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4.3. Innovative trends in management of the development of Ukrainian port infrastructure

Kharichkov S.K., Volosiuk M.V., Lukianova Yu.O.

In the context of social, political and economic transformations currently happening in Ukraine, when all sectors of the national economy undergo reforms, the reform of infrastructure becomes one of crucial, high-priority problems. Of particular importance is the improvement in management of its economic and organizational development. In this regard, it is now relevant to study the issues of introducing advanced practices in management of the development of the Ukrainian port infrastructure, which is the aim of this publication. The paper presents a summary of the experience that the EU countries have had in this respect and outlines possible vectors of its application in the realities of the present-day Ukraine.

According to the Global Competitiveness Index for 2016-2017, Ukraine ranks 96th in the world by the quality of port infrastructure [1], taking the place between Cape Verde (95th) and the Czech Republic (97th).

Seaports play an important role in increasing the competitiveness of a country or a region, as they serve as transport hubs that provide economic links between the domestic and foreign markets. Therefore, it is not surprising that the most influential rating of this kind, The Global Competitiveness Index, contains the component Port Infrastructure Quality.

Countries with the highest-ranking port infrastructure (the Netherlands, Singapore, and the UAE) are continually increasing the quantity of ports and enhancing their quality. For example, the largest and most important harbor in Europe – the Port of Rotterdam – offers foreign companies a perfect springboard to the European market, as goods can be delivered from there to all major industrial and economic centers of

Western Europe in less than 24 hours. Meanwhile, the Dutch government is continually improving its port infrastructure by spending around €150 mln annually on maintenance and expansion of roads and berths, safety and environmental upgrades, as well as other changes [2]. This indicates that port services go far beyond the port itself (its internal and external water area) and cover a large number of coastal and other business operations.

To address these issues, European countries are looking for new forms of integration of their industrial, financial and intellectual capital to boost the quality of port infrastructure. Nowadays, the European Network of Maritime Clusters (ENMC) serves as such an integration tool; it was established in Paris in November 2005. The Network aim is to organize the exchange of experience among its members, coordinate various activities, as well as develop and strengthen marine clusters of the member states and of Europe as a whole [3]. At present, the ENMC includes marine cluster organizations of such countries as such as Belgium (Flanders Maritime Cluster), Bulgaria (Marine Cluster Bulgaria), Denmark (Maritime Development Center of Europe), Finland (Meriliitto), France (French Maritime Cluster), Germany (Bundesministerium für Wirtschaft und Technologie), Italy (Italian Maritime Cluster), Ireland (Irish Maritime and Energy Resource Cluster), the UK (Maritime UK), the Netherlands (Nederland Maritime Land), Sweden (Sjöfartsforum), Spain (Spanish Maritime Cluster), Portugal (Forum Oceano), Poland (Polski Klaster Morski), Norway (Maritimt Forum), and Iceland (Iceland Ocean Cluster).

As for infrastructure of the Ukraine's port industry, the 2000s marked the start of its rigorous development and technical re-equipment. However, the absence of special legislation had resulted in the critical condition of ports. On June 13, 2013, the Law of Ukraine «On Sea Ports of Ukraine» [4] came into force to regularize the legal, economic and organizational foundations of the port industry functioning. An important opportunity provided by this Law was the privatization of port infrastructure objects and development of private entrepreneurship in this sphere. As noted in [5], the commercial activity of ports, which had been historically state-regulated, became open to private entrepreneurs not only for a particular production cooperation, but also for complete privatization. The purpose of such transformations was to develop port competition able to provide a greater economic efficiency and meet the customers' needs to a fuller extent than one state enterprise [5, p. 25].

