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Valuation of Ecosystem Services from the Water Resources of Ports and Associated Public Charges for them: A Case of Sea Ports in Russia

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ABSTRACT

Ecosystem services of the marine environment can be considered as a socio-demographic, economic and environmental component of sustainable development. But till now they are not fully assessed. The unassessed services include the ecosystem services of the port waters, which are also elements of the marine environment adjacent to the coast. In this regard, the article sets out the task of identifying and valuating ecosystem services provided by the port waters. The study justifies attribution of benefits generated by shipping harbors to ecosystem services from marine environment and provides a justification for classifying these services into two categories: core provisioning and supporting services, as well as proposes an outline of a methodology for their valuation in monetary terms. For valuing core provisioning ecosystem services we propose to rely on the estimation of port water rents which are understood as a residual income from port activities, after deduction of all fair returns on, and costs associated with, fixed assets of the port infrastructure. This method was used to estimate the total value of ecosystem services in port water areas for Russia as a whole and to assess the specific values of ecosystem services per 1 sq. km of the port water areas in all the seaports of the country. The supporting services are proposed to be valued having regard to the rent from assimilation potential, which is generated by obviating the need to undertake any compensatory measures for environmental damage caused by the port activities. According to our findings, the aggregate port rent in the country is approximately 33-38 billion rubles (about USD 1,1-1,2 bln. if converted at PPP exchange rate). At the same time, compulsory levies for the use of water resources in seaport waters accruing to the national budget make up an insignificant fraction of this value –about 0.17% — which indicates the ineffectiveness of the current system for port water use levies. To remedy the situation, an algorithm for calculating payments for ecosystem services of the harbors which includes an environmental component is proposed, with the justification of caps for the maximum share of water rent appropriations (10%) that is feasible without disturbing the balance of interests between the state and private port entities. The topicality of this work lies in the analysis of a new category of ecosystem services of the marine environment, ecosystem services of port waters, as well as an analysis of possibilities for developing their valuations for the purpose of port management, including the generation of additional budgetary revenues.

Key words : *Ecosystem services, Valuation, Port waters, Port water rent, Rent of assimilation potential, Sea basins, Russian seaports.*

Doctor of Science in Economics

Introduction

At the present time there is an ongoing global transformation of the world economy, largely due to what amounts to the accelerating transition to the sixth technological paradigm (Perez, 2002; Mathews, 2013). At this stage there is a pronounced trend towards an incorporation of natural resources into the national wealth of countries, including through their record in the system of macroeconomic national accounting and incorporationinto the capital of economic entities—and not only when the natural resources are represented as tangible assets, as for example, land or landed property, but also in case of intangible assets, for example, in the form of endowment with usage rights to the services from ecosystems. According to the International Valuation Standards, intangible assets are non-monetary assets with no physical substance, but which create certain interests and provide economic benefits to their owners [IVS, 2017]. Ecosystem services, which are understood as the various benefits generated by ecosystems, are mostly intangible assets of the public sector that do not belong to a specific owner or owners. That is, the rights to them go unrecorded and benefits —the identification of which is deficient, much less reflected in the balance sheets of any entities — are for the most part uncertain. The emerging distinctive feature of the unfolding sixth technological paradigm is the incorporation of ecosystem services generated by natural ecosystems into the natural capital, their formal embedding as a circulatory element into the monetized economic system for economic management purposes. Here emerges the crucial nexus between Earth sciences and economics: for such an incorporation/recognition to occur, a monetization of the respective benefits is required, that is, their assessment in terms of monetary value. However, this is not always possible due to a number of reasons, the main of which are:

1) The lack of standardized international methodological support/guidelines for valuation of ecosystem services, and
2) The absence of markets for ecosystem services and, as a consequence, of market prices for them, which leads to the need to model the value estimates.

These features fully apply to ecosystem services of natural and man-made waterbody harbors, for which there is a paucity of associated research. We aim to rectify this situation and shed some light on the valuation of ecosystem services provided by port water harbors utilizing the example of sea ports in the Russian Federation. We also reflect upon how these valuations can be utilized for the purposes of port governance practices and in the context of statutory water usage levies.

