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CONDITIONS FOR OLD PORT DEVELOPMENT RECONSTRUCTION-EXPANSION

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Abstract

In the paper, a review and analysis of the reconstruction-expansion of Poti Port development was conducted, which showed that numerous and multifaceted studies are conducted to solve the problem of seaport development within the framework of spatial-territorial and economic limitations, and foreign experience is widely used and adapted. The problem remains acute for each seaport, in our case the Poti Port, as an object that has common sets of individual properties, requirements and limitations regarding development. The need to solve the problem on a scientific basis and the lack of recommendations for the development of port reconstruction-expansion technology and organization methods taking into account local conditions and the establishment of logistics service systems for the developing port determined the relevance of the dissertation research topic, and the direction and content of the research is pre-determined by the acute need for typical models of organization and logistics services for the sea port, by developing optimal reconstruction technology, construction solutions and organizational methods to protect the sustainability of buildings and compliance with modern safety requirements.

Keywords: Port, expansion, reconstruction, logistics, development

Introduction

The development of the world market, international industrial relations and foreign trade led to a dynamic increase in the volume of cargo flows, the services of which are widely included in large transport hubs, including the sea Poti Port, as the main part of the world base transport system and transport infrastructure.

Recently, due to the increase in cargo shipping flows and volumes, the role of seaports, which they traditionally play in the transport system of a certain area or country, is changing.

The existing ports, including the Poti Port, are turning from coordination transport hubs into logistics distribution centers, the territorial and spatial possibilities for their development have been exhausted. Now this problem is becoming more acute for Georgia, because the state of most of the country's sea ports does not meet the growing volume of cargo transported in the ports. Along with the above-mentioned problem, the tightening of customer requirements regarding the quality and complexity of logistics services in seaports, the submission of cargo by sea transport and seaport processing, increasingly aggravates the situation with the determination of directions and the search for resources for the development of ports, using the most adapted surrounding areas and the developed infrastructure of the seaport.

Studying the condition of the areas and facilities surrounding the Poti Port allows us to conclude that there are various options for developing the port's capabilities, with limited resources involved in solving the problem. Existing theoretical and methodological studies, development and methods, organizational and economic problems on this issue do not take into account the peculiarities of the development of seaports, conditions and trends for the development of ports, as well as the needs of clients who have high demands on the conditions and forms of logistics services for processing goods in ports.

Basic part

The structure of the port consists of a breakwater protection mole, an entrance channel and a berth. Each of these infrastructural units needs to work properly for the efficient operation of the port and smooth receipt of cargo.

To achieve the goal, the following tasks must be solved:

– to determine the role of sea ports in the development of the transport and logistics system of Georgia and to evaluate the impact of the development of ports and their infrastructure on

the volume of foreign trade;
- systematization of types of ports in the evolutionary-historical development of the seaport work organization and determination of the need to develop a classification of seaports;
- to study the factors determining the direction of development, the methods and models of organizing the development of sea ports, to determine the necessity of developing a classification of factors affecting the choice of the direction of port development;
- Development of technological processes of port expansion-reconstruction, X-block manufacturing technology and organization of process.

In general, when designing a port, the interrelationship between capital investments, cargo flow and objective factors is evaluated, which is shown in Figure 1.

The high level of risk, in our understanding, should reflect the high degree of adaptation of the port's existing capabilities and technologies to the conditions of changes in the structure and volume of cargo traffic for the production of services. This level of risk corresponds to the type of seaport in which it is easy to change specialization due to uniform equipment and high adaptability in the use of shipping equipment, terminal equipment and port aras.

[The volume of capital investments] [Reporting cargo flow] **[Level 2]** **[Subjective factors]** [State of maritime transport and transport infrastructure] [Existing and prospective technologies of cargo transportation and processing] [Labor resources]	**[Level 1]** **[Objective factors]** [Development of the economy of the country, region, partner countries] [Consumption level] [Geographical conditions] [Existing cargo flows] **[Port development projects]**

Fig. 1. Two-level accounting system of factors affecting the formation of port restructuring/development project.

A low degree of adaptation predetermines specialization for a strictly defined structure of the cargo flow, in which the limits of the flow filling of the volume of each type of cargo are established and, therefore, the design of production capabilities and technologies of services, logistics services and infrastructure should be carried out only for strictly defined cargo volume and direction. We recognize such types of port adaptation as inflexible and in some cases organizationally and economically impossible.

Using the existing statistical database, the methods of probability theory and the "three sigma" rule for problem solving on the organization and variability of cargo flows in Poti seaport, we calculated the empirical scale of permissible risk (Table 1) in the restructuring of cargo flows or the development of the seaport, which can be used to make decisions about flexible specialization according to the structure of cargo traffic in the port.

Table 1

Probability of an adverse outcome (risk value)	Naming risk intervals
0,0-0,1	Minimal risk
0,1-0,3	Little risk
0,3 - 0,4	Medium risk
0,4 - 0,6	High risk
0,6-0,8	Critical risk
0,8-1,0	Catastrophic risk

Taking into account the methods and models of organizing the development of the seaport proposed by us, we propose to add several stages to the algorithm described in the traditional methods, which allows us to take into account possible directions of development that depend on the model and not on the volume of new construction. In the presented algorithm, the part that is most important for this research is highlighted and, considering the theoretical and methodological messages, distinguishes the approach from similar approaches of other scientists and researchers.