After the Law's adoption [4], the Ukrainian Sea Ports Authority (USPA) was established with regional branches in the seaports of Ukraine; it could be regarded as a state authority. The strategic property

of ports that is not subject to privatization has been transferred to the USPA; it includes approach channels, water areas, berths, navigation systems, and general communications. Meanwhile, other facilities with average wear of 80% (warehouses, cranes, and other equipment) make up the property of merchant seaports (one third) and private companies (two thirds). Such an imbalanced division of state property, powers and functions between the USPA and state-owned enterprises is subject to criticism [6, 7]. Since 2016, the Ministry of Infrastructure has planned a port industry reform which would «withdraw the state from all the spheres that have an impact on business», a drastic USPA reform, and creation of a maritime authority that will assume all the USPA responsibilities [8].

The term «port infrastructure» first appears in the Ukrainian Seaports Development Strategy until 2015 [9], which defines it as a specialized property complex including warehouses and storage yards, loading and unloading mechanisms and other property [9].

The above-mentioned Law «On Sea Ports of Ukraine» [4] defines the port infrastructure objects – mobile and immobile objects that ensure the operation of a seaport. Besides, it is the first document to provide description of the following categories:

- general-purpose port infrastructure objects: water area, railway and automobile approach roads (up to the first junction outside the port territory), communication lines, means of heating, gas, water and electricity supply, engineering communications, and other objects that ensure operation of two or more business entities in the seaport;
- strategic state-owned port infrastructure objects: hydrotechnical structures, general-purpose port infrastructure objects, navigation equipment, other objects providing navigational and hydrographic support of sea routes, vessel tracking management systems [4].

The Ukrainian Seaports Development Strategy until 2038 [10] is based on the principled understanding that competitiveness of the domestic transport complex in the world market depends a number of factors. They include the efficiency of operation of seaports, the level of their technological and technical equipment, and the compliance of the infrastructure management and development system with the current international requirements.

According to [11], port infrastructure quality is a five-dimensional notion consisting of the elements associated with resources, results, process, management, and the image and social responsibility. It has been established that this notion covers all aspects of port service provision. Besides internal services within the port, external connections between the port and its customers are also considered, social responsibility being

particularly significant with regard to the maritime sector [11]. Therefore, it is critical to improve the port infrastructure quality with the help of a comprehensive approach rather than merely focusing on port resources. The quality of port services has a substantial positive impact on customer satisfaction. It helps keeping the existing customers and attracting the potential ones, so it is not surprising that analysts associate the development of port infrastructure with investment of funds. When planning an investment, the USPA bets on the ports with a certain cargo traffic. At present, those are the highest-capacity ports in Odessa, Yuzhny, Mykolaiv, and Chornomorsk (see Table 4.11).

*Table 4.11. Cargo turnover at domestic ports, mln tons**

	Yuzhny	Odessa	Mykolaiv	Chornomorsk	Total (13 ports)
2014	47.4	24.6	20.8	17.6	144.9
2015	48.5	25.3	22.2	17.3	144.6
2016	39.3	25.3	22.4	15.9	131.7
2017 (first half of year)	22.1	12.2	11.4	8.0	66.0
Share of grain cargoes in total cargo turnover	24%	42%	43%	50%	

** Compiled by the authors according to [12]*

It should be noted that seaports are classified according to the major cargo nomenclature (see [10]). Currently, most potential investors are involved with the cargo traffic in the agricultural sector. According to the forecasts of analysts, the volume of grain export is going to increase, therefore, agribusiness holdings will invest in the growth of capacity of grain terminals.

Another area for improvement in the quality and competitiveness of port infrastructure is capital investment aimed at dredging channels or specific water areas and maintaining their depth. This is the case with the potential grain container port hub of Chornomorsk. The Ministry of Infrastructure of Ukraine, the State Enterprise «Marine Trade Port of Chornomorsk» and the USPA plan to invest in Terminal 2 over 2017-2018 for the following purposes: dredging of the approach channel of the port up to 16 m; dredging of the water area of the 1st basin of the Sukhyi Estuary up to 15 m; dredging near berths 7, 8, 9, which will allow accommodating vessels with up to 100000 tons of deadweight; reconstruction of the power supply system at berths 8, 9, which will provide for simultaneous operation of four or more cranes; continuation of two railways from berth 9 to berth 7 and 8, which will increase their carrying capacity [13]. By the way, the USPA has invested 887.2 mln UAH in the

