

Industry Transformation Report: Shipbuilding Industry

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Executive summary

- In 2009, shipbuilding industry employed a total of 342,000 persons in 29 European countries.
- Since the mid-1970s shipbuilding sector in Europe has been shrinking as a consequence of several waves of restructuring.
- In the period 2004-2009 shipbuilding industry (SI) has been growing at a faster rate than the rest of the economy on a regional basis. The strong growth may reflect the lower than average employment baseline in most regions. In most regions this results from the small size of the shipbuilding sector, which is undergoing a catching up process.
- The top 25 regions with the highest level of shipbuilding industry employment host an overrepresentation of the SI sector.
- Physical and conceptual transformation of shipbuilding industry and its respective shipyards is an on going process in Europe. This report identifies six different modes of shipbuilding industry transformation for the 29 reviewed European countries: Industry Shift, Industry Niche, Remnants, Knowledge Centre, Real Estate Development and Heritage Industry.
- The only observed Industry Shift has been towards the offshore renewable energy sources in the 29 European countries reviewed in this report and it usually occurs as a result of shipbuilding decline and is driven by policy-maker's interventions.
- Europe is a strong competitor in the shipbuilding industry on a world scale in the particular niches: luxury yachts, cruise ships, icebreakers, tugboats and naval ships.
- The remnant industries are usually highly specialized and technologically advanced sectors of shipbuilding industries.
- In the past three decades trend of waterfront redevelopment in place of shipyards has been taking place across Europe. A large-scale waterfront redevelopment project is often a combination of interventions that includes the establishment of a knowledge centre, real estate development projects and integrated conservation and adaptable reuse of the built cultural heritage.

Introduction

Transformation of the shipbuilding industry alongside the reinvention of the shipyard spaces of the port cities around the world is a crucial territorial wedge in the twenty-first century competitive growth strategies. During the last four decades European shipbuilding industry, its respective shipyards and port infrastructure have been the locations of large investments that potentially reconstitute and create new forms of social and economic development and thus elevate the position of a particular urban region.

As a highly competitive and dynamic sector, European shipbuilding industry has represented a large portion of the labour force in Europe during the last century. The complexity of the production process and the end product, and its susceptibility to the trends and fluctuations on the global market, makes the ability to adapt and innovate a central part of this industry's working. However, after following several periods of growth and decline in the twentieth century, the shipbuilding sector has experienced a steady fall after the initial economic boom during the 1960s. This led several regions in the European Union that were previously active in the shipbuilding industry to engage in diversification of their production and transformation of this industrial sector.

Physical and conceptual transformation of shipbuilding industry and its respective shipyards is an ongoing process in Europe. It involves the reuse and redevelopment of the old port infrastructure and shipyards, skilled labour and know-how with the purpose to relocate the role of the industry and its respective region in the international context in order to compete on the globally scaled growth strategies. In this sense, transformation of the shipbuilding industry across Europe occurs at different pace and degree of change, thus demonstrating a range of trends of the industry's growth cycle.

This report presents a statistical overview of the shipbuilding industry for **twenty-nine European countries** and identifies transformation trends occurred in existing and former shipyards. A range of different redevelopment trends in the shipbuilding sector in Europe is identified on a number of experiences in which the restructuring projects are particularly prominent. On the basis of these, the report introduces a model of the transformation trends taking place across Europe. These trends are classified according to the degree of change of the shipbuilding sector towards a new activity and its level of connectedness with the original shipbuilding industry. The model is illustrated by using the case of Gothenburg (SE), which presents examples of all transformation strategies discussed in the model. Each transformation strategy is further illustrated through a selection of representative cases across Europe and their analysis.

1 Statistical Analysis

The analysis of the shipbuilding industry uses regional data, and trends of 29 European countries. It is important to note that shipbuilding is a cyclical industry; hence a snapshot in time not always sufficiently portrays the trends in this industrial sector. The data used in this report covers direct employment in shipbuilding industry in Europe. However, there are a number of associated industries and professions that are indirectly working in the shipbuilding sector. Therefore, the total employment within this industrial sector in Europe is expected to be higher.

2 Principal labour markets

The region with the highest level of employment in the shipbuilding industry (SI) is the South-East of Romania, with the Port of Constanța. Striking is the cluster concentration among the top six regions, varying between 7.56 and 23.87. The top 25 regions in Table 1 reveal a tendency to be clustered, as indicated by the high concentration levels. The only exception is Denmark with 0.99, but this is likely result of the classification of the entire country as one region.

Figure 1 - Shipbuilding Industry regional employment concentration

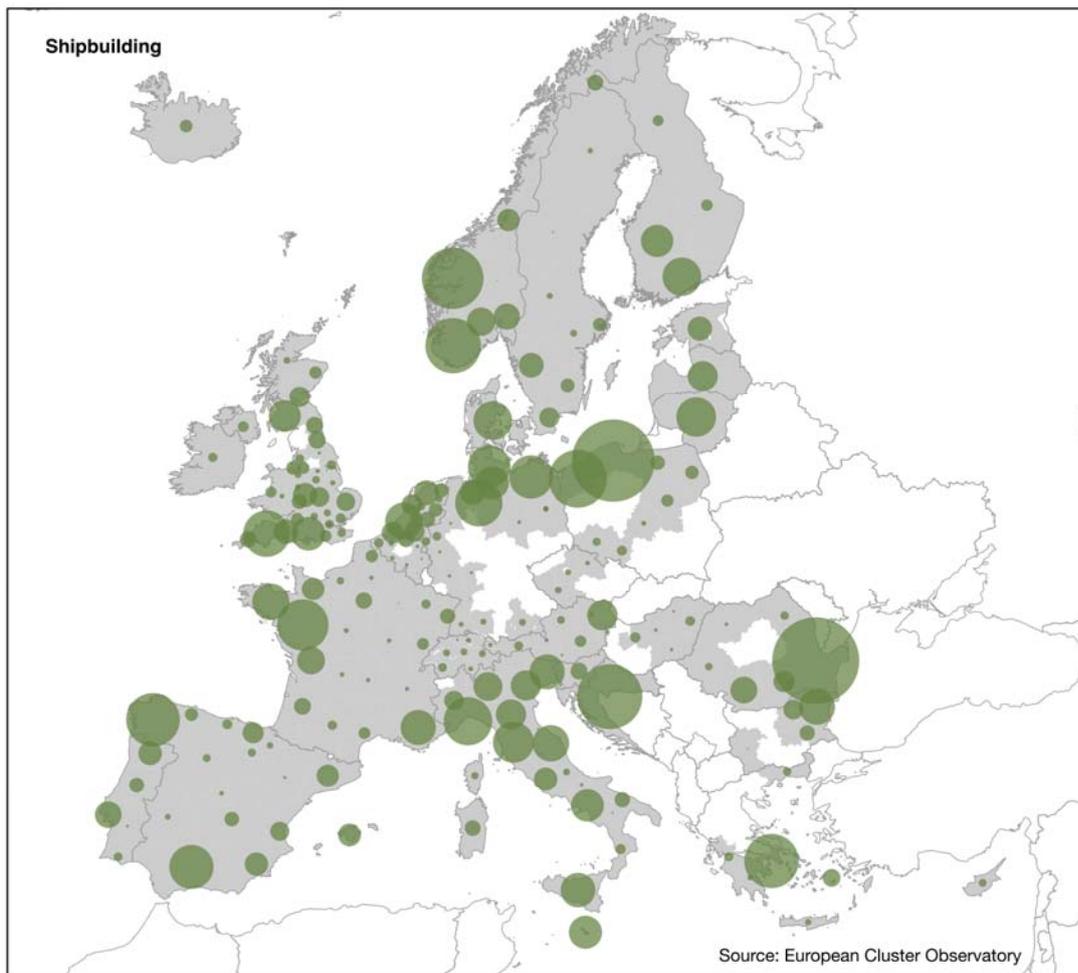


Table 1. Europe's Top 25 regions for Shipbuilding Industries employment clusters.

Region	SI Rank	Employment	European Share	SI LQ
South-Est, RO (Constanta)	1	25,113	7.21%	10.17
Pomorskie, PL (Gdansk)	2	22,718	6.53%	23.87
Croatia	3	14,167	4.07%	7.56
Vestlandet, NO	4	12,582	3.61%	15.78
Zachodniopomorskie, PL	5	11,265	3.24%	16.41
Agder og Rogaland, NO	6	10,239	2.94%	15.15
Attiki, GR	7	9,818	2.82%	2.74
Galicia, ES	8	9,567	2.75%	4.12
Pays de la Loire, FR	9	8,790	2.52%	3.94
Liguria, IT	10	7,787	2.24%	7.52
Niedersachsen, DE	11	7,415	2.13%	1.43
Devon, UK	12	7,214	2.07%	7.57
Andalucía, ES	13	6,484	1.86%	1.05
Mecklenburg-Vorpommern, DE	14	6,292	1.81%	5.76
Schleswig-Holstein, DE	15	6,037	1.73%	3.48
Toscana, IT	16	5,611	1.61%	2.08
Lithuania	17	5,240	1.51%	2.99
Denmark	18	4,965	1.43%	0.99
Etelä-Suomi/Åland, FI	19	4,958	1.42%	2.81
South-Holland, NL	20	4,615	1.33%	1.43
Bretagne, FR	21	4,586	1.32%	2.49
Marche, IT	22	4,469	1.28%	3.82
Severoiztochen, BG	23	4,311	1.24%	3.92
Provence-Alpes-Côte d'Azur, FR	24	4,124	1.18%	1.45
Friuli-Venezia Giulia, IT	25	4,107	1.18%	4.62

