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## IMPACT OF HARMONIZATION ON THE RESULTS OF TRANSPORT PERFORMANCE OF THE DIVISIONS OF THE MARINE TRANSPORT INDUSTRY OF UKRAINE

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*Вардиашвілі А.В., Вардиашвілі Н.Э. Влияние сбалансированности на формирование транспортного результата подразделений морской транспортной индустрии Украины.*

Рассмотрены вопросы ресурсной и организационной сбалансированности морского транспорта. Обоснована необходимость сочетания интересов предприятий морского транспорта с интересами смежных видов транспорта и государства в рыночных условиях. Предложены способы расчета потерь прибыли при несбалансированности провозной способности флота и пропускной способности перегрузочных комплексов морских портов, мощностей предприятий морского транспорта и смежных видов транспорта.

*Ключевые слова:* сбалансированность, эффективность, потери прибыли, провозная и пропускная способность, предприятия морского транспорта, смежные виды транспорта.

*Вардіашвілі А.В., Вардіашвілі Н.Е. Вплив збалансованості на формування транспортного результату підрозділів морської транспортної індустрії України.*

Розглянуті питання ресурсної та організаційної збалансованості морського транспорту. Обґрунтована необхідність комбінації інтересів підприємств морського транспорту з інтересами суміжних видів транспорту та держави в ринкових умовах. Запропоновані способи розрахунку втрат прибутку при незбалансованості провізної здатності флоту і пропускної здатності перевантажувальних комплексів морських портів, потужностей підприємств морського транспорту та суміжних видів транспорту.

*Ключові слова:* збалансованість, ефективність, втрати прибутку, провізна та пропускна здатність, підприємства морського транспорту, суміжні види транспорту.

*Vardiashvili A.V., Vardiashvili N.E. Impact of harmonization on the results of transport performance of the divisions of the marine transport industry of Ukraine*

Reviewed are the issues of resource and organizational harmonization at marine transport. A necessity to harmonize the interests of marine transport enterprises with the interests of intermodal kinds of transport and the state under market conditions is substantiated. The methods to calculate the loss of profit due to imbalance of the fleet transportation capacity and the throughput capacity of cargo-handling terminals of sea ports, marine transport enterprises and intermodal kinds of transport are proposed.

*Key words:* harmonization, efficiency, loss of profit, transportation capacity, throughput capacity, marine transport enterprises, intermodal kinds of transport.

**A**dvanсe of the international division of labour and labour cooperation predetermines formation of the global market of sea trade which, in its turn, is formed by a level and scale of international economic relations. International trade relations are accomplished primarily by sea transport as it is the most developed transport mode (it carries about 90% of international cargo trade). Development of transport as an intersectoral system is predetermined to a large extent by economic and spatial development of the state. Regretfully, the marine transport component does not find its proper place and development in the national policy of Ukraine.

Delay in the determination of transport industry priorities and delay of its support by the state puts the country face-to-face with a threat of transport reliance in the international division of labour system as the developed national sphere of transport services defines the economic safety of the country as the entity of the world economy relations.

Crisis situation with the national merchant marine fleet, which is one of the main elements of the transport industry, does not facilitate a comprehensive development of the country's economy, leads to considerable economic losses and essential losses of export, import and transit cargo flows and does not provide for freight safety of the external economic relations of Ukraine. Negative condition of the transport system of Ukraine also occurs due to imbalance of the resources in its individual components. The above determines timeliness and relevance of this topic. The above determines timeliness and relevance of this topic.

### Analysis of latest researches and publications

A number of studies was devoted to efficiency problems and harmonization of economic development as well as to harmonization of the inner structure of the individual sectors of the economy and, in particular, to the transport system components. Among these works there are the publications by Burkinsky B.V., Vinnikov V.V., Kibik O.M., Kotlubay M.I., Kotlubay A.M., Kryzhanovsk S.V., Nikolayeva L.L., Morozova I.M., Primacheva N.T., Stepanova O.N. and Chekalovets V.I. [1-11]. However, despite a great number of research studies

in that field, some aspects of the evaluation of economic efficiency and harmonization of the transport system components necessitate further development and clarification. This factor determines relevance and practical significance of this topic.

The aim of the paper is to determine losses of the individual divisions of the marine transport industry of the country resulting from imbalance of resources, above all of the fleet transportation capacity and the throughput capacity of port terminals as well as the marine transport enterprises and intermodal kinds of transport.

### Basic material of the study

System approach to evaluating efficiency problems makes it possible to more distinctly select a set of indices that reflect economic feasibility of taking technical, commercial, managerial and investments decisions in the current competitive environment. Diverse forms which result from the efficient use of advanced funds and productive, material and labour resources predetermines priorities of the selected management decisions at various levels.

