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Strategic Adaptation of Seaports to Modern Trends

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ABSTRACT

The subject of the paper is to consider some basic perspectives for the development of seaport strategies, i.e. their strategic adaptation to modern technological, commercial, and environmental trends. The aims of the paper are: a) to explore the motives and possibilities of peripheral ports in the process of adapting to the concentration of container traffic and finding ways and strategies to overcome their peripheral status and include global trade routes, with reference to the Montenegrin port of Bar, and b) to contribute to the understanding of complex relationships, which affect the complex evolution of seaports. It starts with the basic hypothesis that the adaptation of peripheral seaports requires a broader systemic approach, which consists of institutional, functional, commercial, strategic, and environmental frameworks and determinants. The auxiliary hypothesis is that peripheral ports strive to adapt their development to the dominant world maritime trends through the application of various proactive and reactive strategies in a complex institutional environment. In terms of methodology, in addition to abstraction, concretization, induction, deduction, and description, the paper uses qualitative and quantitative analysis. In conclusion, it is stated that the description and analysis of the available literature verified the correctness of the hypotheses. In addition, it is emphasized that seaport management needs to overcome various constraints and conflicts of the economic, institutional, and ecological environment by applying new strategies, knowledge, skills, technologies, and information..

INTRODUCTION

Two and a half decades ago, the world port economy underwent substantial changes, which significantly influenced the evolution of port systems. These changes are the result of globalization of economic flows, technological development, internationalization of production and exchange, concentration of capital in some significant entities of port activity (especially in logistics operators), new organizational solutions and increasing demands (restrictions) of the ecological environment. L. Wang et al. (2017, p. 1) statement as follows *„In 1992, the United Nations introduced the concept of 'sustainable development' in the environment and development conference. Since then, all port stakeholders discussed the port*

sustainable development issues. In principle, a port is a complex system. Port is not only closely linked with socio-economic and government policy, but also directly impacts on the ecological environment and resources. The concept of port sustainability includes three main perspectives:

- *an economic perspective including returns on investment, efficiency of the use of the port area, and provision of facilities for companies to maximize their performance;*
- *a social scope such as the direct contribution to employment in port companies and activities connecting to the port (indirect employment, the interaction and relationship between port and city, the contribution to knowledge development and education, and the livability of the area surrounding the port); and*
- *environmental performance and management including noise pollution, air quality, dredging operations, and dredging disposal*".

The ultimate goal of the evolution of the seaport functional purpose was to form new competitive advantages. According to competent world experts in this field, several basic stages of this evolution are evident (Table 1), noting that the fourth evolutionary stage is already in sight, which is the creation of clusters in seaports, based on modern principles of logistics and organizational functionality.

Table 1. Evolutions of the functional purpose of seaports

Stage	*Purpose*
I	Stevedoring terminal, transhipment, storage and warehousing
II	Additional port services, creating added value of port services
III	Commercial center of transport services (3, 4 or 5 Party Logistics) - technical port services for all forms of transport - storage, processing, distribution - information service - freight forwarding service, - logistics service - environmental and other services
IV	Port-industrial transport and logistics center based on the special economic zone, Port Cluster

Source: according to Titov, 2009, p. 10.

Advances in shipbuilding, propulsion, smart shipping, advanced materials, big data and analytics, robotics, sensors and communications in conjunction with an increasingly skilled workforce are all having monumental shifts in how the maritime industry are approaching new challenges and opportunities. New technologies must be in balance with commercial and environmental requirements in order to maintain the maritime transport system (Delibasic, 2017b). According to the Global Marine Technology Report 2030, two technology landscapes will shape the future of commercial shipping with a significant impact on ship design and ship operation: one is industrial (Shipbuilding, Propulsion and Powering). It refers to technology sophistication and operational efficiency. Others relate to: Smart Shipping, Big Data and Analytics, Advanced Materials, Robotics, Communications and Sensors.

Structural changes in international trade and the evolution of maritime transport have a direct impact on port growth and expansion. Clearly, seaport strategies need to adapt to the dominant trends of increased vertical and horizontal concentration (mergers and acquisitions), which has been prominent in the container-shipping sector. The effects of container shipping concentration on ports are daunting and blackmailing. Carriers are not only merging (horizontal integration), but also incorporating other parts of the freight transport chain (vertical integration), in particular the container terminal industry. Port development predominantly depends on the investments of multinational companies in the industry and the logistics sector. In that sense, the port authorities strive to create the most competitive business environment for these investments.