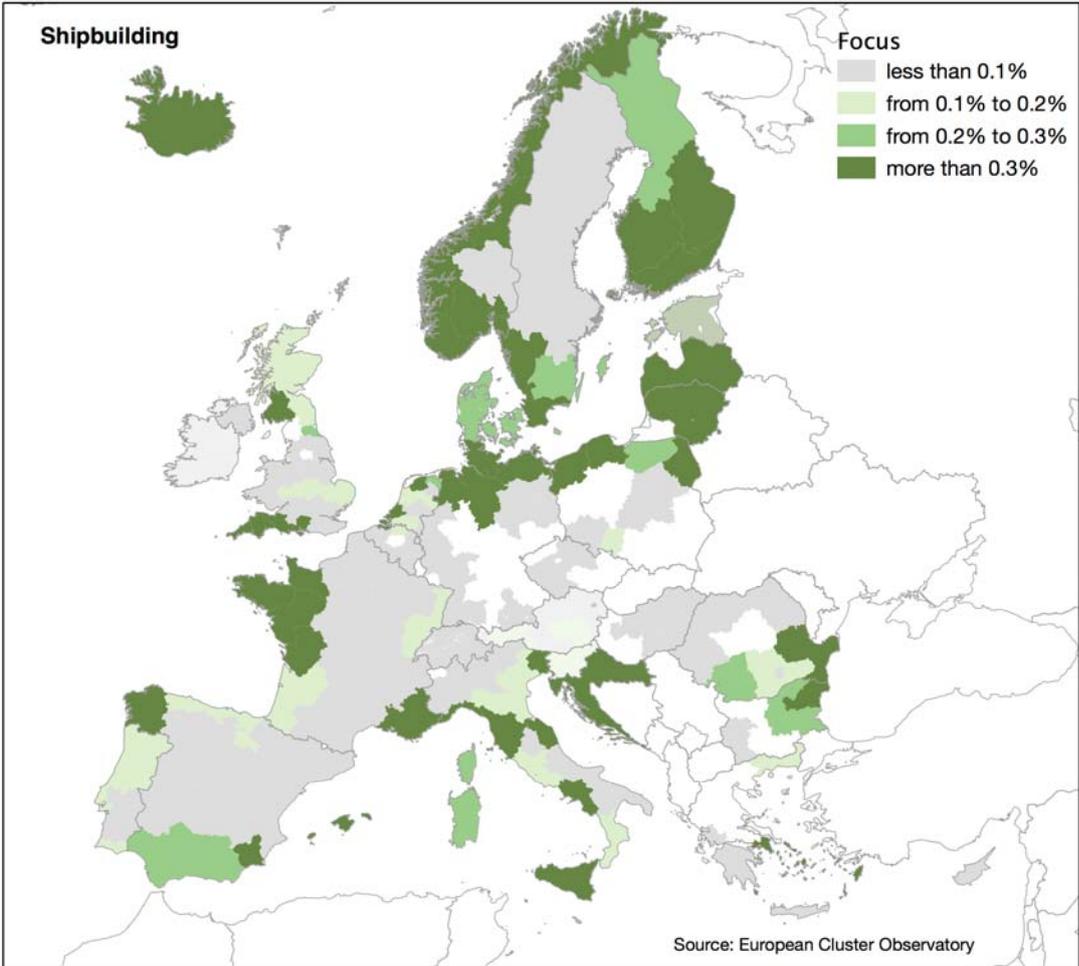
Note: LQ is an indicator of SI employment relative to the total employment of the region, where $LQ > 1$ indicates an over-representation of SI employment.

The regional employment concentration in the shipbuilding industry across Europe presents an uneven distribution. The regions on the southern part of the Baltic Sea and North Sea present a high employment concentration as well as the regions on the southwest coast of Norway. Italy presents an approximately even employment concentration among all its regions. The North-West part of Spain (Ferrol) and South of Spain, as well as Greece (Pireus Port) and the region of Romania facing the Black Sea (Constanța) present high employment concentrations.

3 Regional specialisation and focus

The shipbuilding industry presents an uneven distribution across the European regions, where it is most prominent in coastal regions that are home to major ports. Almost every European country has at least one region with a concentration of shipbuilding activities above 0.3%, except for landlocked regions. This suggests that countries tend to maintain shipbuilding activities in at least one region.

Figure 2. SI Focus: SI share of regional labour force 2009.



Of the top 15 SI Focus regions, Malta has the highest share of workforce employed in the SI. However, Malta workforce size is significantly smaller in comparisons with the other two top SI focus regions, Pomorskie and Zachodniopomorskie in Poland. The level of SI Focus across most European regions is below one, indicating the marginal share of employment in this industry.

Table 2. Top 15 regions by SI Focus

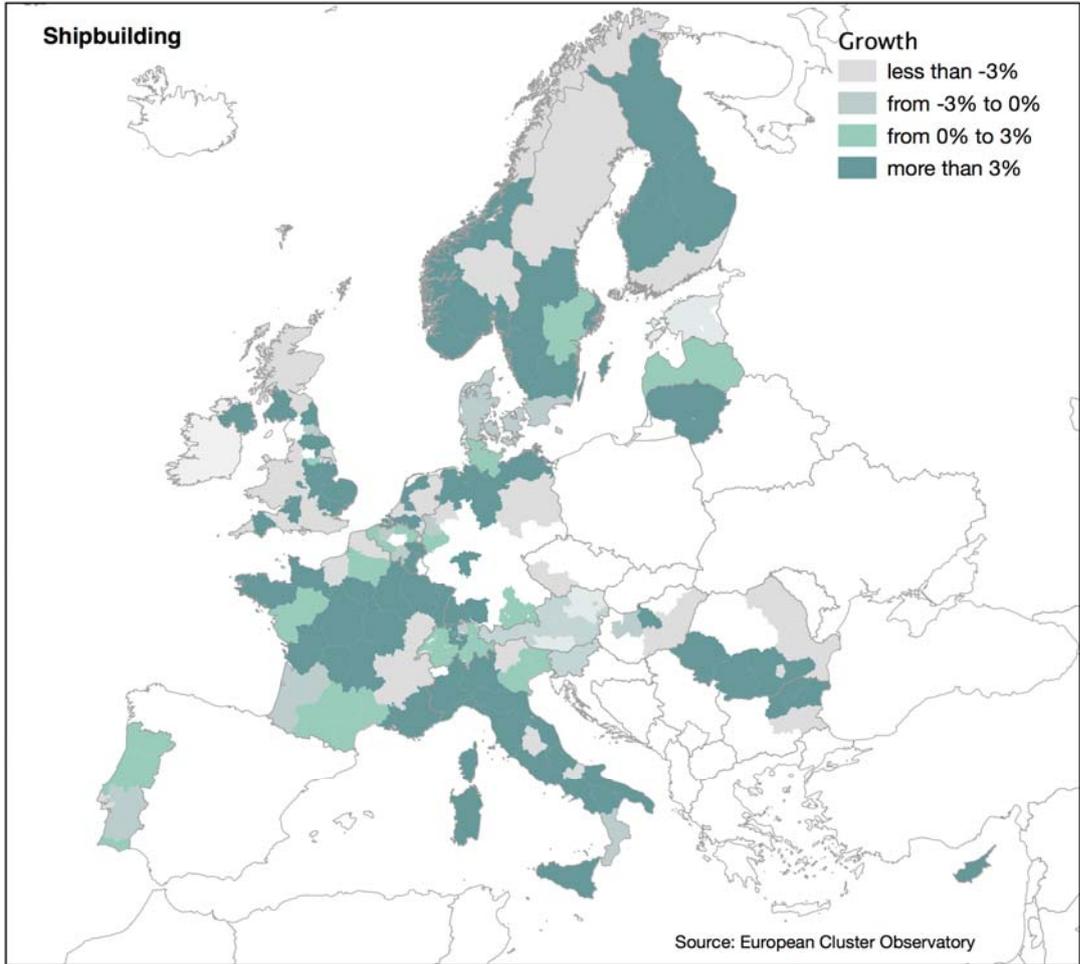
	SI Focus	SI Focus Rank	SI Employment
Malta, MT	9.03	1	3,645
Pomorskie, PL	5.16	2	22,718
Zachodniopomorskie, PL	3.55	3	11,265
Vestlandet, NO	3.41	4	12,582
Agder og Rogaland, NO	3.28	5	10,239
South- East, RO	2.20	6	25,113
Devon, UK	1.64	7	7,214
Croatia, HR	1.63	8	14,167
Liguria, IT	1.63	9	7,787
Mecklenburg-Vorpommern, DE	1.25	10	6,292
Friuli-Venezia Giulia, IT	1.00	11	4,107
Western Finland, FI	0.98	12	3,485
Zeeland, NL	0.95	13	1,548
Notio Aigaio, GR	0.92	14	1,062
Trøndelag, NO	0.91	15	1,688

Note: Focus indicates how large share of the region's total employment the shipbuilding industry constitute.

4 Growth

The shipbuilding industry presents an uneven growth across the regions of Europe, as it is shown in Figure 3. Several regions present a growth above 3% suggesting an expansion cycle for the industry. Noticeable is the consistent growth of SI in the internal regions of France, which are likely a consequence of the extensive network of fluvial waterways. In the regions of Limousin (FR), Champagne-Ardenne (FR) and Liège (FR), the low workforce baseline indicates an emergence of the industry, previously not existent.

Figure 3. Regional Shipbuilding industry average annual growth 2004-2009¹



All the top 25 regions ranked according to the average annual employment growth in the SI show a striking growth rate compared to the overall regional growth rate. The region of Bed and Herts (UK) presents the highest increase in employment in the SI, with a 311.3%. Out of 25 regions only 5 regions present an overrepresentation of the shipbuilding sector in the regional workforce, while in the rest of the cases the industry is just marginal. This explains the strong growth rate across the top 25

¹ The period is 2004-2009 where those years are available; when not, shorter periods have been used.

regions. Exceptions are Wien (AT) with a high level of employment and a remarkable growth of 266.99%, followed by Trøndelag (NO), West Midlands (UK), Sud-Vest Oltenia (RO), Noord-Holland (NL) and Noord Brabant (NL) that already had a consistent employment in SI. In three regions, Vest (RO), Noord-Holland (NL) and Noord Brabant (NL), the shipbuilding industry presents opposite tendency compared to the overall job market.

Table 3. Regions with the highest average annual growth in SI employment 2004-2009.

