is set to allow an efficient operation for the effective coordination of the transnational activities of the cluster created within NEORION and allows common understanding between all partners in order to act in a widely accepted way, for the benefit of the project, the partners, the cluster members, the shipbuilding sector and the greater Adriatic Ionian Area.

The next steps taken by the partnership, will be towards the realization of the strategy in the daily operation for the service provision to the cluster members & the validation in actual working environment, through the pilot actions & further cooperation initiatives of the partnership & the ASPs of NEORION.

12. Annex 1 – Main Shipbuilding technology types

A Selection of Marine Equipment

1 Use of Alternative Fuels
   a Low sulphur fuel
   b Exhaust after-treatment devices (Scrubbers)
   c Alternate fuels (LNG, methanol ...)
   d Bio fuels

2 Electric Propulsion System
   a On-board electric balance management systems
   b Shore connection

3 Hybrid Propulsion System
4 Turbochargers
5 Sail and Kite Propulsion System
6 Fuel and Solar Cell Propulsion
7 System for active trim and speed optimization
8 On-board energy system management
   a Waste heat recuperation

9 Air conditioning and lightening management systems
10 Renewable energy sources on-board
11 Wetted surface cleaning submersible robot

B Optimization of Marine System

1 Hull lines
   a X bow design

2 Hull structures
   a Sandwich Plate System (composting two metal plates by bonding with polyurethane elastomer core)
   b Composite materials implementation

3 Piping optimization
4 Electric optimization
5 Modular design
6 Air lubrication system for the hull
7 Advanced Rudder and Propeller System

8 Speed nozzle
9 Appendages for optimization of the propeller flow
10 Paints designated to reduce friction on wetted surface
11 Study the off-design behaviour of the ship

C Materials Selection

1 Innocuous, inoffensive and environment friendly materials
   a Bio-cide free paint with hydrogel
   b Silicon resistance reduction paint

2 Reclaiming and recyclable materials
3 Decrease the quantity of variety and specification of materials
4 Lightweight and high performance materials (composites)
5 Use of recyclable or recycled materials for ship equipment

D Improvement of Building Technique

1 Welding technology
2 Hull construction with outfitting and painting
3 Module and unit technology
4 Super block lifting technique
5 Hull accuracy control technology
6 Secondary steel nesting
7 3D scanning
8 Additive manufacturing
9 Design for dismantling and disassembling

E Life Cycle Assessment

1 Reduction of vibro-acustic emissions of ship propulsion systems
2 Ballast water management
3 Operations
   a Route planing
   b Sensor and Mathematical modelling

F Ship Recycling

1 The materials and equipment are almost entirely reused
2 Ships' generators are reused ashore
3 Hydrocarbons on board become reclaimed oil products to be used as fuel in rolling mills or brick kilns.

4 Light fittings find further use on land

5 New steel production from recycled steel requires only one third of the energy used for steel production from raw materials

6 Ship Recycling Plan (particularly composite pleasure boats)

13. Annex 2 –Scientific Committee Meeting Evaluation report

Report from Slovenian external partner Peter Vidmar, FPP, Faculty of maritime studies and transport

Executive summary and introduction

Foreword

The European Commission (EC) Blue Book *An integrated maritime policy for the European Union* (COM2007/575) considers seas and coasts essential to the well-being and prosperity of Europe, as they constitute commercial passageways, climate regulators, sources of fish, energy and material resources, in addition to providing residential and recreational areas for citizens. In this sense with the communication "an Integrated Maritime Policy for the European Union" (the Blue Book) the EC recognizes that the seas and coasts are essential for the welfare and the prosperity of the Union, underlines the need to rapidly implement an integrated maritime policy to enhance Europe's capability to face the challenges of globalization and competitiveness and maritime safety and security which "must be based on excellence in maritime research, technology and innovation".

The Regions of Knowledge EU Program encourages European regions to share and adopt the best policies and practices as well as to build solid interregional networks through important European economic clusters, including sea economy clusters.

Approving the EC Communication "Towards world-class clusters in the European Union: implementing the broad-based innovation strategy", recognizes the strategic role of local administrations in implementing policies to strengthen sector competitiveness and promoting research and innovation within joint trans-regional cooperation programmes between clusters and networks of connected sectors.

Looking to the future, the competitive advantages gained by the European Union in the maritime industry sector could be maintained only through the further development of coordinated research activities and through a stronger interaction among the key stakeholders at regional and trans-national level. For this reasons investments in research, technological development and innovation represents key actions for economic growth and for boosting European competitiveness.