Literature review

The subject of valuation is specified first in any attempt at monetary valuation of resources, including the stock of ecosystem services. With regard to the port water areas this specification is compounded by the added problem of underdeveloped classification for the purpose of value assessment of ecosystem services. Although the general classification of ecosystem services is already well-established and used — as discussed in detail in numerous studies (Bobylev, Goryacheva (2019), including for the purposes of valuation (Ojea, Martin–Ortega *et al.*, 2012; de Groot (2020) and management decision-making (Fisher, Costanza *et al.,* 2007; de Groot (2020), in relation to port waters there is still no established classification for systematizing and assessing the benefits from port activities, even though some progress is being made to fill this gap. Thus, in the General classification of ecosystem services, developed for the European Union (e.g. (European Commission, 2013), it is recommended to develop additional classification for abiotic ecosystem products (Haines-Young and Potschin, 2013). Characteristically, some researchers believe that no such conclusive classification can be possible as it won't allow to cover all aspects of ecosystem services beneficial to humans and the best the classifications can aim for is to comply with relevant policies and objectives of resource management (de Groot *et al.,* 2020). So far, the lack of valuation of ecosystem services in port waters impedes the deployment and application of economic mechanisms for regulating economic activities in port areas, including in order to establish reasonable levies for the use of water resources to reduce natural pollution and preserve the aquatic environment and ecosystems of coastal waters.

If, methodologically and in general terms, the issue of valuation for ecosystem services has been resolved (Millennium Ecosystem Assessment panel (2005a), Millennium Ecosystem Assessment panel (2005b); McVittie and Hussain (2013), de Groot (2020)], then in relation to marine ecosystems the methods of their assessment and valuation are in the

stage of formation. Such methods are developed within the 'blue' economy and are used for the management of marine and coastal territories, and, occasionally, port infrastructures (Jin, Watson *et al.*, 2018).

Presently, an increasing attention is paid in the European Union to the influence of the ocean economy on the European landscape, planning for sustainable growth of the blue economy, ocean governance and coastal ecosystems, as well as combating the effects of climate change. It is recognized that the value, or worth, of marine ecosystem services needs to be better taken into account in ocean management and planning decisions, as such value-based assessments help find trade-offs between the competing goals of economic development and mitigating negative impacts on marine ecosystems. In (Austen, 2019) applied methods for assessing and valuating ecosystem services of the marine environment and approaches for their integration into the management and decision-making systems of the European maritime policy are highlighted in detail. Also, these methods are examined in a study (Martin– Ortega *et al.*, 2015), which provides a detailed history of the development of methods for the valuation of ecosystem services of aquatic ecosystems in general. That study also attempts to adapt the general classification of ecosystem services to the ecosystems of the marine environment. For this, the concept of indicators of ecosystem services is introduced to reflect the essence of services for marine governance and decision-making. At the same time it is stated that practical guidelines on the choice of indicators for the management of ecosystem services are still lacking (van Oudenhoven *et al.*, 2012). This situation is also characteristic of the marine environment, making it difficult and almost impossible to provide value measurements for marine ecosystems in their entirety. Therefore, the issue of full accounting for the value of ecosystem services provided by coastal areas, to which the environmental services of port harbors are presumed to be also attributable, has not so far been resolved.

Problem statement

Most of the research on marine ecosystems takes into account such services as the provision of food of marine origin (biological resources), recreation, climate regulation, biodiversity conservation, and a number of others (Mangos *et al.*, 2010). However, port waters and the ecosystem services they provide do not feature prominently anywhere in it.

At the same time, port waters are of great importance for the economies of almost all countries with access to the seas and oceans. With respect to the study country, the total extent of the coastline of the Russian seas is more than 60 thousand kms (NIA Priroda, 2018). The total number of seaports in Russia, according to the Register of Seaports of the Russian Federation, is 63. Their throughput is estimated at 1003,6 million tonnes of cargo per year.