	SI Growth	Rest of the economy	SI LQ	SI Rank	SI Employment
Beds and Herts, UK	311.30%	2.99%	0.11	142	173
Alsace, FR	272.66%	1.51%	0.65	82	771
Wien, AT	266.29%	1.40%	2.01	33	3,060
Vest, RO	256.89%	-0.33%	0.11	138	191
Steiermark, AT	153.35%	4.62%	0.59	103	447
Tirol, AT	135.50%	4.96%	0.52	120	271
Limousin, FR	76.97%	0.94%	0.19	175	77
Burgenland, AT	62.36%	2.98%	0.32	193	42
Trøndelag, NO	55.07%	2.55%	4.22	54	1,688
Lorraine, FR	48.80%	0.80%	0.23	119	288
West Midlands, UK	42.57%	1.18%	0.76	48	1,957
Lincolnshire, UK	39.82%	1.84%	0.18	164	97
North Yorkshire, UK	37.89%	5.55%	0.05	198	36
Sud-Vest Oltenia, RO	30.27%	0.67%	1.07	40	2,413
Darmstadt, DE	27.73%	0.28%	0.01	199	34
Noord-Holland, NL	27.07%	-0.93%	0.57	61	1,402
Salzburg, AT	24.61%	1.38%	0.12	187	55
Noord-Brabant, NL	24.18%	-1.67%	0.63	59	1,438
Derbs and Notts, UK	22.16%	4.37%	0.11	137	204
Champagne-Ardenne, FR	21.74%	0.68%	0.01	212	9
Corse, FR	21.51%	3.23%	1.11	141	179
Madeira, ES	21.18%	1.85%	0.30	186	56
Liège, FR	20.54%	1.42%	0.03	206	19
Luxembourg, BE	18.92%	1.37%	0.04	214	6
North-Finland, FI	18.39%	0.04	1.21	107	389

Note: LQ is an indicator of SI employment relative to the total employment of the region, where $LQ > 1$ indicates an over-representation of SI employment. Growth is measured using compound annual growth rates (CAGR). The period is 2004-2009 where those years are available; when not, shorter periods have been used.

5 National perspective on growth, size and specialisation

The growth of the SI in the regions across Europe presents mixed indications for the period 2004-2009 and no clear patterns. It is surprising that Austria, a landlocked country, presents the strongest growth

in SI with a staggering 218.77% growth, while in the same period its neighbouring countries Czech Republic and Hungary experienced severe contractions in shipbuilding sector.

In the top 15 countries the SI growth largely outperforms the national average growth, but no clear pattern is identifiable among these regions.

Table 4. National average annual employment growth 2004-2009 in shipbuilding industry and in all sectors of the economy

Country	SI Growth	All Growth
Austria	218.77%	2.90%
France	13.59%	1.80%
Norway	12.09%	2.28%
Slovenia	10.51%	6.10%
Cyprus	10.23%	52.96%
Italy	8.58%	2.25%
Bulgaria	6.67%	1.26%
Lithuania	3.51%	-0.86%
Germany	3.19%	0.69%
Switzerland	3.01%	0.80%
Latvia	2.93%	2.66%
Sweden	2.49%	3.01%
United Kingdom	1.99%	1.99%
Belgium	1.54%	1.80%
Finland	1.34%	3.48%
Romania	-1.10%	-0.04%
Denmark	-2.23%	-3.77%
Estonia	-2.56%	28.87%
Netherlands	-3.59%	-1.10%
Portugal	-4.21%	1.71%
Ireland	-7.19%	43.15%
Czech Republic	-23.80%	0.66%
Hungary	-26.23%	0.33%
Spain	*	*
Greece	*	*
Croatia	*	*
Iceland	*	*
Malta	*	*
Poland	*	*

Note: Growth is calculated here as a Compound Annual Growth Rate (CAGR) over the period.

** Insufficient time series was available for these countries*

Table 5 indicates that Malta is the country with the highest overrepresentation of the shipbuilding sector in its workforce (LQ), employing around 3645 people. The Top 5 nations for shipbuilding industry incidence on the job market suggest that in these nations SI is a major national industry.

Table 5. Shipbuilding Industry Focus and National labour markets (2007)

Country	SI Focus	SI Rank	SI Employment	SI LQ
Malta	9.03	19	3,645	41.74
Poland	4.33	2	36,448	20.01
Norway	2.67	4	30,346	12.37
Romania	1.89	5	29,604	8.74
Croatia	1.63	10	14,167	7.56
Finland	0.72	12	9,274	3.32
Germany	0.69	8	26,501	3.18
Bulgaria	0.66	13	6,402	3.06
Lithuania	0.65	15	5,240	2.99
Italy	0.64	1	43,689	2.96
Greece	0.59	11	11,624	2.73
United Kingdom	0.55	3	32,124	2.56
France	0.51	7	27,232	2.35
Spain	0.44	6	27,486	2.03
Estonia	0.41	21	1,980	1.89
Netherlands	0.37	9	14,261	1.71
Iceland	0.34	26	539	1.58
Austria	0.34	18	4,229	1.57
Sweden	0.33	16	5,048	1.51
Latvia	0.31	20	3,029	1.42
Denmark	0.21	17	4,965	0.99
Portugal	0.15	14	5,376	0.69
Slovenia	0.15	23	953	0.68
Belgium	0.10	22	1,389	0.45
Hungary	0.06	25	777	0.28
Cyprus	0.06	29	208	0.27
Switzerland	0.04	24	936	0.17
Ireland	0.03	28	289	0.15
Czech Republic	0.02	27	360	0.11
Malta	9.03	19	3,645	41.74
Europe			348,121	

Note: Focus indicates how large share of the nation's total employment the SI sector constitutes. LQ is an indicator of SI employment relative to the total employment of the region, where $LQ > 1$ indicates an over-representation of SI employment.

6 The industry transformation model

The slowdown in the European shipbuilding sector initiated with the oil crises of the 1970s. As demand for ships declined in Europe during this period, shipbuilding capacities simultaneously increased a continent away, notably in the East Asian countries. Today shipyards in Japan, South Korea and China are home to the world's biggest shipyards and provide for the majority of the production and supply of the large container ships and vessels globally. As the shipbuilding industry is experiencing changes in competition and in revenue sources, European shipping is already paying close attention to seeking opportunities for forward thinking in respect to the future developments of the industry. In the endeavour to stay afloat and to keep up with the global competition, the results to the global market shifts and economic crisis of the last few decades in Europe have consequently been, as in few cases, an absolute decline or a transformation of the shipbuilding sector. In the case of the latter, transformation involves diversification and re-capacitation of the redundant infrastructure and the local know-how in new ways.

This report identifies six major transformation paths taking place in Europe today, as presented in Figure 4. The transformation is differentiated according to two axes representing the degree of change and the level of connection with the former know-how of the shipbuilding industry. The scope and the spatial configuration of the transformation model can be broadly divided to urban and regional dimension. Namely, transformation towards the knowledge centre, real estate development and heritage industry primarily occurs in the shipyards and ports situated in cities and in close proximity to urban areas, while industry shift, industry niche strategy and remnant are transformations taking place in shipyards situated on the urban fringes. Nevertheless, this spatial division is neither absolute nor conclusive, but only indicative, as there are number of examples to which this categorization does not apply.

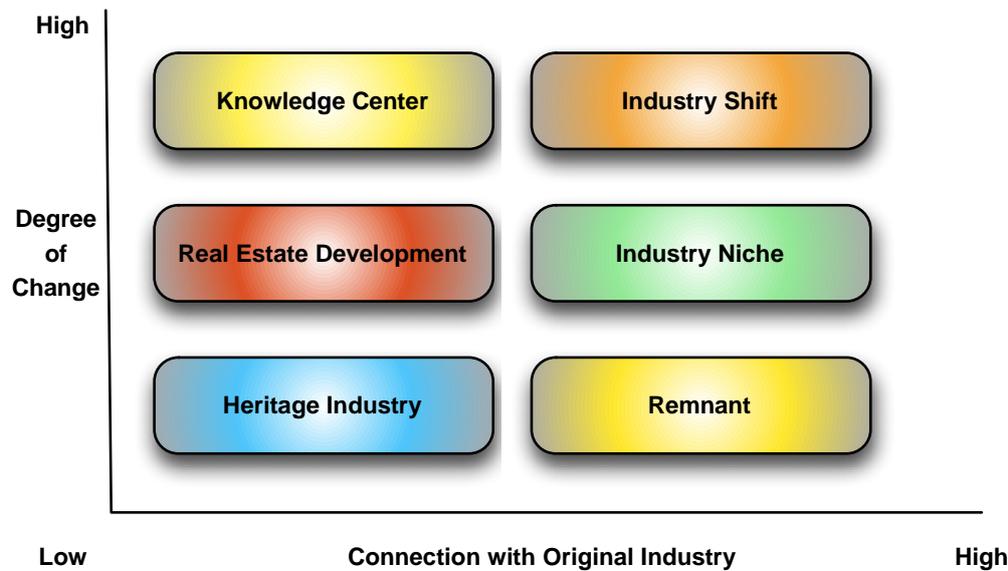


Figure 4 - Industry Transformation Matrix

Industry shift

Industry shift is one of the identified trends in the transition process of the European shipbuilding industry and shipyards. It occurs when a completely new industry replaces the old shipbuilding activities. This trend has very weak links to the previous shipbuilding industry, and might employ a part of the local knowledge, skills, know-how and facilities in the new industrial endeavours. Industry shift is seen in the European experiences where the existing know-how of the shipbuilding industry has been used in the energetics sector and the alternative energy production. Particularly production of equipment for wind turbines and wave energy has been the leading trend within the energetics. A number of countries with a long shipbuilding tradition and geographical and meteorological advantages have today adopted the strategy for harnessing alternative energy resources.

Industry niche

In view of the demand for new technologies and new types of vessels, some of the European shipyards have specialized in a particular niche for which the existing know-how, technology and high innovation capacity provide sufficient competitive advantage to guard the market. European industry specialization is evident in the production of cruise ships, luxury yachts, icebreakers, offshore support vessels, and tugs.

Remnant

Despite the general trend of shipbuilding industry decline within their respective regions, some of the European shipyards found their competitive advantage in their strategic position, developed technology, available infrastructure (i.e. dry-docking) and highly specialized skills and know-how. A thriving trend in this vein is diversification of the shipbuilding industry into an industry of its own. A prominent example is the repair, maintenance and dry-docking of ships, and welding industry.

Knowledge centre

Transition from the industrial to the knowledge intensive economy has been a policy objective of some European port cities with strong tradition in the shipbuilding sector. During the last two decades this transformation affected the economic function of the city (region), but also its physical and social fabric. The new landscape that emerged is a point of knowledge production, as well as the attractive site of investment. Few examples of this transformation regard development of science parks, university centres and research institutes around and in place of the traditional shipbuilding areas.