The recent years have seen growing interest in the environmental impact of port operations and development due to pressing global issues such as climate change and energy consumption. The port industry is facing increasing challenges since because it must be harmonized of environmental regulatory. Glavna environmental issues related are to at the level of vessel and cargo handling operations, port extension projects and hinterland accessibility. In addition, providing adequate capacity, quality services and cost-effective solutions are essential. In this sense, devising a green port strategy fulfilling both economic and environmental objectives would be desirable and contribute to the port‟s sustainable growth and development (Bauk and Delibasic, 2017; Delibasic, 2017, 2017a).

It is considered (Wilmsmeier and Notteboom, 2011) that port selection can be based on several criteria, from physical characteristics and geographical location to port efficiency, strategic carrier considerations and hinterland access. On the other hand, M. Magala and A. Sammons (2008) argued that port choice is a by-product of the choice of logistics pathway (function of the overall network cost and performance).

1. STRATEGIC, FUNCTIONAL, AND INSTITUTIONAL EVOLUTION OF SEAPORTS

With the changes of the complexity of the international environment, the traditional strategies and theory cannot meet the requirements of sustainable port development any more. The competition among the port enterprises is not only the competition of the core competence of the port, the port industry chain or the port supply chain, but also the competition of the port business ecosystem. The strategy of the port business ecosystem includes horizontal collaboration, vertical collaboration, and collaboration between enterprises and the environment. Horizontal collaboration in the port business ecosystem mainly refers to the cooperation between the port enterprise, which is at the core of the ecosystem, and other port enterprises to achieve horizontal collaboration of interests by complementing resources and preventing vicious competition. The vertical collaboration in the port business ecosystem mainly refers to the vertical benefit collaboration formed by the core enterprise with upstream and downstream enterprises in intensive operation and risk-sharing.

Strategic management concept is relevant for ports because they are can be considered business networks in an analogy with the business ecosystem (Pettit and Beresford, 2017). Ports are confronted with a closer integration in the maritime and shipping industries. The cooperation agreements taking place in the maritime and shipping industries can take several forms, such as alliances and mergers among shipping lines, conferences, the involvement of shipping companies in terminal management, and extending interests in inland transport of shipping companies (Van de Voorde and Vanelslander, 2014). The content of the fourth generation seaport (evolutionary stage) is based on the mutual capabilities and competencies of the seaport, various companies and participants in the logistics chain of cargo delivery. A seaport is increasingly becoming a cluster which contains the environment of the port industrial-logistics zone, port terminals, transport-logistics and distribution centers, and cargo handling complex, with numerous service complexes, specialized storage facilities, and intermediary agencies. The functional environment of the port cluster was modeled by Titov (Ibid., P. 11) as shown in Figure 1. The port cluster is formed in order to increase the competitiveness of all transport nodes, which is based on volume effects, stimulating innovation in the environment of transshipment and terminal port complexes, developing new clusters and creating synergies between them.

The various clusters are interconnected by information, material and financial flows, transport and storage infrastructure, and the basic cell of the port cluster, which consists of various steward terminal functions (loading and unloading operations). Customs, freight forwarding, service, brokerage, overhaul, production, inspection, and other port functions are networked in the mentioned system. All this is linked with the appropriate information support. In this way, the seaport appears as a concentrator of cargo flows, connected to transport-technological supply chains. It forms around itself various branch economic activities and activities in the hinterland. In that way, it creates a cluster structure, whose basic cell is the port infrastructure. The port cluster is formed in order to increase the competitiveness of transport hubs, which is based on the effects of volume, stimulating innovation in the environment of transshipment and terminal port complexes, developing new clusters, and creating synergies between them.