This guidelines has been conceived in the frame of the NEORION project, financed by European Union with ADRION Programme, and is the result of a jointly work performed by several actors coming from industrial, institutional, scientific and academic sectors of Greece, Italy, Croatia and Slovenia.

Next forthcoming activities will be aimed at the definition of a Joint Action Plan for a further improvement of the strategic results achieved and for a better exploitation of common initiatives and activities among

the regional key actors for the improvement of RTD (Research Technology Development) investments and regional capacities and for boosting European competitiveness in the sector.

Context and approach

The present document - Evaluation Meeting Agenda (here below referred to as EMA) is the result of an extensive discussion of the members of the Technical Steering Committee representatives as well as the integration of collected data from the Regional Research Agendas.

EMA aims at identifying and setting up concerted research strategies necessary for answering to the sector's industrial needs and is the basis for defining common RTD policies and programmes that support their efficient implementation and accomplishment. In particular, the EMA will provide a longer-term view for:

- establishing an active network of both individuals and further bodies collaborating on research and innovation in the maritime industry sector;
- fostering more collaborative research activities within the maritime industry in Adriatic Ionian region;
- setting up key directions for trans-national strategies to encourage and facilitate increased collaborative research and innovation programmes tackling the maritime industry;
- fostering collaborative and multi-centre research projects through the involvement of existing regional excellence structures;
- creating a platform for a detailed implementation plan – Joint Action Plan and related business plan, which will be the developed in the NEORION project.

In this sense, the document provides opportunities and strategies for setting up collaborative research and innovation jointly activities, and is aimed at developing links among policy makers, research and industry stakeholders belonging to Adriatic Ionian region countries.

EMA will summarize common interests and needs of all territories, focusing on activities to be further developed for boosting the shipbuilding and leisure boat industry performance and for contributing to regions development. A particular attention will be paid on the reinforcement of project maritime cluster networks as instrument for creating common visions and strategies for the future and for recognizing European Framework Programs as a pathway for economic and research development. The document will be promoted also through the maritime forum (www.xxxxxxxxxx.eu), created by the project for initiating thematic networking activities among regional actors and for establishing a community of interest on topics related to the maritime sector. In conclusion, the intention of the EMA is to summarize and introduce into the executive level the great research, development and innovation challenges arising from the new economy – acknowledging the importance of continuing and enlarging efforts in research and innovation

in the maritime sector for reaching competitiveness of the maritime industry in the project regions, as well as for contributing to a better mobilization and effective use of resources and funding.

The maritime sector into Adriatic Ionian region

As already mentioned in the introduction paragraph, the analysis carried out underlines main strengths, weaknesses and opportunities of the industrial sector into the three main target regions. The following paragraphs will give an overview on the state of the art on the industrial situation, presenting also some indications for future activities and making some proposals for common collaborations, taking into account also political, economical and institutional frameworks.

The common SWOT realized by the project indicates that in all regions there are strong research competences, especially in the field of components and systems, while a common weakness is, besides Fincantieri in Italy, limited size of enterprises. Opportunities for the sector derives from the good research base and institutional and political framework, but the insufficient technology transfer activities and the increase in personnel costs and services represents a threat.

The SWOT analysis showed the following conclusions:

- common strength is the highly specialized competences (Italy in shipbuilding and yachting, Slovenia in high technological content of leisure boats – motorboats, Croatia in education and research in shipbuilding and Greece in strong shipping industry);
- common weaknesses are the limited enterprise size, and that the public research is not sufficiently in line with companies' innovation needs;
- common opportunities derives from the good institutional and political framework,
- common threats are the insufficient technology transfer activities and brain drain and low interest in sector by young generation. The SME's could not compete with large shipyards and large enterprises in eastern countries (China, Korea, ect.)

Current state of knowledge: after the regional reports

The present paragraph summarizes the result of an intense discussion process among the project participating body within the project and regional stakeholders dealing with shipbuilding and leisure boat industries, as well as represents the summary of key findings of the three Regional Research Agendas.

For better understanding, activities have been divided into two sections:

- research and innovation (carried out projects and on-going projects);
- technology (developed technology to be jointly exploited and technology demand).

The sequent sub-division is regarding the related sectors:

- shipbuilding;
- leisure boat;
- components and systems.