1. During the construction of a specialized port, it will be necessary to assess the consequences of changes in cargo traffic for the main port and to

design the commissioning of the specialized port capacities. The flow of specialized cargo "separated" from the main one will be completely or largely redirected to the specialized port, which predetermines the need to assess the possible excess of transshipment capacities in the main port and plan their use to serve other cargo flows. At the same time, it should be noted that according to preliminary calculations, the model of the main port development organization and the creation of a specialized port as a complement to the main one will be a more capital-intensive option than the development organization model with the allocation of an additional holding port.

In general, the assessment of the economic efficiency of port development models requires consideration of characteristics, specification and calculations based not only on traditional methods, but also on the assessment of the influence of various factors, taking into account the reliability of the forecast of cargo movement in terms of volume, nomenclature and direction, and the use of a conceptual scheme of the source of investment financing.

The practice of economic relations shows that the service component in modern conditions allows any company focused on serving a large number of customers to develop dynamically, and the sea port as a multifunctional object of the transport and logistics system of the region is no exception. In our research, the service will be understood as a set of services provided for cargo transportation and processing, as well as a set of additional services that will depend on the type of port and its specialization.

Taking into account the peculiarities of the organization of logistics services in the sea port, we came to the conclusion that it is necessary to develop our own classification of logistics services, because the classification given in the sources available to us does not fully reflect the peculiarities of various logistics service objects.

The analysis of the most important service parameters allowed us to establish additional classification features that affect the construction system of the seaport. At the same time, the type of port and its specialization in terms of cargo transportation with a selected level of risk became crucial.

In our opinion, the criteria for choosing the preferred option for designing a specialized or holding port should be adopted as follows: The ratio of port capacity to the one-time volume of cargo flow, the duration of processing of a given volume of cargo flow, the cost/quality ratio of processing services.

We present a conceptual model of organizing an efficient logistics service in a third-generation seaport, which is presented in Figure 2.

In this case, the algorithm of forming a constructive system in the port can be briefly presented as a sequence of mandatory interactions:

• Determining the general configuration of the design changes at the main and additional port areas with the lowest total costs;

• Evaluation of the level of customer service and the projected capabilities of the logistics service system;

• Ensuring minimum overall costs in all locations that require reorganization;

• Analysis of the sensitivity of the project to the increase in the level of service, the volume of the cargo flow or its changes, the direction of the cargo flow and the costs directly related to the creation of additional income;

• Determining the threshold level of the main facilities.

[The main port] [Regional logistics center] [Infrastructure] [Logistics service departments]	**[Customers]** Logistic operators Logistics providers	**[Filling port]** [Infrastructure] [Logistics service departments]
a) Logistics service model in developing development projects as a holding port		
[The main port] [Regional logistics center]	**[Customers]**	**[Filling port]** [Infrastructure] Logistic operators

[Infrastructure] Logistic operators Logistics providers		Logistics providers
b) Logistics service model in the development of development projects as a specialized port _____ - Material flows ---------- - Information flows		

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_____ - Material flows
---------- - Information flows

Fig. 2. Conceptual model of organizing efficient logistics services in the third generation sea port

The technological process of the reconstruction of Molo and the organizational structure of the implementation of the reconstruction, which is successfully completed at the stage of the reconstruction of the Poti Port, as well as the technology of strengthening and restoring the retaining wall, are elaborated. The obtained results will be successfully used for the next expansion.

Technology of making X-blocks

The technology of making X-blocks in its content consists of several important stages: 1. Planning-arrangement of industrial area and warehouse area;
2. Preparation of production methodology;
3. Mold making;
4. Preparation of concrete mix-design;
5. Product production process;
6. Quality control and management;
7. Product warehouse and its management;
8. Logistics of product delivery.

The planning and arrangement of the industrial site and warehouse site has a great importance on the amount of capital expenditure. The cost of the final product (block X) is largely determined by the area on which we carry out the production and storage process. The production methodology includes the solution of a number of issues and also plays an important role in the price and quality of the final product. The methodology includes the selection of the type of mold (vertical or horizontal molds), planning of the concrete pouring process, selection of tools, selection of mold lubricant, number of workers, maintenance of concrete during the curing process, formation and creation of a safe working environment for workers. Concrete mix design should be prepared according to international standards EN-206-1 and BS 8500. The mix-design must meet the following requirements: concrete class C25/30, high strength concrete is not recommended, it must be resistant to aggressive environment (sea water), and the water-cement ratio must be determined depending on the climatic conditions of the production area. The cement must be selected according to the resistance to sea water as required by the standard EN 197-1. Inert materials must meet the requirements of EN-12620 standard.

The production process of the products should be carried out in accordance with the pre-prepared methodology. The process should be managed by a production engineer and skilled labor under the supervision of a quality control officer. Quality control includes: concrete mixture consistency control, vibration control, concrete temperature control in the mold, visual inspection of finished products, geometric dimensions of finished products, concrete shrinkage test, detection of the number and size of cracks, preparation and implementation of methodology for repairing damaged surfaces. After the formation process, the products are assembled. An important challenge is the area to be stored, the selection of the type of equipment for placing the products in the warehouse and sending the finished products from the warehouse. Delivery of finished products depending on the dimensions and weight of the

products (3 m^3 volume, 7.5 tons) to the construction site requires the selection of appropriate equipment for the safe movement of cargo, the selection of equipment for loading the products and fastening of the products to the transport vehicle.

3 Conclusions

Research of all the above-mentioned processes and preparation of a complete technological cycle and implementation in production will allow us to develop the reconstruction-expansion of the Poti Port with the right technological and organizational solutions.

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