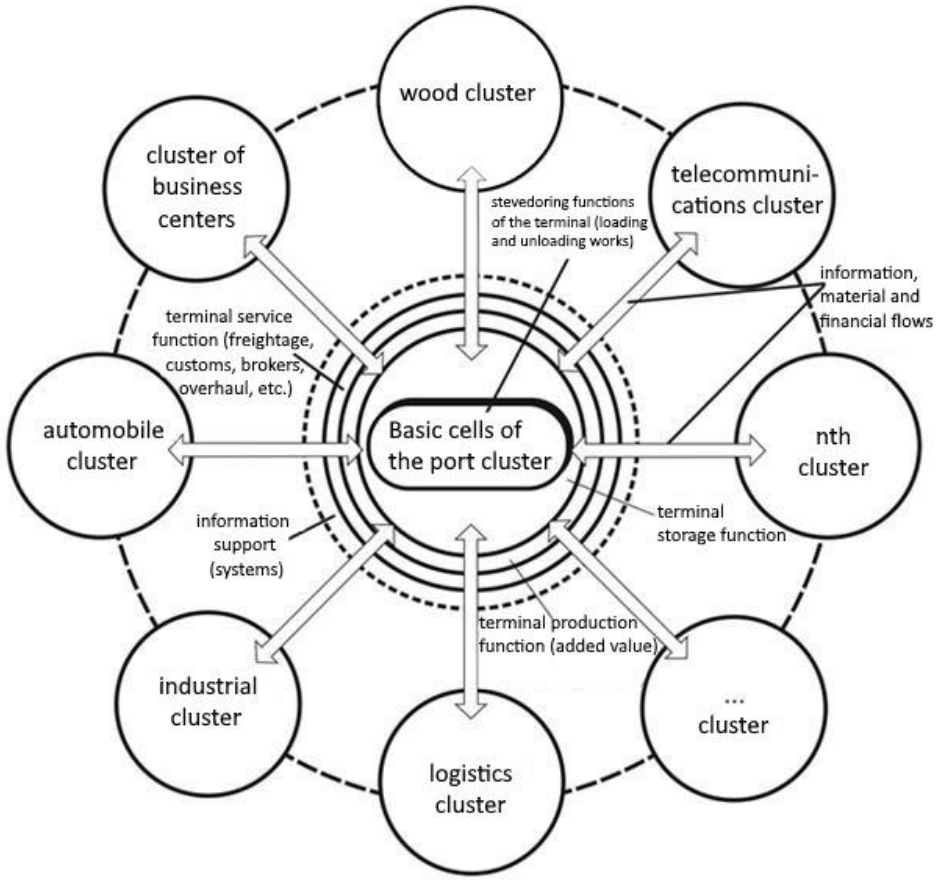

Figure 1. Functional environment of the port cluster

Source: Ibid., p. 11

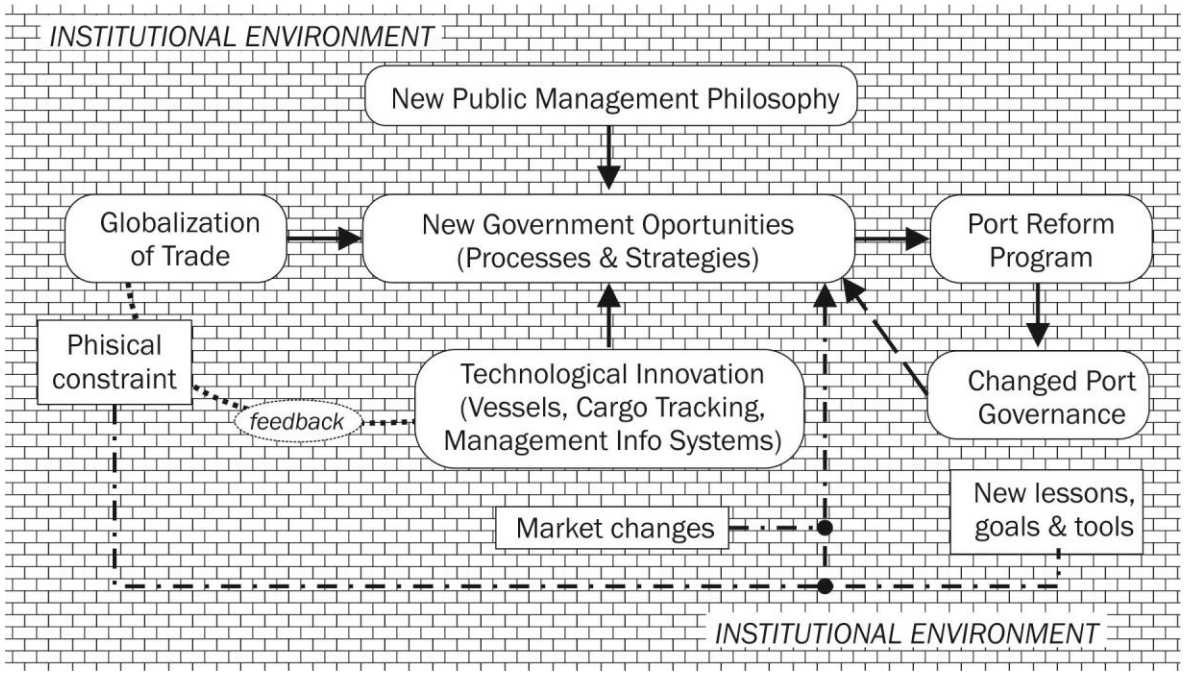

Figure 2.The decision flows for port governance

Source: Brooks and Cullinane, 2007.

In the institutional evolution of seaports, the main change was the involvement of private operators as intermediaries between seaports, freight forwarders, and shipping companies. In this sense, in addition to state bodies and port authorities, the institutional structure was supplemented by private operators, who are responsible for the development of superstructure, management strategies, and modern technological equipment (Grgurevic, 2020, p. 235). Figure 2 conditionally shows the basic flows that connect the various levels and segments of decision-making which are relevant to port governance. As shown, the front covers various levels and environments: international, market (commercial), management, strategic, technological, organizational, institutional, operational, and functional.

2. CHANGING THE STRATEGIC ROLE OF SEAPORTS

R. Robinson (2002) explained the role of seaports[1] in the modern environment, which has been significantly changed and restructured by logistics. Previous research has viewed ports as (Ibid.):

- places for handling ships and cargo,
- operating systems that deal with efficiency,
- economic units that operate according to appropriate principles, and
- administrative units dealing with management, organization, and business policy.

Factors affecting port performances su: infrastructural, network and connectivity, operational, sustainability and environmental (Delibasic, 2017b). The new port environment has been significantly changed and restructured under the influence of globalization, technological revolution, corporatization, privatization, integration, intermodalism, containerization, digitalization, and