Real estate development

Port cities and shipyards across Europe contain some of the world's most valuable real estate, and there are huge profits to be made from the redevelopment of the existing properties. With the aim to transform the derelict shipyard and port city infrastructure, real estate development is one of the most prominent examples of restructuring taking place in European shipyards and ports. In this instance it is to note that the real estate development in the port cities and shipyards is in few instances going hand in hand with integrated heritage conservation of port and shipyard infrastructure, as part of the large scale urban revitalization and waterfront redevelopment projects.

Heritage industry

As mentioned above, revitalization of waterfronts and shipbuilding areas in Europe often involves a heritage component. Adaptive reuse of historical buildings through an integrated approach to conservation and development has affected many traditional port cities with long history, and their appeal to tourism development and as areas for small business incubation. Namely, an ensemble of historic buildings and infrastructure offer a level of attractiveness that an individual site is rarely able to offer, therefore contributing to the overall appeal of cities and their respective regions. The appearance of the heritage industry usually takes place in areas subject to waterfront redevelopment within a broader project of knowledge centre and real estate development.

7 The model applied - Gothenburg shipbuilding restructuring

The city of Gothenburg is located on the west coast of Sweden. In the early 1970s it was the second largest ship builder in the world hosting three world-class shipyards (Götaverken, Lindholmen, Eriksberg), employing directly around 15,000 people and indirectly additional 30,000 people. By the beginning of the 1990s only marginal activities in the shipyards had survived. This makes of Gothenburg an exemplary case for understanding the ways in which a restructuring of a formerly flourishing industry may occur. In order to understand the evolution of the shipbuilding industry and its associated decline that led to the restructuring towards new industries, a brief historical timeline is presented.

The city Gothenburg in 1970s had a population of 425,000 people and counted four active shipyards (i.e. Götaverken, Lindholmen, Eriksberg and Arendal), which employed 25% of the available workforce. Shipbuilding was one of the largest industries in the region. However, following the 1973 oil crisis the shipbuilding industry experienced a sharp decline with a collapse of demand for new vessels. Significant was the reduction in oil tankers demand, one of the major productions of Gothenburg shipyards, which led to a crisis for the local shipbuilding sector. The national government fearing for the consequences of the crisis launched a nationalization program for the local shipyards, which they became incorporated as one single company under the name Swedeyard. The nationalization aimed to restructure the existing shipyards adjusting the supply to the reduced demand and target emerging markets. The Arendal shipyard used the existing know-how converting its production to supply the offshore oil and gas market, the largest clients where in Norway that at the time had just discovered a number of large oil deposits, while the Götaverken shipyard specialized in the activities of maintenance, repair and refitting of vessels. This repositioning of the business allowed an additional decade of work for the local shipyards, while most of other European shipyards faced closure. Nevertheless, by the beginning of the 1990s most of the shipyards had ceased their production. The complete exodus of shipbuilding activities from the Gothenburg region led the national government to plan a series of interventions that could revitalize and repurpose the existing shipyards. One of these interventions consisted in a real estate development plan, but due to lack of agreement among the involved stakeholders and adverse market conditions the government did not succeed in realizing the project.

Today, Gothenburg is the largest port in Scandinavia, although the shipbuilding activities have become marginal and city relies mostly on knowledge-intensive and automotive industries². The city economic transition from industrial to knowledge economy has been successful, as indicated by the

² The 100 largest employers in the Gothenburg region 2011 report - Retrieved on April 15th, 2012:
<http://www.businessregiongoteborg.com/download/18.775106461353f5a20961b4b/The+100+Largest+Employers.pdf>

second position in the Innovation Union Scoreboard³, which reflects a high level of innovation. The restructuring of the Gothenburg shipyards have occurred according to different paths that can be mapped on each of the model quadrants presented in the previous section.

With the decline of the shipbuilding industry a number of related firms survived due to their high specialization and focus on emerging sectors, labelled in this report as remnants. Gothenburg presents a few examples of remnants, which survived the decline of the shipyards. One example is ESAB AB, a company specialized in welding technology. The company grew in close relation to the shipyards for which it provided technology, but it managed to survive thanks to its highly specialized technology and its expansion on foreign markets. Today the welding technology born in support to shipbuilding has become central to the manufacturing of wind power generators. A second example of remnant is Consilium Säkerhet AB a company specialized in the development and manufacturing of safety equipment for vessels, and oil and gas rigs. The company founded in 1912 entered the market producing a speed log and later on specialized in fire and gas detector. The company survived the decline of the shipbuilding industry in Gothenburg becoming today one of the market leaders in designing and manufacturing a wide range of safety equipment. But remnants are not limited to the manufacturing of new technologies and products, a service company like SSPA AB⁴ an engineering company born in the beginning of the 20th century has outlived the shipyards continuing its activity of providing engineering services for offshore and naval projects.

The existing expertise related to shipbuilding allowed the Götaverken Cityvarvet shipyard on Lundbystrand to specialize in reparations. Beginning in 1993 the Götaverken Cityvarvet shipyard restarted its activities focusing on the repair business with a workforce of 70 units. In the year 2000 it was acquired by the Dutch company Damen Shipyards Group, leader in the reparation business, and since then has progressively created a thriving business, which today employs over 140 people.

The Gothenburg case is an emblematic showcase of how a region, which experienced the decline of the shipbuilding industry, has built onto existing knowledge and physical assets to shift towards other industries. The emergence of new industries on the ashes of shipbuilding industry should not be considered an organic process on the contrary it often requires a strong role of institutions supporting the change. There is necessity of human resources requalification. An example of attempt to industry shift in Gothenburg is Consafe⁵ a company started in 1977, which designed and manufactured accommodation modules for offshore fixed platforms. Consafe did not succeed in creating a long-lasting new industry, closing down not even a decade later in 1986.

The most visible changes in the shipbuilding industry, however, occurred with the waterfront redevelopment that involved a transformation in large part of the former shipyards and represented a crucial step in the transition towards the establishment of new industries. The most significant enabler

³ Innovation Union Scoreboard 2011 - http://ec.europa.eu/enterprise/policies/innovation/files/ius-2011_en.pdf

⁴ SSPA - <http://www.sspa.se/>

⁵ Consafe Logistics - <http://www.consafelogistics.se/>

of the shift to a different economy has been spurred by the vision of transformation of the local economy, from industrial to knowledge-intensive. Two principal events supported the transformation of the previous industrial area in a science park with business and residential areas. In the year 2000 the city council and Chalmers University, an internationally renowned institution, decided to profile the emerging area as knowledge intensive, beginning with establishing a new campus in the area that later on was followed by the Lindholmen Science Park. The initiative also gained the support of the industrial groups already present in the city - Ericsson, Volvo Group, and Volvo Cars, which found the proximity to the existing city centre, and availability of space promising to the establishment of their premises and for setting up the ground for today's IT cluster. In 2011 the Lindholmen Science Park counted over 300 companies with 9000 employees. In addition three educational institutions, Chalmers University, IT University and had around 9000 students.

An example of development of the heritage industry came from the local entrepreneurs, who saw the potential of capitalizing on the city legacy as shipbuilding power, creating ambitious attraction for tourists and local citizen with an open-air museum⁶, displaying boats from different eras, and the Sjöfartsmuseet Akvariet museum⁷. The use of the area surrounding the shipyards by the entertainment industry became a way to create acceptance among the citizens of the value of the area and the existing heritage to gain support before further proceeding with the re-purposing through the real-estate development.

The restructuring of the Gothenburg shipyards featured a strong orchestrating role by the local government, which at the end of the 1980s took over this initiative from the national government. The actions of the national government consisted in the 1970s to the nationalization of the shipyards, prolonging their existence for an additional decade, and in the 1980s by an attempt of real estate development failed due to weak planning and unfavourable market conditions. The local government conversely succeeded in involving some of the national industrial champions (automotive, information technology), which allowed create momentum for the restructuring of the former shipyards relocating and expanding their existing facilities with new one there.

8 Shipbuilding transformation paths across Europe

Using the transformation model introduced in this report the shipbuilding sector in Europe is analysed. Each of the following six sections present one of the transformation paths through a selection of representative cases.

⁶ Maritiam, Open Air Ships Museum - <http://www.maritiman.se/>

⁷ Sjöfartsmuseet Akvariet museum - <http://www.sjofartmuseum.goteborg.se>

Industry Shifts

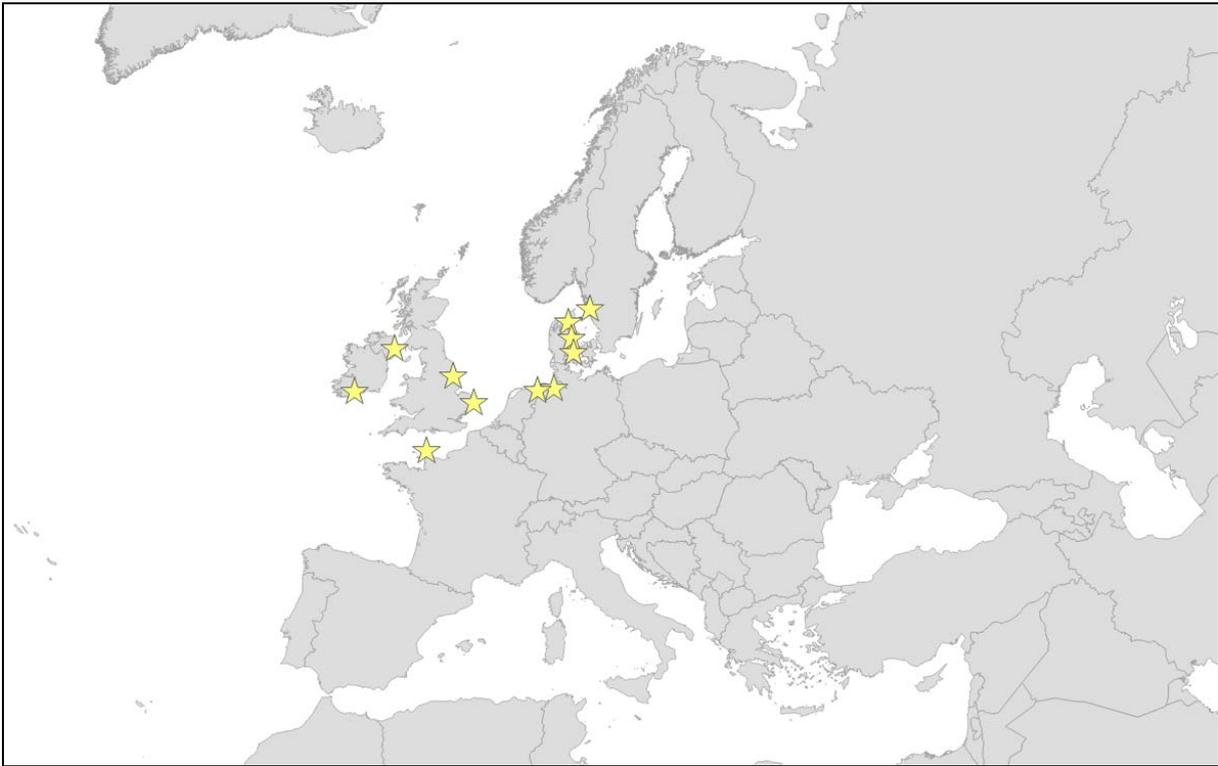


Figure 5 - Selection of cases of port cities and shipyards engaged in Industry Shifts

The industry shift is a radical departure from the shipbuilding activity, but still uses some of the existing know-how. The results of an extensive review of activities at former and existing shipyards across Europe led to the identification of one single type of shift. The shift identified concerned with the establishment of offshore renewable energy sources sector in facilities formerly part of shipyards and recruiting people formerly employed in the shipyard. This shift is characterized by a consistent and defined pattern across several regions, mostly in Northern Europe, and stems out of policy interventions.