The system of general, individual and specifying indicators offers an opportunity of presenting not only quantitative characteristics of the use of each kind of resources and costs but also of determining their harmonized development and impact upon the final result. The structure of the indicators ensures quantitative formulation of the objective and reflects complex nature and interrelation among the marine transport enterprises.

Existence of the in kind and cost forms of the results of performance of the marine transport enterprises is due to commodity-money relations. Cost indicators ensure comparability of the results with the losses, and the dynamics of transport services. In kind results define the conventional volume of transport work and vary depending on the development tasks, i.e. the cost indicators evaluate the economic aspects of the enterprise performance while the in kind indicators reflect the volume of the results and correlation of the transport potential to the consumer market demands.

Under the conditions when the transport mechanism development is regulated not by efficiency, which is determined based on long-term prices and possibilities, but by the consumers' demands, the factor of harmonizing resources, time and organization is enhanced so as to provide for the process sustainability.

To evaluate the extent of harmonization of marine transport enterprises, it is required to apply in kind indicators that measure transport work and transport services (volume of carried and handled cargo, their nomenclature, period of delivery and handling transport vehicles, etc.). Moreover, enhancement of the in kind indicators role is possible parallel with enhancement of significance of the cost leverage under market conditions. The absolute level of development of marine transport enterprises is evaluated by a volume of works performed, its rate of

growth and stability of the efficiency figures. The relative development level can be determined by the value of transport and economic results divided by a unit of the fleet, ports and ship-repairing yards resources.

Development and functioning of the transportation industry which is quantitatively expressed by a system of efficiency parameters is determined by a degree of harmonization achieved in development of the individual marine transport enterprises, consumers and intermodal kinds of transport. Transport system as a totality of proportionally developed branches of the economy that satisfy the needs in movement of cargo and passengers in circumstances of economic self-reliance necessitates that the self-regulating mechanism was adjusted so as to maximize individual results within the cumulative effect.

That being said, the harmonization as applied to the transport complex should be determined by a proportionality of the economic growth of its components as well as by the rational level of requirement in resources, by economic feasibility and quantitative and qualitative match to the current demand situation in the market. The requirements to harmonization are reflected in efficiency indicators and take into account the optimization regularities of the results. Economic effect of the transport complex performance should be calculated with due account of the harmonization and the degree of consumers' satisfaction characterized by the aggregate of main parameters, indicators of the use of resources and accomplishment of the development tasks. Thus, the results of transport complex performance should be based on the indicators that coordinate the interests of its components, i.e. sea ports and shipping companies should correlate their interests with the interests of consumers and the economy (timely delivery of cargo by the national fleet, rational use of resources, etc.). In order to achieve efficient operation of a transport complex, it is required to harmonize production capacities and volumes of works, services and products.

In case resources of the cargo-handling terminals and the transportation capacity of the fleet are not balanced, the sea ports sustain profit losses amounting to:

$$\mathcal{O}_{eq} = \sum_{j=1}^m \left[ \sum_{i=1}^n \Delta Q_{ij} (d_{ij} - S_{ij}) + \frac{\sum_{j=1}^n \Delta Q_{ij}}{Q_j} (D_{o_j} + D_{c_j} - R_{o_j}) - \left[ - \sum_{i=1}^n \Delta Q_{ij} \Delta t_{sp_{ij}} (d_{sp_{ij}} - S_{sp_{ij}}) - P_j \right] \right], \quad (1)$$

where  $m$  – number of domestic ports whereat the vessels of the shipping companies call;

$n$  – number of cargo kinds at a particular port that have not been loaded because of a non-delivery of tonnage;

$\Delta Q_{ij}$  – quantity of the  $i$ -th kind of cargo that was not loaded in the  $j$ -th port because of a non-delivery of tonnage,  $t$ ;

$d_{ij}$  – revenue rate of handling the  $i$ -th kind of cargo at the  $j$ -th port;

$S_{ij}$  – self-cost of handling the  $i$ -th kind of cargo at the  $j$ -th port;

$Q_j$  - normative supply of cargo-handling operations in the j-th port, t;  
 $Do_j$  - normative returns on the husbandry of vessels in the j-th port;  
 $Dc_j$  - normative size of dues received from vessels;  
 $Ro_j$  - normative costs of the husbandry of vessels in the j-th port;  
 $\Delta t x p_{ij}$  - additional period of storing the i-th kind of cargo at the j-th port;  
 $d x p_{ij}$  - storage charges for the i-th kind of cargo at the j-th port;  
 $S x p_{ij}$  - self-cost of storage of the i-th kind of cargo at the j-th port;  
 $P_j$  - amount of the fine paid by a shipping company at the j-th port because of a non-delivery of tonnage.