intensified market competition. Seaports have become functional and networked parts of complex logistics systems and supply chains. Today, seaports are hubs that share maritime transport (distribution) and land distribution, whose levels of functionality (services, integration, and operability) are constantly evolving and improving. No matter how many new principles and criteria emerge, economies of scale remain dominant. As a result, seaports no longer compete with each other individually, but supply chains do.

T. Notteboom and J.-P. Rodruque (2004) conclude the following: "*Observed logistics integration and network orientation in the port and maritime industry have redefined the functional role of ports in value chains and have generated new patterns of freight distribution and new approaches to port hierarchy*". Seaports that prefer efficiency, competitiveness and development must accept new freight distribution paradigm. She implies a 'regionalization' phase in port and port system development. Contributed to this: containerization, structural changes in logistics and development of global supply chains. Port Regionalization je tijesno povezana sa Port Terminal Systems and Logistics Integration (Ibid.).

Ports are complex organizations in which many entities, (Figure 3) institutions, and processes interact at different levels. Within a port, two different sets of people act as stakeholders: those who directly use, regulate, maintain, and police the port, and those who indirectly benefit or are otherwise affected by the activities of the port. Luka is a mix and cross-over of economic, social, political, legal environmental/ecological, and technical impacts. In order to be efficient and competitive in the market, it must successfully integrate with the supply chain network, hinterland/intermodal transport network, liner shipping network, and urban network.