The offshore renewable energy sector has been strongly growing during the past five years as a result European and national policies aiming to increase the quota of energy generated by alternative sources. The EU strategy “Europe 2020” pinpointed as one of its main goals, the “green growth”. The increased business potential of renewable energy sources in offshore environments have supported an increment in research and experimentation of new solutions. Beside wind power there have been several experimentation to exploit sea tides and sea waves for energy production. This has resulted in the construction and test of new equipment, which was mostly built at former shipyards profiting of the existing know how. The specific meteorological conditions required for successful implementations and environmentally concerned governments made the countries in the northern part of Europe frontrunner in exploiting and developing offshore technologies. In this section a selection of cases concerning industry shift is presented with examples from Denmark, France, Germany, Northern Ireland, Ireland, and United Kingdom.

Denmark

One clear example of shift is noticeable in Denmark, where historically has been very active in the shipbuilding sector, with a market share of the global shipbuilding remained above 2% till the end of 1990s. The shipyards were mostly located in its four major ports, Aalborg, Aarhus, Odense and Copenhagen. In the early 1980s the shipbuilding sector counted on a workforce of more than 18,000 people that shrieked to around 6,000 in 2007. The decline of the sector has been delayed, but once it began it progressively affected all shipyards, with the Lindø shipyard in Odense closing down last in early 2012, with an estimated direct and indirect job loss of 8,000 units. The strong implication for employment required a restructuring of the shipbuilding sector implied the attempt to re-use the existing know-how, infrastructures and workforce.

One example of shift occurred in Denmark concerned the emergence of wind power technology production. The newly emerging companies eyed some of the existing facilities and know-how available that could support their production. This resulted in a windmill wing company moved to Aarhus to take advantage of the local existing know-how in making fiberglass boats.

Denmark has also been at the forefront in developing and installing wind power technology offshore, with the first commercial installation completed already in 1991 with the construction of a wind farm at 2.5km of the Danish coast at Vindeby⁸. The successful results obtained from the first installation led to a specialization of the industry into offshore wind production and a strong demand for this type of a solution. Differently from inland installations, offshore required the construction of support infrastructures at sea, sparking a whole lot of economic activities, which found the shipyards as an ideal location. Nowadays, Denmark is home to world leading producers of wind power technology with a direct workforce of 21.000 people⁹. The shipyards of **Odense** at Lindø, and the one in **Aarhus** today host wind power activities that likely have taken over part of the workforce from the former shipyards. In addition to the construction of offshore wind power generation facilities, there has been a necessity of developing specialized vessels to conduct maintenance resulting in new orders for the still existing shipyards. The shift of part of the shipyard infrastructure to become instrumental to offshore wind power were first and foremost consequence of the nature of an offshore installation, which is made at sea. In addition, Denmark geography as a peninsula located in a windy region and a supportive national government, which supported the development of this technology for supplying the country with electric energy. The Danish central government supported the growth of wind power energy sector with several policy interventions that began already in the early 1990s with different types of supports to the industry till 2007 when the government introduced a more organic strategy titled *A visionary Danish energy policy for 2025* with the aim of increasing the wind power production across the country.

⁸ Offshore Report, 2011 -

http://ewea.org/fileadmin/ewea_documents/documents/publications/reports/Offshore_report_web_01.pdf

⁹ Denmark future as leading centre of competence within the field of wind power - Megavind Report

The development of renewable energy sources has not been limited to one approach, but there has been experiments to combine wind and wave power. One of these experiments was undertaken at the **Nakskov** shipyard (DK) starting in 2007 where the first exemplar of Poseidon Floating Power¹⁰ has been built and floated.

United Kingdom

UK currently is the world largest producer of electricity from offshore wind power. The development of renewable energy source was set in motion by a regulatory constraint for electricity companies in UK at the beginning of the 1990s requiring to have a portion of the supplied electricity deriving from renewable sources. Overtime the target of renewable sources has been increased, which offered additional momentum for the exploration and establishment of offshore wind facilities. In UK the massive construction of offshore wind park created a transitioning of several underused and often inactive shipyards to provide facilities for construction and maintenance companies supporting the wind power sector.

Northern Ireland

The city of **Belfast** (Northern Ireland) hosts the shipyard Harland and Wolff¹¹, most famous for having built the Titanic, since it was founded in 1861 it launched over 1,700 vessels. In its heydays counted on a workforce of over 35,000, but this number sharply declined after 1973 leading to near foreclosure in the late 1990s. In the past five years a wave of restructuring hit the languishing shipbuilding industry. The increasingly fast paced development of renewable energy such as offshore wind power required skilled labour for construction, which led to reabsorbing part of the workforce previously active in the shipbuilding industry. In 2010 the Belfast harbour has undertaken considerable investments to become an hub for construction and maintenance of offshore wind farms, this resulting in the creation of 150 new direct jobs and expected to mobilizing an additional 100 indirect jobs. The existing facilities and the increasing specialization in developing offshore energy solution allowed the attraction of new project with different technologies, such as tidal stream turbines. Belfast is particularly well positioned geographically to provide a support base for the ambitious energy plan of the UK for the development of offshore wind farms.

Ireland

Cork like other shipyards, which have ceased to build vessels have been attracting jobs for the manufacturing of parts for new devices to be used in offshore electricity production. The shipyard of Cork has worked on part of Oyster Ocean Energy project¹² in Ireland, aiming to produce electric power from wave energy. The project installed the first testing wave energy device in 2009 at the European Marine Energy Centre (EMEC) in Scotland's Pentland Firth, which proved the concept successful. In

¹⁰ Poseidon Floating Power - <http://www.floatingpowerplant.com>

¹¹ Harland and Wolff - <http://www.harland-wolff.com>

¹² Aquamarine Power - <http://www.aquamarinepower.com>

June 2012 a larger model of the wave energy device started its operation in the same area and additional sites have been identified to start future implementations.

Germany

In the North of Germany the **Bremerhaven**, the port of the city of Bremen, is one of the most important German ports. The port till the late 1980s hosted several shipyards that in line with the global shift of the shipbuilding production suffered of a great crisis that led to the loss of 3500 jobs, but the crisis continued further with record high unemployment up to 25%. As a response to the dramatic situation the local council started to explore ways of restructuring the port and achieve profitability. The strategic location combined with the existing infrastructure and technical know-how were the crucial element that led to the establishment of an excellence centre for renewable energy. The restructuring enabled the creation of a new cluster around renewable energy technology, attracting four major players in the offshore wind industry that allowed to the creation of over 2000 new jobs during the past 5 years. A research collaboration between the technical university of Bremen, Oldenburg and Hannover established ForWind: Centre for Wind Energy Research¹³, while the local university of applied science developed bachelor and master programs in Wind Energy. Research activities also include facilities for research and development of the technology by the Fraunhofer Institute for Wind Energy and Energy System Technology¹⁴, which operate a rotor blade test facility.

A second port facing the North Sea in the North-West of Germany is **Emden**, which has a longstanding tradition of shipbuilding activities. The *Nordseewerke* shipyard has been in operation since the early 20th century launching a total of 559 vessels both for civilian and military purposes. This included cargo-ships, cruise ships –one of these ships starred in the tv series Love Boat-, specialized type of ships (i.e. Icebreakers), as well as military ones and submarines. The shipyard, owned by ThyssenKrupp Marine Systems till 2008, crumbled on the world economic crisis risking the unemployment for its 1200 employees. However, the intervention of SIAG Schaaf Industrie AG¹⁵, which acquired the shipyard restructuring the activities from shipbuilding to production of wind power offshore installations, allowed retaining part of the jobs and know-how. The conditions of the shipbuilding industry restructuring can be ascribed to two factors. One factor is the strategic location, allowing easy access to existing and future offshore wind farm installations. While the second factor is the national energy policy aiming to increase the current share of renewable sources for electricity from 16% to 40% by 2020 which supports investors with clear indication for their future returns. The plan¹⁶ envisages a development of the off-shore wind energy production, which should reach 10GW by 2020 and 25GW by 2050. A remnant at the shipyard is the maintenance service facilities managed by the previous owner ThyssenKrupp Marine Systems.

¹³ ForWind - <http://www.forwind.de>

¹⁴ Fraunhofer IWES Bremerhaven - <http://www.iwes.fraunhofer.de/>

¹⁵ SIAG Nordseewerke GmbH, Emden - <http://www.siag.de/mod/Company/Locations/SIAG+Nordseewerke+-GB.htm?id=514>

¹⁶ BWE - <http://www.wind-energie.de/en/policy/offshore>

France

The Port of **Cherbourg** in the Normandy region (North of France) has been for long the base of DCNS, a naval defence company and conducting shipbuilding activities in the same premises. In the mid-90s it was faced with the need of restructuring its activities due to a downturn of the demand. During the 2000s the company has been diversifying its activities acquiring an engineering company. In spring 2012 the company embarked in a new project to transform part of the port in a new hub for the development and manufacturing of tidal turbines, a marine renewable energy technology. The manufacturing plant is planned to begin its activities in early 2014.