However, benefit streams generated by the ecosystem services of the water resources used by the ports have not been quantified in monetary terms to date. The current situation with realistic economic evaluation of these benefits does not permit a creation of any models for managing port activities that will be effective from the standpoint of both the state and society. Potentiation of port activities is nowhere regarded as an ecosystem service in scientific or applied research aspects. Globally, marine environment ecosystems are taken into account only in management decisions when the design of seaports is contemplated (Wiebe, de Boer *et al.*, 2019). Methods for their valuation to determine the amounts of environmental payments are in an inchoate state, whether in international or the domestic practice.

Thus, it can be concluded that valuations of ecosystem services of aquatic resources in the marine environment are still incomplete due to the lack of incorporation of ecosystem service valuations related to port waters. There are no generally accepted methodologies or standards in this area. The main reason for this state of affairs is the status of universal public significance and generally free access to economic benefits generated by the water resources in the port waters.

The purpose of the study. Having regard to the above, the objective of the present study is a valuation of ecosystem services of harbors utilizing the example of Russian seaports, as well as the estimation of related fair water use levies that the availability of these services can support. To achieve this objective, a classification for ecosystem services of port harbors is proposed and a technique for their measurement and valuation is developed on the basis of abstraction of water rents from the general level of port revenues.

Data and research methods

The estimation part of this study is carried out using

official data from the Russian statistical service (Rosstat) and the Register of Seaports of the Russian Federation. The research methods applied are based on the existing methodology for the valuation of ecosystem services, the assessment of natural resource rents, and a method for the valuation of ecosystem services in the port waters developed by the authors.

The first step in developing a methodology for the valuation of ecosystem services of port harbors is a classification study acceptable for the purposes of value estimates. The second step is to calculate the port water rents and provide a justification for the fair value of water use levies chargeable for ecosystem services in port water areas.

Classification of ecosystem services in port waters

According to Millennium Ecosystem Assessment panel (2005a), ecosystem services are defined as "the benefits that people obtain from ecosystems". These benefits are further classified according to the functions performed by ecosystems, namely, they are divided into four categories: supporting, provisioning, regulating and cultural services.

Port waters generate substantial streams of benefits for the economy and people that are not monitored directly by the market and have no reflection in market prices. That is, port harbors perform supporting functions allowing vessels to enter ports and to conduct their various operations relating to cargo handling and transportation of people for daily, business and recreational purposes.

The benefits from these operations are of a rent-based nature and can be estimated as a residual income generated by a water space in the form of an enclosed port harbor area. The port water (or harbor) area is understood as the water surface of a port within the established boundaries, in which maneuvering and the berthing of vessels is facilitated (SO standard, 2005). Let the associated income be conventionally designated as the port water rent. Since all these types of work carried out in port waters, especially cargo transshipment, are associated with environmental pollution through emissions of pollutants into the atmosphere and their discharges into the water environment, the ecosystems of the port waters and the space above them partially assimilate this pollution, creating a rent of assimilation potential (Gusev, 1997). This function can be generally classified as the supporting one.

Thus, ecosystem services of port harbors can be divided into two groups:

1) Supporting, or those that create benefits in the form of economic rent from the port activities (the port water rent), and
2) Supporting in the form of assimilation of pollutants resulting from port activities (the rent of assimilation potential).

The latter can be estimated by the rent of the assimilation potential.

Neither the former, nor the latter type of port rent is monitored at the level of the state or by public associations, and the rents therefore end up being captured by port operators as an additional income that no one measures, nor, accordingly, imposes any tax upon—a state of affairs which is not at all conducive to reducing pollution and to more equitable distribution of income sources for the state.

The methodology and techniques for evaluating port water rents

The research methodology is to apply the theory of natural resource rents to valuing ecosystem services of port harbors, with the rent being interpreted as a residual income attributable to the natural resource after deduction of all returns on man-made capital in the form of tangible harbor infrastructure. This methodology is not infrequently applied to water resource valuations in various contexts (Young and Loomis, 2014). To carry out the valuations in our study we use a method of rent estimation for services generated by port harbours; this method returns valuations of the supporting ecosystem services based on the data in public domain and available from official statistical databases for Russia (RosStat). To incorporatethe obtained estimates in the process of managing port waters and regulating economic activities in seaports, we also outline a methodology for calculating payments/levies for water resources in port waters.