infrastructure of the port of Yuzhny to dredge its water area from 15 m to 19 m, which resulted in receiving an additional income of 877.97 mln UAH due to the growth of cargo traffic and abolition of discounts [14]. The investment in the infrastructure project increased the port capacity, which allowed for the entry of 351 large-tonnage ships of the Sapesize class and their loading up to a complete draft at berths 5-6. During the project implementation, the growth of cargo turnover in the water area of the port of Yuzhny was 14.57 mln tons.

Particularly noteworthy is that the Seaports Development Strategy [10] focuses on the specialization of seaports by the major cargo nomenclature:

- oil and petroleum products – seaports of Odessa and Feodosia;
- chemical liquid cargo – seaport of Yuzhny;
- metallurgical industry cargo (iron ore, coal, ferrous metals) – seaports of Odessa, Mariupol, Chernomorsk, Kerch and Yuzhny;
- grain cargoes – seaports of Odessa, Chornomorsk, Mykolaiv and Kherson;
- container cargo – seaports of Odessa and Chornomorsk [10].

Accordingly, the Minister of Infrastructure V. Omelyan has highlighted the necessity of forming a hub (centered) model of seaports [8].

By the term «hub port», we mean the main seaport strategically feasible in terms of transport infrastructure and logistics functions that performs the entire complex of port services determines by international competition and development of new technologies. Thus, the task of forming competitive hubs on the basis of the Ukrainian maritime complex and their integration into the world's port system is extremely urgent nowadays. This fact sets the following priorities in improvement of the seaport infrastructure quality in Ukraine [10]:

- increase of cargo handling rate, efficiency, and quality;
- modernization and development of general-purpose port infrastructure objects, in particular, automobile and railway approach roads;
- effective state regulation of specialized seaport services provided by natural monopolies and services covered by the port dues;
- improvement of the document management system, simplification of permit procedures, reduction of cargo handling time;
- provision of equal, competitive conditions for conducting business and receiving services at a seaport;
- coordination of actions on congestion and increase of load capacity at seaports.

In our opinion, further development in this sphere (that is, creation of a marine transport hub on the basis of a seaport) will create the necessary prerequisites for its transformation into a marine cluster. In turn,

this will allow exploiting the potential of port infrastructure facilities to a full extent, thus leading to an increase in the competitiveness of both the port and the respective region.

Summarizing all the above, it can be concluded that elaboration of basic directions for further development of the port infrastructure requires a study of appropriate foreign experience. Let us consider the present-day means of enhancement of the port infrastructure quality in other countries (Table 4.12).

Thus, having studied the experience of EU countries, it should be noted that the quality of the Ukrainian port infrastructure can be improved through transition from centralized management, planning, and instruction to their regional organization and local development tools. This is proved by the fact that the territorial dimension is diversified from geographical, economic, administrative and institutional points of view. Port infrastructure at the local level at the same time can be an integral part of the regional, national, European and international levels.

Table 4.12. Means of improving the port infrastructure quality in European countries*

<i>Name</i>	<i>Aim</i>	<i>Results</i> (as illustrated by some ports)
<i>Cluster Pôle Mer Bretagne Atlantique</i> (established in 2005 in France)	Establishment of joint research projects and support for the growth of participating companies, particularly through the placement of new products, services and processes resulting from market research	Seaside region of France – Bretagne-Pays de la Loire Maintaining their identity and integrating into the human and geographical environment, port cities are truly laboratories of sustainable development in densely populated urban areas. Port infrastructure should perform its functions for a long period of its operation. Therefore, the main objective of the I-MARECO project is high performance and life cycle of the port infrastructure. I-MARECO aims at developing a common expenditure strategy for the maritime infrastructure through the creation of surveillance systems (multisensory devices) that will eventually optimize management and performance, as well as facilitate feedback. Other ongoing projects include: AIMS – integrated noise monitoring of the marine environment; COVASED – a platform for management of earth sediments and development of their economic potential; OPTIMISME – development of global energy flow management in the port zone; SEEWALL – monitoring of marine protection works with the use of seismic listening; WATCHDOG – an autonomous intelligent robot for underwater diving