Industry Niche



Figure 6 - Selection of cases of port cities and shipyards engaged in Industry Niche

The pursuit of shipbuilding niches is characteristic of several shipyards across Europe. In developing a niche presence companies use their existing know-how complementing it with targeted investments in research and development to offer innovative high quality solutions and a wide range of vessels customization. At present this represents one of the competitive advantages of the European shipbuilding industry, which allows to provide highly tailored products compared with the large Asian producers usually focused on volume production of standardized vessels. In Europe the principal SI niches include Cruise Ships (Germany, Finland, France, Italy), Luxury Yachts (Italy, The Netherlands) Naval ships (Germany, France, Italy, Spain, United Kingdom) and Offshore support vessels (Germany, Norway, United Kingdom). The remainder of the section presents a selection of examples in Finland, Germany, Italy, and Norway.

Italy

Italy hosts several shipyards from North to South. The once strong shipbuilding industry through time has undergone a process of downsizing and market niching. The largest shipyards owner in Italy, Fincantieri, has made cruise ships one of its core business since 1985. This led to the creation of an excellence in three shipyards in **Monfalcone**, **Marghera** and **Sestri Levante**. The cruise ships market has been steadily growing till the late 2009 with constant flow of orders populating the order book, though today the future looks uncertain.

Norway

The shipbuilding sector in Norway today employs 20,000 people. Norway has undergone a restructuring of its shipbuilding sector that led to several mergers of existing shipyards but with a landscape still dominated by a high level of fragmentation. In order to remain competitive the shipyards have been specializing in the development of small vessels, fishing boats, passenger ferries and vessels for the support of oil and gas rigs. The direction in the specialization has been given by an existent demand within the country and the local know-how for production. One of the latest strategy to maintain the sector competitive is to outsource part of the manufacturing process of the vessel structure to third countries (i.e. Eastern European countries), which once completed is transferred to Norway where it is outfitted. This allow to reduce costs that otherwise would be very high, and still maintain locally know how concerning fitting technology and equipment.

Finland

In the Nordic countries a second examples of restructuring by niching of the shipbuilding sector is **Finland**, which maintained a strong presence through the production at its three shipyards (Helsinki, Turku and Rauma). The Finnish shipyards specialize in the production of cruise ships and ice-breakers. Since early 2000s, the South-Korean owned STX-Europe Group acquired the shipyards continuing the production of cruise ships and ice-breakers vessels. In 2011 an increasing demand for new vessels fitted for Arctic navigation led STX-Europe Group, with its long standing know how in ice-breaking technology to form a join venture with the Russian United Shipbuilding Corporation aiming to the development of artic Maritime technology and shipbuilding at the Finnish shipyards.

Germany

The port of **Papenburg**, is a small river port situated on the river Ems. The port although being small has a long tradition in shipbuilding that in the past counted up to 23 shipyards. Today's only one shipyard has survived, the Meyer-Werft shipyard¹⁷ a family owned company, which has been active in the sector for six generations. The shipyard carved its niche in building car and passengers ferries, different passenger and carriers ships, but most particularly focusing on the production of cruise ships.

¹⁷ Meyer-Werft - <http://www.meyerwerft.de>

Remnants

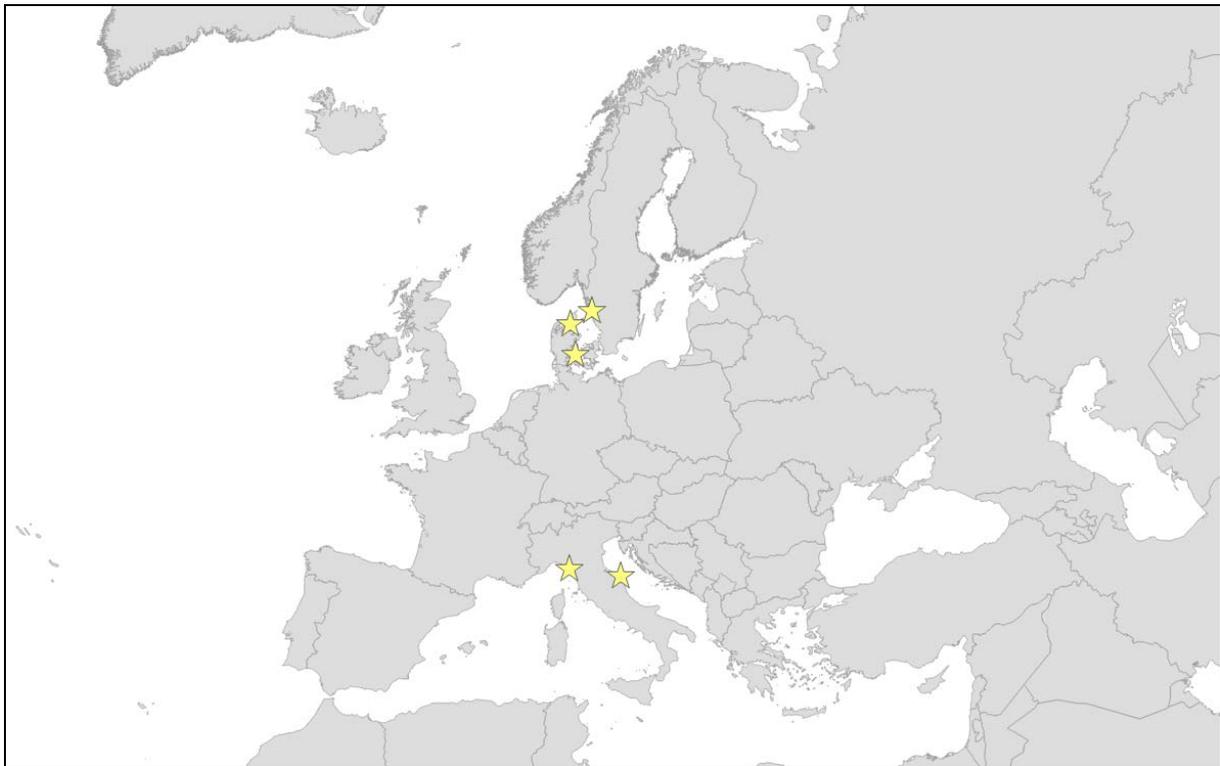


Figure 7 - Selection of cases of port cities and shipyards showing Remnant Industries.

Across Europe several regions present remnant industries that lived on after the demise of the shipbuilding industry. The characterizing traits of remnant industries usually are highly specialized and technologically advanced. This section presents examples of remnants industries in Odense (DK), Aalborg (DK) and Malta.

Denmark

Odense hosts the largest Danish shipyards in Lindø. The shipyard owned by A.P. Moller-Maersk, the world largest container-shipping company, has been a key supplier for the mother company that commissioned innovative vessels. In 2009, the property decided to phase out the production at the shipyard expecting to close it down by 2012. Although, sparse shipbuilding activities remain, the production of large vessels has been fully outsourced to the Far East. At the same time a repurposing of the Lindø shipyard was planned with the aim of transforming it in industrial park using the existing real-estate space. Taking advantage of the large estates it has been foreseen the expansion of the activities for servicing offshore wind farm.

Aalborg hosted a shipyard, which overtime specialized in the production of reefer ships, refrigerated vessels used for the transport of perishable goods, with the consequent development of a particular know-how for the area. The shipyard was closed down in 1987 with a loss of 3000 jobs. In the process

of closing down one of the internal excellences, the production of boilers for ships was spun off becoming known as Aalborg-industries¹⁸. To date the company is recognized as one of the world leading company in the design and manufacturing of marine boiler and has become part of the multinational group Alfa Laval. The company has been thriving including new product line for the maritime industries. This represents one form of successful remnant in which know-how has been retained and expanded with likely the positive effect of absorbing small portions of the existing workforce. A second industry remnant is the Danyard Pipe A/S at Frederikshavn, which is specialized in the production of pipes for marine use. By 2005 the rest of the site was completely cleared and undergone a real-estate redevelopment with exception of the dry docks where yacht production continued.

Malta

Malta with its strategic location at the crossing of the routes in the middle of the Mediterranean Sea favoured its rise as shipbuilding centre. The shipbuilding industry was the engine of the island industrialization during the colonial period under the UK dominion. The local shipyards have been specializing in repair and refitting but the company operating them have been experiencing difficulties in retaining the workforce and remain competitive. This resulted in a nationalization of the shipyards during the 1990s. In 2004 with the ascension of Malta in the EU, they were required to privatize them, which occurred in 2011 when the Palumbo group¹⁹, an Italian shipbuilding company acquired the premises to conduct repairing work, maintaining the traditional excellence in repairing work.