The technique to estimate the port water rent is based on the industry-level use of the rental approach to port-related economic activities, and takes into account economic opportunities for the abstraction of water rent generated in seaports.

The port water rent is formed mainly in the process of the transshipment of goods delivered by water transport. To establish its value in the industry related to the transshipment of goods delivered by water transport (activities of stevedores and other economic entities using port facilities), the sta-

tistics from the Russian Statistical Service (Rosstat) in the EMISS Rosstat database for the years 2016-2018 was analyzed for the following types of economic activities:

- Loading and unloading of cargo and passengers' luggage;
- Stevedoring activities;
- Transport clearance of containers;
- Harbor terminal facilities operations, such as ports and piers (excluding loading and unloading operations) ;
- Operations of gateways;
- Seaborne navigation support, ship piloting and ship berthing;
- Lighter unloading and ship salvaging operations.

The analysis showed that the available information is sufficient to estimate values of ecosystem services in the seaports of Russia. To determine the amount of the rent, data from the financial statements of port industry related enterprises, including data from profit and loss statements aggregated by Rosstat in the framework of the quarterly statistical survey of the enterprises under the P-3 form, were used.

In accordance with the well-established concepts of calculating economic and resource (natural) rents in Russian and international practice, including under the UN System of National Accounting [SNA - 2008 (United Nations, 2008)] and the System of Environmental-Economic Accounting SEEA–2012 (SEEA, 2012), resource rent is defined as the "surplus value" that accrues to the user of the resource or is generally created by the industry. It is estimated as the residual income remaining with the user after deducting from the service income all the costs and returns on fixed assets and working capital employed by the user (or at the level of an industrial sector). Resource rent is, thus, calculated by the deduction from the standard indicators *of gross profits* of any specific subsidies, addition of specific taxes and deduction of user costs associated with the use of produced assets in the form of depreciation of fixed assets (SEEA, 2012). Since, according to the rules of Russian financial accounting, the cost of services/production already includes depreciation of fixed assets used in core operating activities, the"*profit from sales*" indicator employed in the Russian financial reporting practice has already been cleared of consumption (depreciation) of fixed capital assets and represents the starting point for the derivation of port industry resource rents (water rents).

Within the ports sector, the industry resource that lays the foundation for the industry rents are the port water areas, while harbor infrastructure improvements, handling and berthing infrastructure represent fixed capital assets. Thus, the industry rent at current prices (prices of the period being analyzed) can be estimated under the residual method using the following formula:

$$R_{it} = PS_{it} - (V_{Bi,\,t-1} \times K), \quad (1)$$

where, R_{it} – is the rent in industry i received in year t; at current prices prevailing in the year t;

PS_{it} — profit from sales (as the closest measure to gross profits or gross operating surplus in Russian accounting) in year t in the considered industry i at current prices for year t;

K — is the rate of return on capital/produced assets (a contributory asset charge for fixed assets); K *is* also the rental yield threshold, which, according to the recommendations in SEEA- 2012 Framework Document (SEEA, 2012), can be the average nominal profitability over the subject period in the industries being surveyed or the average rate on ruble-denominated government bonds in the money market (for example, over 5 years); in the current Russian practice the range for K indicators used is usually centered on 10% (5% is a real return, plus 5% is an allowance for the expected annual inflation).

$V_{Bi,t-1}$ –is the residual (book) value of fixed assets (produced capital) at the opening of year t in the considered industry i or-- for more dynamic industries — the average annual balance-sheet carrying amounts.

The calculation of Russia's aggregate port water rent is shown in the table below.

Therefore, as can be seen on the basis of 2017 data, the total seaport rent for Russia can be estimated at about 38.07 billion rubles, or $ 1,2 bln. PPP dollars[1].

The purchasing power parity exchange rate for rubles into dollars can be estimated to be at around 25-30 rubbles for 1 USD dollar [World Bank, 2020], whilst the average effective market exchange rate over 2017-2020 period was above 60 rubbles.