Table 4.12. Continuation

<i>Name</i>	<i>Aim</i>	<i>Results</i> (as illustrated by some ports)
<i>TEN-T</i> (<i>Trans-Euro-pean Transport Network</i>) (founded in January 2014)	Elimination of bottlenecks and technical barriers among transport networks of the EU member states; strengthening of the social, economic and territorial cohesion of the European Union; modernization of existing infrastructures and platforms	Recognition of the NAPA ports (five seaports in the northern part of the Adriatic Sea) as the main ports of the EU in the TEN-T, successful cooperation within the framework of the Motorways of the Sea (MoS) projects and IT support projects, such as customs clearance of containers (Single Window and EDI Center), and successful participation in several international exhibitions in Europe and Asia
<i>EcoPorts Network</i> (launched by a number of active ports in 1997; fully integrated into the European Sea Ports Organization (ESPO) since 2011)	Elimination of all negative environmental impacts resulting from various activities, such as shipyards, fishing sector, maritime transport and the city as a whole	<p>Port of Vigo (Spain) Taking action against climate change, introduction of LNG and OPS, reduction in carbon emissions, incorporation of marine renewable energy sources into the port activities, creation of the National Park of the Islands Cíes. It is planned to develop an infrastructure for gas and electricity supply to vessels.</p> <p>Port of Dover (United Kingdom) Receiving CEEQUAL Award for the environmental quality of the port infrastructure construction, reduction in carbon emissions, implementation of marine renewable energy sources in the port activities, improvement of the waste management system.</p> <p>Port of Thessaloniki (Greece) The relations with the city became more transparent. Major environmental pressures that arose due to the port operation have identified relevant environmental programs and indicators for improving the port's environmental efficiency. It is planned to perform special works on optimization the bulk cargo processing, which will sharply reduce air pollution with dust</p>

* Compiled by the authors according to [15, 16, 17]

Conclusion. Improvement of the port services quality constitutes a promising direction of port infrastructure development, which is determined by international competition and state-of-art technologies forming new requirements for the safety, rate and quality of cargo handling at the port. Therefore, the following priorities of innovation management at the development of domestic seaport infrastructure can be outlined.

1. Using both state subsidies/loans and private funds through attracting substantial domestic and foreign investment. For several years, it has been planned to conduct a concession in the Ukrainian ports, that is,

to transfer a part of their facilities for temporary use to private individuals, enterprises, other countries, etc. This will promote restoration and development of the infrastructure without allocating huge sums from the state budget.

2. Besides infrastructure and equipment, an effective seaport requires effective management. For domestic ports, the state administration reform, the transfer of centralized management to the regional level, and the creation of regional maritime authorities to provide high-quality port services all make up an urgent necessity. At that, involvement of local authorities in the management of port enterprises is also essential.

3. Solving environmental problems of seaports. Some ports are highly industrial; depending on cargo volume and placement, they can have an impact on the water and air quality and, accordingly, on the health of the population. This year, European countries celebrated the twelfth anniversary of the Green Port Policy, which requires an effective environmental management system. Each domestic port can develop plans for managing waste from ships and daily port operations or models for implementing the Green Port concept. They will be aimed at achieving a low level of natural resource consumption. However, this cannot be realized without effective cooperation between public authorities and private companies. It will ultimately lead to a boost in the quality of seaports services, thus positioning them as competitive in international markets.

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