The common agreement is that the level of knowledge in EU as in the Ardiatic Ionian region in shipping and shipbuilding in high and can be compared with the rest of the world. The common idea is to invest in innovations also applying to funds from EU. The level of knowledge could be increased with the exchange of personnel and the creation of clusters. Innovative clusters in shipbuilding should promote green ships and technologies as well as to promote innovations. On the other side we agree that each EU region could not be competitive in shipbuilding with eastern countries. Ardiatic Ionian region cluster should seek the connection with other EU clusters on shipbuilding to promote a common strategy on EU shipbuilding and shipping.

SELECTED JOINT RESEARCH AREAS OF INVESTIGATION:

A COMPETITIVE EUROPEAN MARITIME INDUSTRY

- **Innovative Vessels and Floating Structures**
  - Design Innovation and Systems Optimisation
- **Innovative Marine Equipment and Systems**
  - Intelligent Data Management
- **Tools for Accelerated Innovation**
  - Tools for Design and Analysis
  - Simulation Software for Process Acceleration and Minimising Risk
  - Product Model and Inter-System Data Communication
- **Next Generation Production Processes**
  - Integration of Design and Production Planning
- **Effective Waterborne Operations**
  - Intelligent Maintenance Planning and Optimisation

MANAGE AND FACILITATE GROWTH AND CHANGING TRADE PATTERNS

- **Accelerated Development of New Port and Infrastructure Facilities**
  - Planning Tools for Optimal Logistic Chains and Hinterland Connections
- **Interoperability between Modes**

- Transfer Nodes
- IT Systems
- Intermodality of Transport
- High Quality and Efficient Intermodal Service

- **More Effective Ports and Infrastructure**
  - Equipment and Systems for Faster Cargo Handling
  - Automatic Operation
- **Intelligent Transportation Technologies and Integrated ICT solutions**
  - Simulation of Logistic Chain

Implementation strategy

The EMA, resulted as a dialogue regarding opportunities and strategies for setting up collaborative research, innovation programmes and start a networking will allow to:

- establish an active network on research and innovation in the maritime industry sector;
- set key directions for trans-national research strategies to encourage and facilitate increased collaborative research and innovation programmes tackling the maritime industry;
- foster collaborative and multi-centre research projects through the involvement of existing regional excellence structures.

The EMA is part a strategy for realising the long-term vision on research and technological development strategies and activities in the partner regions, based on the results achieved so far. In specific, a joint Action Plan will be set up, aimed at putting into action collective research activities in the marine industry and setting up concerted strategies for investing in RTD, consequently guaranteeing the sustainability of the NEORION Network and driving economic development in the regions. The Action Plan will also take into consideration the knowledge obtained through the detailed analysis of best practices, accomplished outside the territory of the involved regions.

The Action Plan will tie up to the results achieved within the previous project phases and will include the following measures:

- Full exploitation of available research infrastructures to be shared and used by research institutions, enterprises and SMEs of the involved regions for initiating collective research on advanced technologies for the maritime industry with special focus on shipbuilding, so as to improve the co-operation among the actors and strengthen creative innovation environments.

- Improved usage and exploitation of Structural Funds attributed to the regions as well as European funds by assisting research institutions, industry and SMEs of the regions to apply for funds and to manage and implement research projects.
- Innovation aid by the regions for the production of several products, such as the development and construction of new ship types (prototype) promoting safer and environmentally sound ships, the production of new components and systems of a ship, the production of new procedures in regards to production, planning, logistics or concepts, aimed at providing an incentive for the adoption of innovative technical solutions across the European shipbuilding and marine equipment industry.
- Creation and development of trans-national RTD links towards broader and deeper forms of international collaboration between funding agencies, developing advanced financing and guarantee schemes. In this context, concerted RTD policies will be implemented in coherence with the established trans-national research agenda. These policies shall encompass the launch of joint calls and concerted innovation programmes, resulting in increased investments in RTD and strengthening the regions' RTD capacity, also with regard to the development of high-potential human resources.
- Finding suitable private partners for investment projects in order to generate financing of RTD coming from the private sector, facilitated through the direct connection of project partners to regional industrial clusters and the work in the International shipbuilding dissemination forum.
- Increasing the research potential and the researcher mobility by supporting and initiating programmes of international Ph.D. training with top-level research, conducted e.g. with existing centres in the regions and networks of excellence. In this regard, incentives of regional programmes and joint initiatives will be created that aim to increase the researcher mobility from one region to another and support therefore collaborative research activities.
- Implementation of concrete technology transfer projects, resulted from the matching of technology needs and technology offers achieved through the work in the Liaison Offices, aiming at turning research results into marketable IPRs and/or products.
- Improving SME support services, including the provision of information on the product market of the shipbuilding sector and the assistance in financing issues related to the participation in research and the take up of new technologies.