One of the central tasks of supply chain management is the coordination of relations within it. This includes assessing the position of each supplier in the chain and assessing its importance, i.e. contributions to the overall success of the cooperation. At the same time, each organizational link in that chain strives to maximize its own performance and profit. Seaports are actively involved in these supply chains

[1] "*Seaports are interfaces between several modes of transport, and thus they are centers for combined transport. Furthermore, they are multi-functional markets and industrial areas where goods are not only in transit, but they are also sorted, manufactured and distributed. As a matter of fact, seaports are multi-dimensional systems, which must be integrated within logistic chains to fulfil properly their functions. An efficient seaport requires, besides infrastructure, superstructure and equipment, adequate connections to other transport modes, a motivated management, and sufficiently qualified employees*" (UNCTAD definition)

through various adaptation strategies, depending on their own capabilities, conditions and constraints. Figure 3 provides an example of some of the stakeholders in the analysis that may influence or exert pressure on. Port performance must be analyzed by keeping in mind both the stakeholders inside and outside the port environmental.

Figure 3. Outside stakeholders in the port

Soure: Adapted to Gharehgozli et al., 2017.

In maritime logistics, there are three types of actors in cargo handling; port authorities, shipping lines with terminal operations, and independent container terminal management companies. Their action depends on global supply chains (Heaver, 2006). The structures of port administration/port authority could be illustrated by the landlord model, in terms of its ownership and the operating structures of the port. The port could be separated into infrastructure and superstructure, whereby the infrastructure is administrated by the governance and the superstructure is operated by private companies.

Studying ports in the network context would be even more beneficial to capture the complexity needed to understand port performance and its interaction with various stakeholders. Unable to define unified framework for analysing port's integration in global freight supply chains including shipping line networks, especially from the hinterland aspect and intermodal transport network. Because, such a framework encompasses embraces a wider group of stakeholders involved (terminal operators, port authorities, shippers, shipping companies, inland transport providers, freight forwarders/logistics service providers, and other ports).

Ways and modalities of connection and integration can be various. They must be based on the specifics and actual goals of the port. They very much depend on the geographical, location, infrastructural,

supra-structural, and logistical characteristics of the port, the economic development of the port hinterland and the home country, its political relations, and integrations in the region. All this needs to be networked, as well as local port operation management with a global manufacturing supply chain in various fields such as service, organization, value-adding, and flow (information, material, and financial). Above all, it is necessary to valorize and harmonize different institutional levels and relations.

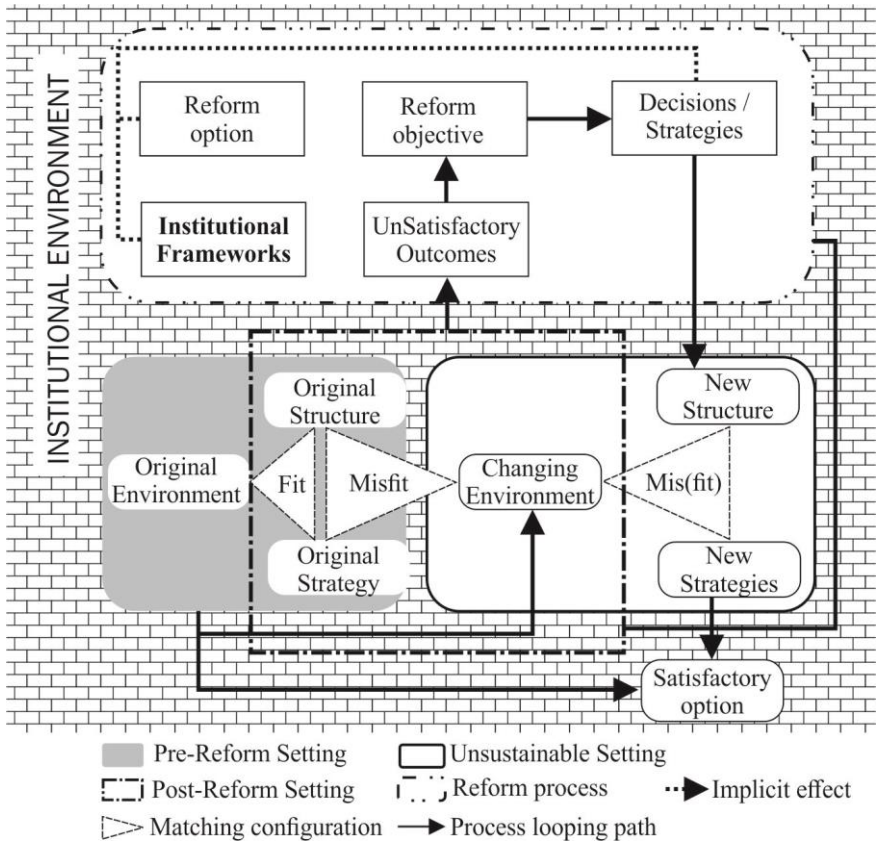

Figure 4. The road to institutional reforms, management reforms, and governance

Source: Pallis & Ng, 2010.