¹⁸ Aalborg-industries - <http://www.aalborg-industries.com/>

¹⁹ Palumbo Group - <http://www.palumbo.it>

Knowledge Centre

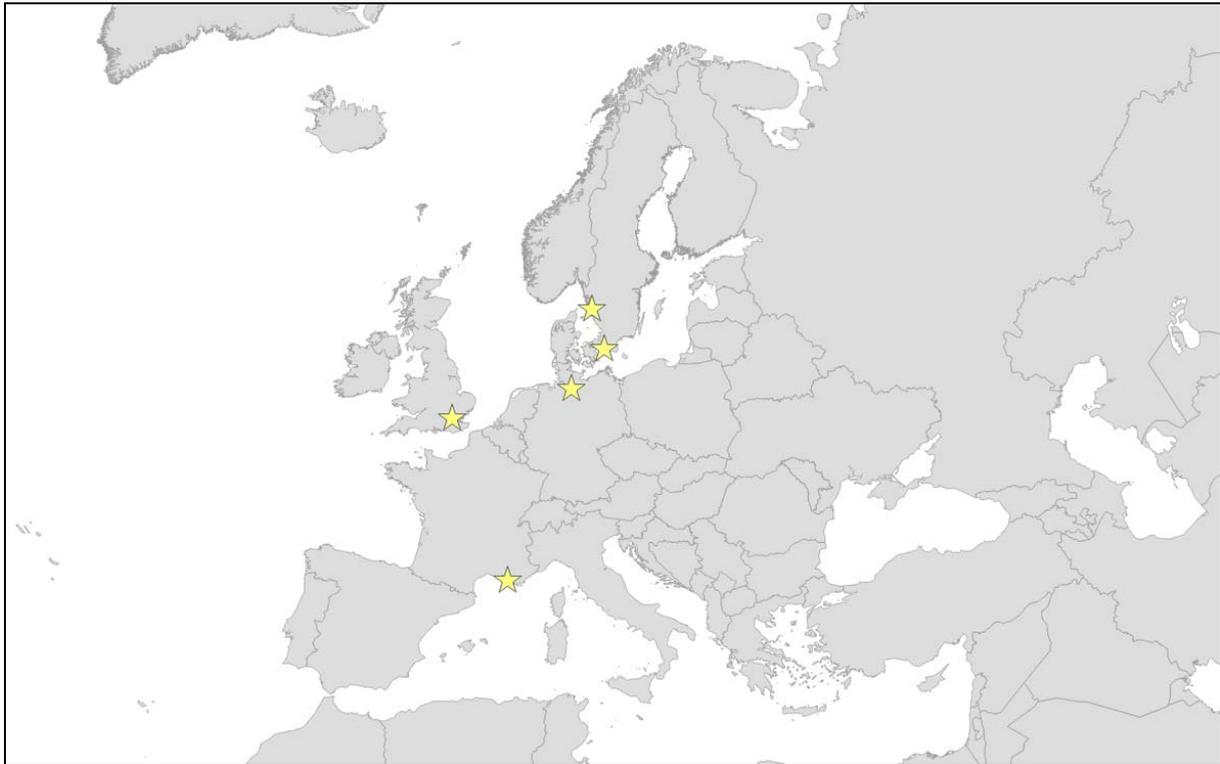


Figure 8 – Selection of cases of port cities and shipyards engaged in Knowledge Centre

The planning and development of knowledge centres has been usually adopted by regions aiming to diversify an existing industrial economy through expansion in knowledge economy. The creation of knowledge centre implies building infrastructures for knowledge intensive industries, while providing a contextual support to the creation of local ecosystems that can boost the transition from industrial economy to knowledge economy.

Across Europe projects of waterfront redevelopment have been chosen as catalyst to the expansion of local economies towards knowledge economy. Waterfronts favourable locations, proximal to city centres, and their landmark role represent an attractive combination for establishing knowledge intensive businesses as well as university and research centres. The existence of wide areas facilitates the attraction of other firms and the creation of clusters. The reminder of this section presents a selection of examples across Europe, namely Marseille (F), Malmö (SE) and London (UK).

France

The city of **Marseille** in Southern France undertook a project of waterfront redevelopment in order to reclaim the space of the old port and revitalize it. The project called Euroméditerranée, which began in the 1992 and it was completed by 2002, strongly focused on attracting knowledge intensive businesses. In specific the area resulted in a cluster for telecommunication companies (i.e. 9 Telecom, France Telecom, Futur Telecom, Telecom Italia), information technology companies (e.g. Monster – Employment search engine) and financial services with banks.

Sweden

In south-west Sweden the city of **Malmö** present an example of establishment of a knowledge centre. This instance can be found as part of an overall project of waterfront redevelopment in the locations of the former shipyards in the area called Västra Hamnen (West harbour). The city council in the mid-90s planned the establishment of a new educational centre, Malmö University, with the plan to locate the facilities within the waterfront redevelopment in the so-called Universitetsholmen (University Island). The university was founded in 1998 focusing on multi-disciplinary offering of education. In 2012 the university employs 1400 people with 25,000 students. In addition the availability of new real estate space paired with the necessity of expansion for the local IT industry led to the creation of an IT hub in the region.

United Kingdom

The city of **London** in its docks regeneration project, undertaken in east London (London Docklands), has planned for the creation of a knowledge centre supported by the establishment of the University of East London²⁰. The new university was born out of the existent Polytechnic of East London, which formerly was the combination of the Polytechnic of East London and the Barking Regional College of Technology merged in 1989 but kept their facilities separate. The decision of favouring the creation of this educational pole is targeted to allow the development of knowledge intensive business in the area.

²⁰ University of East London - <http://www.uel.ac.uk>

Real Estate Development



Figure 9 – Selection of cases of port cities and shipyards engaged in Real Estate Development.

Across Europe there has been several real-estate developments in place of former shipyards with the intent of valorise area proximal to city centres. The real-estate approaches underline plans for city expansion, entailing new residential areas but also business and commercial activities. In few instances and mostly in recent redevelopments, as it is discussed in section 12, there has been an increasing trend of developing knowledge centres to elevate the type of economic activities to more knowledge intensive ones. In parallel the development plans eye the possibility of using the existing heritage to attract potential tourism flows as discussed in the following section. Few examples of the real estate redevelopment in the city and port areas are visible in Genoa (IT), Barcelona (ES), Bilbao (ES), Gothenburg (SE), Marseille (FR), Hamburg (DE), Amsterdam (NL) and Rotterdam (NL). This report will focus on two instances, respectively Hamburg and Rotterdam.

Germany

The city of **Hamburg** in the Northern part of Germany is one of the major water gateways to continental Europe. During the last decade the city of Hamburg has embarked in a major development effort in areas partaking to the harbour, but adjacent to the existing city centre. The project named Hafen City²¹ plans the expansion of the city centre with up to 40% new inhabitants from the current 1.8 millions. Differently from other regions that underwent similar intervention, the area re-claimed by the

²¹ HafenCity Hamburg - <http://www.hafencity.com/>

city was a part of the harbour mostly purposed to warehouse. The master plan has designated this area to become the cultural heart of the city favouring the establishment of creative industries. In addition, the plan pursued the foundation of a new university specialized in architecture and spatial planning, which derived from a spin-off of four departments of the University of Hamburg in 2006.

The Netherlands

Rotterdam is one of the best-known examples of how a regeneration program for the port area can become an integrated urban-scale project²² and how integrated planning, policy coordination and cooperation between different agencies can work together in the redevelopment of the waterfront and port areas. Until 2004 Rotterdam was the world's busiest port, and today it remains the busiest port by cargo tonnage, container hub and transshipment port in Europe. It has a long history going back to the 14th century when it developed from a small town into a major harbour, originally built on the Nieuwe Maas River, and later extended to the North Sea through a new waterways system. The connection between the river and the sea offered a range of opportunities for industrial activities to take place in this area in the wake of the 20th century. From 1960s to 1970s Europoort was developed making Rotterdam the major water gateways of Europe. Along with the development and expansion of the port facilities and infrastructure, a range of integrated projects has been taking place to reinforce the centrality of the river in relation to the urban fabric and connect the urban areas, boost economic development and build new districts²³. The revitalization of the 202-hectare area with offices, residential units, shopping and leisure areas, educational and training spaces has transformed a particularly blighted area into a district that in a few short years has attracted businesses, residents and tourists²⁴. A further project of the Waterstad consists of the construction of the commercial and office area, hospitality structures, residential units, leisure and exhibition spaces and a theatre. At the same time, this project is directed towards the protection and preservation of the maritime fabric of the area.

²² Giovinazzi, O., Moretti, M. (2010). Port cities and urban waterfronts. *TeMA Lab Journal of Mobility, Land Use and Environment*, Volume 3: pp. 57-64

²³ Ibid.

²⁴ Ibid.

Heritage Industry



Figure 10 – Selection of cases of port cities and shipyards engaged in Heritage Industry

Today many functionally obsolete buildings and infrastructure in shipyards and port cities sit vacant or underused. Some of these buildings and spaces present valuable cultural heritage and have an important cultural and historical significance for cities, regions and countries. The relation between the built cultural heritage and the economy has only been addressed in the recent two decades, and here port cities have played a significant role. Recent experiences show that the presence of heritage in the city can contribute to the overall appeal of an area for people already visiting for different reasons, but it can also stimulate extra-economic development through its integrated conservation and utilization. Integrated conservation and adaptive reuse of the cultural built heritage has positive effects on the overall socio-economic structure and development of the city and its respective region. In this respect, cultural heritage presents a competitive advantage through which it is possible to attract public and private investments and to channel and coordinate multiplicity of projects in redevelopment strategies in order to create preconditions for shift in the local economy. Apart from the societal and cultural values, some of the direct economic benefits recently identified in respect to the integrated conservation and redevelopment strategies that focus on the built heritage resources refer to the jobs and household income generation, heritage and cultural tourism development and creating economic stability by utilizing the existing resources to support the local economy. A striking example is drawn from cases around the world, where a million US dollars spent on new construction generates 36.1 jobs, while for every million US dollars spent in rehabilitation of an historic building, generates 40 jobs.

In an example from Norway, historic rehabilitation generates 16.5% more jobs than new construction²⁵. Likewise, practices around Europe have shown that historical buildings and districts are natural incubators of small businesses. Many commercial businesses as well as the creative industries tend to settle in historic neighbourhoods primarily due to their low cost of occupation. Likewise, the location, character, and often prestige that the heritage building provides are central components of not only the marketing but the ultimate profitability of the small business tenant²⁶. In addition, cultural heritage landmarks and sites provide attractiveness for the city and its region. Tourism accounts for the 50% of the European GDP. Heritage tourist stay longer and spend more per day, therefore, have a significantly higher per trip economic impact than do tourists in general. The adaptive reuse and integrated conservation of cultural heritage buildings and infrastructure of port cities is identified in several European cities, such as Bilbao (ES), Barcelona (ES), Valencia (ES), Zaragoza (ES), Marseille (FR), Liverpool (UK), Amsterdam (NL), Hamburg (DE) and Genoa (IT) to name a few European cases. It is to note that heritage industry development often occurs as part of the large-scale waterfront redevelopment projects, alongside with the knowledge centre and real estate development projects. During the last few decades these developments have been mostly promoted through organization of the Olympic games, Expo and European Capital of Culture nominations.

Italy

Urban regeneration and **adaptive reuse** of the port infrastructure and built cultural heritage of **Genoa** (IT) is an example of the waterfront redevelopment project aiming to reconnect the historic city centre and the Ancient Port. In this endeavour, one of the principal objectives has been to return the area of the port to the city through organization of cultural initiatives, development of convention industry, and creation of venues for tourist attraction. Since 1992 a series of joint projects was realized through the occasional cooperation between the City Administration and the Port Authority. The restoration and transformation of the Cotton Warehouses into a convention centre, creation of the Piazza delle Feste, construction of the largest aquarium in Europe and the Bigo panoramic elevator were in the year 2000 followed by the construction of multipurpose complex, new venues in the Scio district and regeneration of the public spaces of the seaside promenade. Further regeneration projects include construction of the tourist port, Museum of the Antarctic, Museum of the Sea and Navigation and other educational, public and leisure facilities, as well as the revitalization of the historic city centre near the port area. Plans for renovation and development of new and already existing public spaces, cruise ship terminal, shipyards, urban parks and an international airport are envisaged to transform the port of Genoa over a period of the next two decades and revitalize its economic and productive sector.