Harmonized development of marine transport enterprises in case the intensity of transport work changes as well as the development priorities of certain modes of transport constitute the most important managerial problem. Assurance of reliability and sustainability of transport and economic ties at intensive development can be achieved due to intrasectoral, intra-system, intersectoral and territorial harmonization that, in their turn, are subdivided into technical, qualitative, monetary and labour harmonization.

Harmonization makes an interlink in the development of enterprises of the transport industry of Ukraine in the complicated environment when both internal and external economic relations are being stabilized. The main factor of stabilization is to take into account the interests of the state, consumers and transport enterprises. Such harmonization is twofold: harmonization of resources and harmonization of the organization.

Harmonization of resources of marine transport is based on adequacy of the transportation capacities and cargo-handling capacities as well as the capacities of intermodal production capacities of sea ports and other transport modes. If these are imbalanced, the profit losses can be determined as follows:

$$\mathcal{E}_{en} = \sum_{k=1}^l \left[ \sum_{i=1}^n (A_{ik} \Delta T_{ik}) + \sum_{j=1}^m D_{jk} \Delta T_{jk} m_j (f_j - S_j Y_{nj}) \right], \quad (2)$$

where  $l$  - whereat the vessels of the shipping companies call;

$n$  - number of transport means of the related transport modes that are served by the k-th port;

$m$  - number of the related transport modes that are served by the k-th port;

$A_{ik}$  - specific costs of the time measuring device which measures the composition of the i-th rolling stock staying at the k-th port;

$\Delta T_{ik}$  - time savings (losses) of the i-th rolling stock (rail cars, locomotives, trucks, river transport vessels and tugs) at the k-th port which are dependent on the fleet of the enterprise, days;

$D_{jk}$  - average carrying capacity of the rolling stock of the j-th related transport mode (rail cars, trucks, transport vessels) in the k-th port whereat the fleet calls;

$\Delta T_{jk}$  - time savings (losses) of the j-th related transport

means in the k-th port;

$m_j$  - design capacity of 1 t cargo carriage per 1 day of j-th kind of transport operation;

$f_j$  - design revenue rate of a unit of the transport work of the j-th kind of transport;

$S_j$  - design average self-cost of a unit of the transport work of the j-th kind of transport;

$Y_{nj}$  - proportion of variable costs in the self-cost of transportation by the j-th kind of transport.

Organizational harmonization is determined by the management system of sea transport and its productive forces.

Enhancement of the technical level of the world fleet and restraint of the development of domestic shipping companies and ports enhances the role of the organizational forms of harmonization which predetermined the necessity to take into consideration a level of proportionality, continuous transport servicing, loading of the cargo-handling terminals, delivery of transport means and permanent loading of berths. Achievements of foreign transport enterprises are due to a rational use of labour and optimum build-up of the capacities and organization of industry engineering. Therefore, extension of advanced organization methods is an important element of the scientific and technological progress and a good way to use the transport resource system. Along with that, the organizational harmonization does not warrant equitable relationship between ports and shipping companies.

Besides, harmonization is the most important regularity of the self-financing mechanism. However, it is rather difficult to achieve on transport because of a number of factors. Harmonization of the development and functioning of the marine transport enterprises depends, above all, on the methods used to manage the results and resources. So, imbalance of the port work on the whole and its individual division in particular may reflect not only on the fleet but also lead to violation of the port contractual obligations and the fact that a certain division or a structural department performs with the intensity that surpasses the capacities of the enterprises that provide services to it. If the capacities of the port and cargo flows are not harmonizes? It is possible either to look for additional capacity utilization or to change composition of the resources.

Economic development implies equilibrium between the requirement and production, between the industry and business divisions and the system of resources. Along with that, the chronic deficit of investments does not allow of reaching the balance - not only between the economy and the transport industry but also at the level of fleet and ports. Which contributes to losses:

$$\mathcal{E}_{ar} = \gamma_1 \sum_{i=1}^n D u_i \Delta T \vartheta_i V_{\theta} \cdot K_{\theta} + \gamma_2 \sum_{i=1}^n D u_i \Delta T \vartheta_i V_H \quad (3)$$

where  $D u_i$  - net deadweight of the i-th vessel, t;

$\Delta T_{\text{э}i}$  – total reduction (prolongation) of the on-berth time of the  $i$ -th vessel at ports as compared with the normative time due to (by fault) the port activities, days;

$\gamma_{1(2)}$  – share of the resulting free tonnage-days that are used for replacing the chartered foreign (domestic) tonnage or for calculating the losses – the share of the chartered foreign (domestic) tonnage of a shipping company in tonnage-days used for replacing the losses of carrying capacity;

$V_{\text{в}(H)}$  – costs of chartering foreign (domestic) tonnage that the enterprise bears;

$K_{\text{в}}$  – currency exchange rate.