A. Pallis and A. Ng (2010) schematically proposed a way to manage (functional and strategic), governance[2] and institutional reforms in a seaport (Figure 4). They prefer the method of adjusting all port structures in a time when downtime, changing conditions, and various scenarios can occur. Figure 3 explains that institutional frameworks play a significant role in the functional and strategic adaptation of seaports.

3. METHODOLOGICAL ALGORITHM OF ELABORATION AND IMPLEMENTATION OF THE SEAPORT LOGISTICS STRATEGY

The transition from the transport functions of to the logistics functions essentially means a change in the character of the seaport functional purpose. The seaport goals are increasingly identified with the basic goals of logistics. It means optimal utilization of bandwidth, high flexibility in the production industry, rapid response to customer requirements, willingness to provide complex services in the package,

[2] The logistics strategy of seaports is a long-term and hierarchical direction of logistics development in the form and means of its implementation (logistics technologies, logistics operations and functions, information system), formulated by port authorities in accordance with strategic goals.

security in the execution of services, short deadlines for service delivery, cost reduction, continuous and comprehensive customer support, etc. The realization of these goals leads to an increase in the competitiveness of seaports.

At the same time, there is a necessary change in the port infrastructure, because transport and logistics centers are being formed on the seaport territory, while industrial and logistics zones are being formed in the hinterland. These are realistic conditions for the realization of new logistics port functions, which enable seaports to be included in logistics supply chains. Thereby, it is considered (Titov, Ibid., p. 7) that seaports can participate in logistics supply chains as organizers of cargo delivery at various stages of their movement, or as logistical elements at the joints of system transport components.

Table 2. Basic logistics strategies of seaports

Form of strategy	*Method of realization*
minimization of total logistics costs	reduction of operational logistics costs in certain logistics functions, optimization of decisions in certain logistics functions
quality improvement of logistics services	improving the quality of certain logistics operations and functions, value-added logistics services, improving information support and customer requests, quick response to customer requests, quality control certification, use of benchmarking, etc.
investment minimization in logistics infrastructure	direct delivery of cargo to customers, without storage, use of the concept "just in time", optimal dislocation of logistics infrastructure, etc.
outsourcing	orientation of the port to key competencies, adjustment to the 2PL, 3PL or 4PL concept (depending on the level of development), optimization of the choice of external investors (providers), optimization of the number of logistics intermediaries
Participation in the supply chain	supply chain choice optimization (good positioning)

Source: Adapting to Titov, 2009, p. 8.

The logistics strategy of seaports is a long-term and hierarchical direction of logistics development in the form and means of its implementation (logistics technologies, logistics operations and functions, information system), formulated by port authorities in accordance with strategic goals.

4. DEVELOPMENT POSSIBILITIES OF THE MONTENEGRIN PORT OF BAR

As distributing centres of trade and transportation network, port Bar play an important role in the development of the montenegrin economy. With the changing of the global business environment, the port enterprise operation environment is continuously changing. Growing problems are becoming increasingly complex. Challenges, uncertainties, and risks alternate. The development of the port of Bar will have to respect environmental requirements (restrictions).

The growth of the global economy, production, and trade over the last 25 years, and new marketing techniques that generate greater demand have increased the need for efficient transportation infrastructure and services. However, this has led to a growing gap with the environment. Efficient transport and logistics are essential for the business due to production expansion around the world using cheap labor and other benefits and incentives. This requires frequent deliveries, precise planning, and efficient logistics, because it is a condition for connecting numerous components, assembling parts, and regular delivery of finished products to the desired destinations.

In this context, inland intermodal facilities or dry ports are attracting attention because of the potential that they offer to improve transport efficiency and meet supply chain. Efficient transport providers (especially seaports) will always attract larger amounts of foreign direct investment.

To achieve this, significant effort is required that requires strategic coordination within a wider international framework and involves a greater number of stakeholders in both the public and private sectors.