Calculation of unit port water rents for the water areas of seaports

To assess the value of ecosystem services in specific

Table 1. Value estimates for the total port water rent for Russia as a whole in 2017, billion rubles

1	Profit from sales in the industry 2	Fixed assets at residual carrying amounts 3	Rate of return on capital,% 4	Contributory asset charge on produced capital (port infrastructure) 5 col. 5 = col. 3 ×col. 4	Port water rent 6 col. 6 = col. 2- col.5
All ports, out of which:	41,7	74.57	0.1	7.46	34.24
-sea ports	40.3	72.27	0.1	7.23	33.07
-river ports	1.4	2.3	0.1	0.2 3	1.17
Rent transferred from Russian seaports to offshore jurisdictions					5, 00*
Port water rent in seaports					38.07
*Estimate					

Source : estimated by the authors based on the analysis of Rosstat data and the trends in interest rates set by the Central Bank of Russia and leading Russian banks.

port areas, we can apportion industry-wide estimates of the port water rent by units of tonnage of ships served in particular ports (we used *Gross tonnage*, abbreviated as *GT,* for such an allocation):

$$WR_{GT} = R/VGT, \quad (2)$$

where: WR_{GT} - unit port water rent, $ PPP/*GT*;

R — is the total port water rent generated per year in the seaports of Russia, $ ths'd PPP;

V_{GT} — is the gross tonnage of all ships served by the Russian ports per year, *GT*.

WR_{GT} = 38 070 000 rub. th'sd. / 1621958 GT th'sd= 23 rubles/ *GT* (or about $0,8 PPP/ GT)

Thus, the following formula is applied for the valuation of ecosystem services provided by specific port harbors per unit of area, in sq.kms,:

$$WR_{ES} = (V_A \times WR_{GT})/Sa, \quad .. (3)$$

where : WR_{ES} – is a value estimate of ecosystem services in the subject port area, USD PPP ths'd / km^2;

$V_{A\_}$ is the annual tonnage of ships served in the port, *GT*;

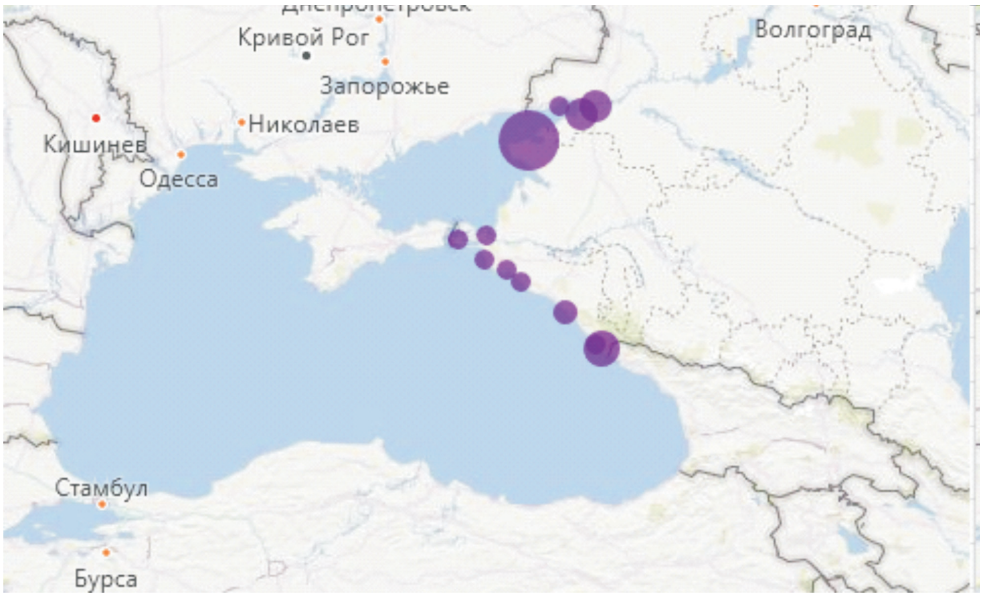

Fig. 1. Valuation of ecosystem services in the port water areas of the seas of Russia by the amount of port water rent: Azov-Black Sea basin

WR_{GT} – is the unit port water rent, WR_{GT} = 23 rubles / GT (or $0,8 PPP/ GT)

S_A - area of the designated port water area (harbor) being assessed, in sq. km.