Imbalance between the merchant fleet capacity and the handling terminal at ports still remains the basic problem for the efficient use of resources. Therefore, it is not only the absolute completeness of the use of resources that can be a qualitative indicator but their harmonization as well.

Development of sea transport, in case its divisions are still not harmonized with the transport fleet requirement, is the original factor of the development efficiency. The requirements of market mechanisms aimed at acceleration of cargo delivery and higher efficiency of the transport component are preconditioned by limited possibilities of extensive development and limited resources. As the financial resources are deficient, the transport process management mechanism should take into consideration the factors that influence the results in order to shorten the harmonization period.

The economic factors are:

- the mode of the law of economy of time;
- development objectives of cargo delivery by sea based on a free supply of transport capacities by the companies of various ownership kinds;
- imbalance of the capacities of the adjoining maritime transport facilities;
- improvement of the economic incentive system.

The technical factors determine:

- technical level of the fleet and ports;
- sophistication of interaction between technical elements of the transport system and competition.

The organizational factors include:

- inconsistent of the indices and related sub-system management tasks;
- interrelations between shipping companies, sea ports, clients and adjacent transport modes;
- level of qualification and the forms of employees participation in managing production processes.

Among the economic development factors it is possible to single out specific features and nature of the economic development, deficit of economic resources, regularities that shape the production infrastructure and the priorities of the maritime policy of Ukraine.

With the intra-sectoral imbalance of the maritime transport, observed is a growth of the transport costs of the consumers and of the share of past labour inherent in the cargo being transported, besides the economic losses born by sea ports and shipping companies.

It should be mentioned as well that the clients' subsystems – transport product consumers – obtain additional profit or bear losses due to improvement (reduction) of safety and qualitative characteristics of cargo resulting from transportation, improvement (interruption) of stability, regularity and reliability of fleet performance and improvement of cargo-handling technologies.

Imbalance of the maritime transport is revealed in various levels of performance which is reflected in the interrelated indices. The indices reflecting transport performance are clearer while the indices accounting for public needs as regards delivery periods and the cargo delivery structure as well as the requirements of related enterprises are less vivid.

Harmonization of development of sea ports and shipping companies should be guided by the development level achieved by the regional economy and the condition of external economic relations. Harmonized growth of the throughput and carrying capacities of the ports and fleet, improvement of the technology and organizational management, higher quality and improvement of the forms of work should be aimed at optimization of the resulting effects. The development rate should be measured by growth of labour productivity and relative savings on the investments in creation of new jobs

Economic harmonization depends on the nature of interaction of the aggregate of political, social, economic and other factors, therefore, when looking for final results it is necessary to separately calculate the value of the extrasystemic effect.

The mechanism governing intra-business relations necessitates improvement of statutory and regulatory relations and optimization of final economic results. A system of restrictions that predetermines, to some extent, the method to achieve the preset goal plays a specific role in management and selection of the optimization directions aimed at achieving the preset objective. Scantiness of resources is reflected in the level of development optimization.

At the first stage of the final results optimization the general features and specific peculiarities of the impact of external sub-systems (contracts-orders, requirements, volumes and nomenclature of works, etc.) are established. The target-oriented concept and conditions of work performance are also specified at this stage. Afterwards, a decision-making process forks: a method to assess final results of the fleet and port performance is determined, the parameters of the final results are established and the sources of funds for the development are defined.

Optimization of the maritime transport development should be based on the assessment of a proper time for improving transport and economic links. The Correlation in the development of the industries of material production, foreign trade and maritime transport can be determined with due account of the achieved efficiency of its use.

Harmonization mechanism should include the organization of transport means handling, system of production, organizational and economic relations and business links, economic levers, legal regime of

running business and tax relations with the authorities.

Consequently, the technical and economic parameters of use of the fleet and cargo-handling terminals present a first-priority task for regulating the efficiency of harmonized resources.

At the same time, modern economic mechanism of development of the maritime transport enterprises does not stimulate their harmonization.

### Conclusions

Based on the above, one of the main tasks of the transport complex development in Ukraine as a maritime state is to develop and accomplish a single program of development for the merchant marine fleet, sea commercial ports and shipbuilding and ship-repair enterprises.

Such program should be developed with due account of the place of the country in the international division of labour, its export and import potential and transit possibilities in accordance with the integration vectors. The state, at the level of its transport industry, should formulate the standards complying with international criteria and determine development forecasts and transport and technical policy in the sphere of shipping and shipbuilding.

In their turn, the businesses – shipping companies, sea commercial ports, shipbuilding and ship-repair enterprises – are to develop, guided by the adopted state development program, their own investment programs in accordance with the current conditions on the domestic and foreign markets using the efficiency criteria.

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