Undoubtedly, a strong institutional framework is a prerequisite for any major investment. Institutional strength consists of two core dimensions: enforcement (the degree to which rules are complied with in practice) and stability (institutions are stable when they survive not only the passage of time but also changes in the conditions – Levitsky and Murillo, 2009). In Montenegro, institutional instability is directly related to political and economic instability. Therefore, the creation of a stable and efficient institutional environment in Montenegro is a condition for all other reforms and prosperity. This condition allows to reduce uncertainty and develop stable expectations subjekata privređivanja about others' behaviour.

It is considered that in the transport sector, there seems to be overwhelming consensus that there is no one single recipe or template for institutional arrangements for dry port development. The correct choice depends on a number of factors and policies, among which are: lokation, port policy, government policy, land policy, investment policy, environmental policy, infrastructure policy, logistics policy, transport policy, legal relief, etc.

Figure 5 shows a conditional model of the port-industrial terminal in the port special free economic zone. Substantial evolutionary progress is visible in the part of the port industrial zone, which contains the transport and logistics center, in which the added value of the newly produced port services is created to the processing part, and to the part of creating new qualities. All these activities relate to input and output material flows, as well as to all forms of transport.

Raising the port cluster to the level of a special free economic zone enables the seaport to become a catalyst for the process of creating production systems around the basic port cluster. However, all cluster-concentrated activities are based on modern principles of logistical and organizational functionality. Port clusters are integrated on the basis of port industrial terminals in the port special free economic zone. The practice of advanced world ports has shown the justification for the formation of transport logistics centers within the port free economic zones.

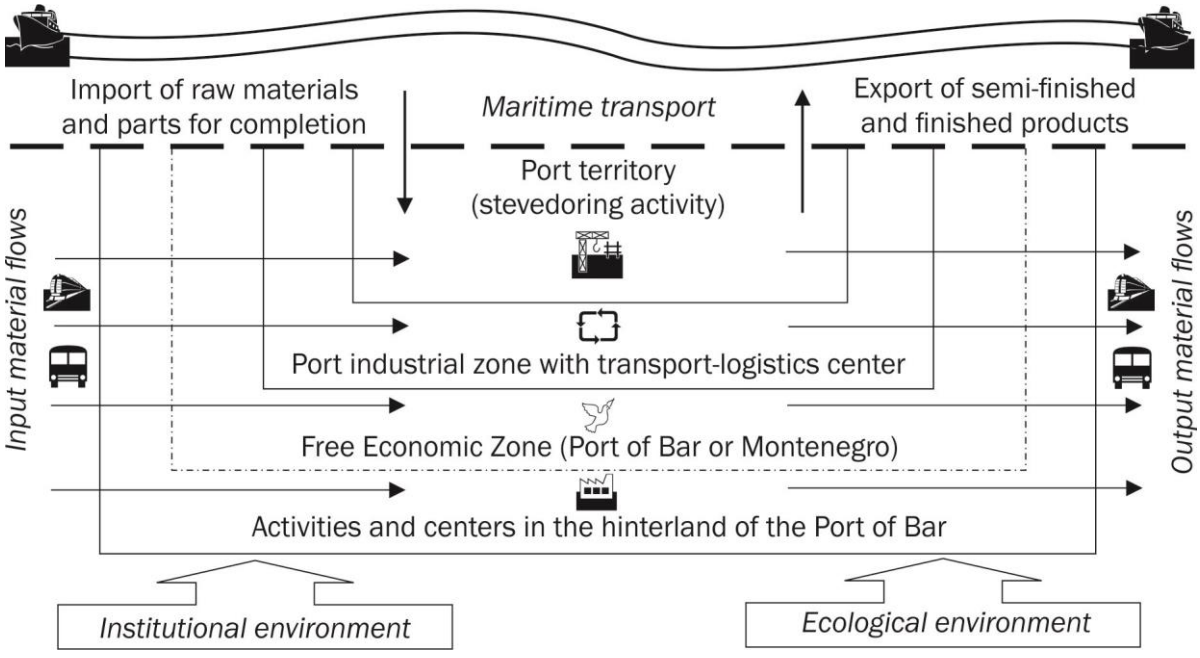

Figure 5. Hypothetical model of future development of Luka Bar

Source: Own creation

The port of Bar must attract foreign investors, shippers, large logistics providers, bankers, and other important business entities in order to expand spatially, increase its competitiveness and economies of scale, complete and modernize infrastructurally, increase the depth of its draft for receiving the largest ships, build intermodal logistics and distribution centers in the closer and wider hinterland, train person-