Research findings

The results of the valuation of ecosystem services in the port waters of Russia based on the outlined technique and as broken down by seas and major sea basins surveyed are shown in Table 2 and and in Figure 1 with respect to the key Azov-Black sea Basin.

As can be seen from the Table 2, unit valuations of ecosystem services in the sea ports of Russia (per sq. km of port area) based on the port water rent tend to be more or less stable, with the median value of $244PPP/year per sq.km. of port water area. Despite the presence of some outliers, unit values of ecosystem services in the range of $100-$1500 PPP per sq.km/ year tend to be quite characteristic of the sample. Quite predictably, the northern ports are generally characterized by somewhat lower unit valuations.

These unit rental values can be converted to the

Table 2. Unit valuations of ecosystem services provided by major sea ports of Russia

Port	$ PPP/km^2/year	Port	$ PPP/km^2/year
Azov-Black Sea basin			
Azov sea	2116	**Japanese Sea**	506
Azov	2783	Vladivostok	395
Yeisk	7049	Vostochnyi	1404
Rostov-on-Don	2472	De-Kastri	302
Taganrog	415	Zarubino	102
Temryuk	244	Nakhodka	490
Caucasus	3180	Nevelsk	1384
The Black Sea	**416**	Olga	59
Anapa	244	Posyet	652
Gelendzhik	158	Soviet harbor	59
Novorossiysk	465	Kholmsk	1026
Sochi	108	Shakhtersk	175
Taman	162	**Arctic basin:**	
Tuapse	1071	**Barents Sea**	**819**
The Baltic Basin	**442**	Varandey	238
Baltic Sea		Murmansk	1171
Vyborg	728	Naryan-mar	28
Vysotsk	16675	White Sea	0
Kaliningrad	2423	Arkhangelsk	5
Primorsk	1372	Kandalaksha	498
Saint Petersburg (the Big Port)	196		
Ust-Luga	1434	**Pevek (East Siberian Sea)**	**65**
The Caspian basin (Caspian sea)	190	**Karsk Sea**	121
Astrakhan	197	Dixon	447
Makhachkala	471	Dudinka	91
Olya	153	**Bering Sea**	**16**
The Far Eastern basin		Anadyr	10
Petropavlovsk-Kamchatsky	52	Beringovsky	14
Okhotsk sea	**177**	Providence	20
Korsakov	116	Egvekinot	63
Magadan	102		
Moskalvo	2		
Nikolaevsk on the Amur	186		
Poronaysk	3		
Prigorodnoye	619		
MEDIAN FOR ALL PORTS	**244**		

Source: author's estimates

capital stock valuation of ecosystem services by, say, using a social discount rate of 5% — yielding 20 years' worth perpetuity and the characteristic unit value of the stock of ecosystem services in ports, therefore, on the order of $2000-30 000 PPP per sq.km of port area. These are conservative estimates since they don't account for the rent of assimilation potential in full and fully depend on the current level of shipping in Russian ports.

Calculation of levies for the use of port waters

The obtained figures for estimates of port water rents allow us to reasonably set the amount of levies for the use of port harbors by ships. While it is a matter of policy for national tax authorities, the capture of 10% water rent by the state in the form of water use levies has been suggested by the authors to be a reasonable policy objective (Filchenkova *et al.*, 2019).

Discussion

According to our estimates, the seaports of the Russian Federation generate more than 33 billion rubles (more than $1,1 bln. at PPP) of port rent annually, which averages at about 20 rubles ($ 0,8 at PPP) of rent per ton of various types of cargo handled through the seaports of the Russian Federation. Water rent generated by sea ports forms the greater part of the total water the rent for river and sea ports (about 97 % of the total port water rent). This value can be calculated based on the official statistical data without recourse to any simulation methods or contingent valuations, helping to make informed management decisions on optimizing the operations of sea ports and assess a potential revenue that can be collected by the state on unrecorded rent flows without causing any damage to the economic activities of the port entities.