²⁵ Rypkema, D. (September 2003). Planning for the Future, Using the Past: the Role of Historic Preservation in Building Tomorrow's Washington, DC

²⁶ Rypkema, D. (2009). Economics and the built cultural heritage in Heritage and Beyond. Council of Europe Publishing: pp. 113-123

United Kingdom

Redevelopment of the *Liverpool's* waterfront and port infrastructure has been an example of a sustainable development and conservation of the historic legacy that is envisaged to lead to the shift the economic base and creation of the new image for the city. As a commercial port that quickly grew into one of the world's major merchants centres dependent on the marine trade in the 18th and 19th centuries, Liverpool was the leading port of the British Empire at the time and a pioneer in the development of modern dock technology, transport system and port management²⁷. Much of its existing architecture and heritage comes from this area - a series of six areas in the historic centre and docklands with commercial, civic and public buildings today stand as a witness of Britain's history and its influence as a maritime superpower. However, during the mid-1970s Liverpool's shipbuilding industry and shipping have experienced economic decline, while unemployment rates in the maritime sector increased by the 1980s. Much of the port and industrial infrastructure have at the time become obsolete. As a response to the economic downturn, since the mid-1990s Liverpool's waterfront has undergone significant redevelopment and reorientation towards the service sector industries and knowledge economy. Liverpool's cultural heritage and its integrated conservation and use in the waterfront redevelopment projects led by the public and private partners has had a significant role as a catalyst that enabled a shift towards the service sector economies, in particular tourism, cultural industries and leisure sector. In fact, today less than 10 % of employment is based in manufacturing and port activities. Since 2004 Liverpool's waterfront is listed under the UNESCO protection, as a World Heritage Site. Further physical and functional redevelopment of the city and its port infrastructure was envisaged around the designation of Liverpool as the European Capital of Culture in 2008 in a series of large-scale redevelopment project that are to be completed by 2020s. These projects aim to manage a complex yet flexible system, reinforcement the cruise ship industry, to build a sports complex and shopping centre, adaptive reuse for the three historic warehouses and a series of projects to create new natural reserve and improve public access with the objective to create a synergy between a multiplicity of functions and to reinforce local identity²⁸. While Liverpool is committed to preserving its maritime legacy, the fine balance between the preservation of the urban fabric and new construction and development requires a constant reassessment.

²⁷ Liverpool – Maritime Mercantile City - <http://whc.unesco.org/en/list/1150>

²⁸ Giovinazzi, O., Moretti, M. (2010). Port cities and urban waterfronts. *TeMA Lab Journal of Mobility, Land Use and Environment*, Volume 3: pp. 57-64

9 Analysis

Shipbuilding is still an important industrial sector in Europe, although during the last three decades this economic sector has experienced strong rationalization in attempts to remain competitive. Demand for new transportation technologies, new types of vessels and port technology, but also the ongoing transition from fossil fuels to more sustainable sources of energy, are in this respect seen as one of the way forward for the European shipbuilding industry. Today European shipbuilding maintains its primacy in the construction of cruise ships, luxury yachts, and hi-tech vessels, such as the offshore support vessels and military vessels. The rationalization of shipyards overtime has led to several closures and confronted the local communities with the necessity of exploring new ways to recuperate the lost employment and repurpose the existing infrastructure and disused shipyard spaces.

The aim of this report is to identify *industry shifts* and the emergence of new industries in place of shipbuilding industry in Europe and to pin point the existence of potential synergies between the former and new industries. The review conducted in this report highlights the existence of a particular type of shift that occurred in former shipyards, namely the establishment of the offshore wind and sea power industries. This industry shift has been occurring predominantly in regions characterized by specific geography and meteorology, mostly in shipyards facing the Northern and Baltic Seas, but also along the coast of the Atlantic Ocean, where the meteorological conditions are characterized by strong and constant winds and ample tides.

The shift towards new industries does not appear to be a fluid process, but a result of the systemic planning by policymakers aiming to spur structural changes. This is a clear example in analyzing countries such as Denmark, Germany and UK, which have in place specific energy policies aiming to increase their energy provision from renewable source, especially marine ones. The offshore wind power in these countries has been booming and led to a conversion and re-use of the facilities and spaces previously dedicated to the shipbuilding sector. The limited presence of this industry in neighboring countries, such as Sweden and Finland that have lagged behind in introducing specific policies, suggests a strong policy dependence. To date there are no clear signs of industry shifts occurring in the countries facing the Mediterranean Sea, especially not in the direction of wind power generation due to the largely unsuitable meteorology conditions for its application. In view of that, one pattern emerging from this report is a division between North and South of Europe, where the North shows a larger number of industry shifts compared to the South. One of the factors behind the shift towards renewable offshore energy production lies in the regulatory schemes promoted by European Union, which allowed creating a cohesive group of countries pursuing the establishment of the offshore industry.

This report further identified three distinctive, yet interrelated developments occurring across Europe. Development of knowledge centers, real estate development, adaptive reuse of historical buildings and integrated conservation of the local cultural heritage, have been the approaches used to promote

restructuring in the existing economic fabric of the shipyards and port cities in decline. Revitalization of the built heritage of the port cities and shipyard spaces involves as a property in the urban and real estate market as a resource for the economic development. Therefore, as cities on the coast grow and expand towards the water, the waterfronts become attractive targets for real estate development projects and restructuring processes that are ultimately aiming to trigger new economic developments. Since moving away from the shipbuilding industry in these regions leaves behind obsolete infrastructure and redundant shipyards spaces, they at the same time provide a level of attractiveness for location of business activities and lure in new inhabitants into the area. The heritage component and maritime legacy in this respect is an additional competitive advantage whose use is employed to attract public and private investments for creating a new image of the city. When focusing on the service, heritage and knowledge intensive industries, heritage buildings and infrastructure, as well as the possibility to open up the city towards the water, are crucial features around which new developments are taking place.

In view of that, many shipyards and port cities in Europe located in proximity to city centers have become targets of large-scale urban redevelopment projects and projects of urban expansion. For the reviewed cases, large investments have been made, and more are being planned. These plans are mostly realized as projects of public-private partnership, which take place through competitions for organization of major international events, such as Olympic games, Expo, and European Capital of Culture nominations, as few examples. Furthermore, in regions where the shipyards are located in small communities and ports of historical significance, there has been a tendency of preserving the infrastructure and historic legacy, which is further used to accommodate private and public needs.

Even though restructuring and realization of the knowledge centers, real estate development and integrated conservation and use of cultural heritage often go hand in hand, a discrepancy can be found between attempts to preserve existing infrastructure on the waterfront and to promote new developments and constructions in the area. As in every fast paced change a number of issues arise, particularly in this context new developments seek to replace the economic backbone of the industry and therefore to create a new one for the city and its region. Such changes will have long-term implications on the social, cultural and demographic composition of the wider region and its future developments. In view of that, redevelopment projects and similar undertakings require a careful consideration that will include a case-by-case approach due to diversity and peculiarity of waterfronts and maritime traditions present in European port cities.

It is important to notice that even though the presented transformation model of the shipbuilding industry in Europe points towards the urban-regional divide, this spatial configuration is nevertheless only indicative. Knowledge Centre, Real Estate Development and Heritage Industry are typical for transformation of shipyards and ports situated in cities and in close proximity to existing urban areas. Industry Shift, Industry Niche Strategy and Remnant usually occur in shipyards situated on the urban fringes, but there are also examples where this shift takes place in close proximity to urban centres.

Within the context of the identified changes and shifts, attention should be given to the fact that European shipbuilding industry encompasses a wide range of professions and accompanying industry that directly and indirectly supports the working of this economic sector. Both in Europe and elsewhere, restructuring events have impacted productive workforce beyond the shipbuilding sector in view of the complexity and variety of professions and suppliers involved. Developments in the shipbuilding industry in Europe are often results of the particular historical, geographical, socio-economic and cultural circumstances. Therefore, the identification of a dominant transformation trends across Europe should not be read as the only recipe to conduct shipbuilding industry restructuring. On the contrary, the approach to shipbuilding industry transformation and restructuring should outline the existence of clear geographical connotations that are accounted for and reflect in policymaker's programs. It should also be noted that strategies implying a shift towards a mono economy, hence consisting of one single industry, although providing a short-term relief to the regional economy, on the long run might be detrimental to it and fossilize the workforce. Differently, a shift should aim to maintain a plurality of industries that enables workforce diversity and maintains the regional economy flexible.

This report further identified that innovations taking place within the sector are often a result of a specific legacy of the shipbuilding industry. Namely, in several shipbuilding regions it is noticeable that the existence of remnants greatly relies on innovative products that have been growing out of the relation with the shipbuilding industry. This suggests that diversity and complexity of shipbuilding professions enables flexible and novel solutions within the sector, which in turn may be a fertile soil for developing further innovative entrepreneurial endeavors. In today's economy, shift is often seen as a path to innovation and growth opportunity, but this might be a myopic reading of it. The shift is not a sufficient precursor to growth and innovation, whereas the ability of an industry of igniting innovation in the regional economic fabric through enabling the emergence of new innovative industries is likely to have a greater positive impact.

This report bears the question of the innovation potential of an industry and if the occurring of an industry shifts will have a similar innovation potential as shipbuilding did to fuel the future prosperity of a region. The analysis conducted in this report should be understood in light of the short time elapsed since most of the shipbuilding restructuring instances occurred, hence the current assessment should be reviewed in the future to further validate the current trends.

About the European Cluster Observatory

The European Cluster Observatory, launched in June 2007, is the most comprehensive database and knowledge platform for clusters and regional competitiveness in Europe. It is managed by the Center for Strategy and Competitiveness (www.hhs.se/csc) at the Stockholm School of Economics, and is funded by the European Commission, Directorate General for Enterprise and Industry.

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