nel management and institutionally adapt to world. The only way for the port of Bar to adapt to changes in the global maritime market is to increase the size of the infrastructural and supra structural capacity, to increase technological and information advancement, to cooperate with logistics providers, and to integrate its logistics functions.

In modern business conditions, according to V. Draskovic and M. Draskovic (2012), the advanced sea ports tend to integrate all functional areas of logistics to the greatest possible extent, in order to significantly shorten the time of executing orders of port services, accelerate and streamline logistics flows, reduce total logistics costs, reduce the time of logistics operations and achieve the appropriate complete and quality customer satisfaction in the part of the port logistics services. Tu praksu mora da slijedi Luka Bar. This practice must be followed by the Port of Bar.

In maritime industry, there are requirements for the purchase of new ships that will perform container service between the Port of Bar and a transhipment centre. For entering into long term agreements with the parties interested in the transhipment of goods from a wider gravitation area of the Port of Bar, it is necessary to introduce the most updated logistics forms and create a single transport chain, which would include various forms of transport. Through organizational, management and functional transformation, and subsequent privatization of the Port of Bar, it is necessary to create infrastructural prerequisites for raising the attractiveness and optimal positioning of the Port of Bar on the market of transport. This will facilitate the attraction of foreign capital to be invested in operational activities and other development projects of the Port of Bar. These are all strategic movements toward the creation of conditions for providing the Port of Bar with regional significance. This primarily refers to the finding of strategic partners (Port, shipowner and global logistics provider). It is necessary to improve the port infrastructure, provide a deeper draft and updated technology for the transhipment of containers and general cargo. As unused opportunities, there are modalities for the activation of 7.8 ha of the port aquatorium, which is aimed at developing production and trading activities. This also anticipates the procurement of modern mechanization (mobile port cranes, loading bridges with deadweight of 12 tons, etc...).

The hinterland of the Port of Bar can be adjusted to the development of assembly industries and distribution centres for export to European countries, banking services and insurance, ecotourism and organic food production for the needs of tourism and export. The development of operational port and logistic functions, associated with the formation of large distribution centres, modern warehouses and port terminals (in the very Port of Bar and its hinterland) can be put in the function of the future free zone, which would be oriented toward the entire territory of Montenegro. In this part, the transport logistics is of special importance. It also anticipates the development of inspections, quarantines, industrial and economic administration, tax authorities and banks, insurance and telecommunications companies, liberalized legislation in the field of investment, low taxation and profit repatriation.

CONCLUSION

Many entities participate in the market of maritime services, in addition to seaports. They face various constraints, which need to be overcome by proper seaport management through applying new strategies and knowledge, skills, technologies, and information. It is the only path that ensures the quality, timeliness, and safety of maritime services. In addition to this, the success of maritime companies depends on their competitiveness and competitive advantage. Therefore, seaport management is considered to be the main organizational resource of maritime companies. The totality of management methods enables their efficient application in everyday business practice.

With the advancement of transport technologies, logistics principles, and network connection, the movement of cargo in the port, the speed of delivery, the quality of logistics services have been improved, storage and terminal spaces are used more efficiently, energy is saved, environmental standards are applied to a greater extent.

Long-term business, logistics, development, and other crisis processes in the Montenegrin port of Bar require the application of a maritime integration strategy into international supply chains in the near future. This is probably the only rational way to put the port of Bar on a sound business and competitive

basis, increase its port and logistics capacities, improve its work skills, activate its narrower and wider hinterland, as well as the long-wanted idea of a free zone. This positioning implies radical changes in traditional management structures, which are characterized by inefficient bureaucratic control and deficient knowledge.

Strategic alliances between port operators and shipping lines have both exhibited strong concentration processes and increasing vertical integration. These developments have significantly influenced the development of ports and their dependence on the network strategies of global players.

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