Estimated at slightly above 1 bln. dollars at PPP, the water rent of the total seaport economy in the country is a rather conservative amount, since many stevedores (business entities in the territory of the ports) often withdraw their profits by writing them off to expenses in offshore jurisdictions. With the development of seaports caused by changes in traffic flows (for example, redirection of traffic flows to the port of Ust-Luga), this situation can be aggravated even further .

At the same time, official budget revenues collected in the form of water use levies from all types of ports —both sea, river and lake — amount to a negligible 66 million rubles (about $1 mln.) (NIA Priroda, 2018). This is a tiny amount compared to the port water rent estimated in this study –about 0,17 % of the same.

Additionally, the analysis of statistical data reveals the absence of economic rent directly on the part of the state-owned basic infrastructure providers in Russian seaports (the National Port Administration (Rosmorport), the seaport authorities). This means that they will have to resort to indirect mechanisms for the abstraction of rents from stevedores and other port facility operators — for example, through increasing property rents on the port property leased to stevedores in order to have the economic base and the financial ability to meet payments for the use of harbors levied by the state and to ensure the proper functioning of the ports, taking into account the recent tightening of environmental restrictions and requirements.

In transitioning to the rental-based system of levies for the use of port water areas, it is proposed to withdraw to the budget not in excess of 10% of the annually generated port water rents — in order to maintain a balance between the interests of the state and port business and not to restrict competition in port activities unduly. In absolute terms, the respective figure for port water rent abstraction can amount to about $50 mln.annually. Acceptability of these evaluations can be supported by water levies received by the Russian state from the economic use of freshwater resources. So, at present, about 10% of the water rent created by freshwater resources is abstracted by the state in the form of payments for freshwater use, and this proportion of the value does not cause a criticism on the part of the respective freshwater users, attesting to its acceptability by the business. Estimation of this share is provided in (Filchenkova *et al.*, 2019).

On the other hand, the 10% share for the port water rent abstraction can be justified by the need to consider the presently un-evaluated environmental factor for compensating and remediating the nationwide environmental and public heath damage caused by sea ports and vessels calling at these ports (especially, due to the transshipment of coal by the open-dump method). Since the existing system of business levies for the negative impact on the environment, fines and remedial payments for environmental damage operating in Russia is rather archaic and does not take into account the wide changes,

including the global ones, that have been occurring in relation to environmental public interests (fair quality of the environment, the global climate change, sustainable development goals, waste abatement, etc.), this leads to the emergence of "environmental" rent, or rent of the assimilation potential, for water resources accruing to the entities operating in ports. Its value can be estimated in the amount of uncompensated public spending or environmental damage caused. This value will also represent a valuation of the supporting ecosystem services in the port waters.

Conclusion

We have considered environmental ecosystem services of port waters and provided an overall and unit monetary valuations for them under the rent-based approach and utilizing an example of the Russian seaports. Additionally, the question of end beneficiaries for this rent has been broached. At the present, legal relations in the system of water use levies in Russian seaports are found in an unsettled, transitional state, and there is also a cross- system, when funds are first charged to the budget and then refunded.

Most of the port water rent is not assessed or taken into account in the current system of payments for the water resources of the sea ports. In addition, as a result of the applied and officially permissible tax optimization systems, a significant part of the rent, according to expert estimates, is withdrawn from the domestic taxation system to various offshore jurisdictions and cannot be fully calculated; therefore our findings have a conservative bias to them.

The situation can be changed by introducing regionally-differentiated (according to the sea basins) reasonable payments for the use of port waters calculated on a rental basis.

To this end, it is advisable to conduct regular valuation rounds for ecosystem services in port waters, including to assess the level of port water rent and the rent of assimilation potential, which will make it possible to justify the levying of payments for environmental pollution in ports. However, as at the present, it doesn't appear legally possible to directly obligate stevedores using the port infrastructure to transfer the water rent to the State, since most of the infrastructure they use is leased in its turn from the state-owned enterprises. The same applies to ships calling at seaports and paying various port fees and charges. An increase in the latter will lead to a decrease in the competitiveness of the Russian ports and a decrease in the international cargo traffic, which, for financial reasons, can be redirected to other seaports.

Taking into account the current situation, we are principally proposing to consider a port water rent as arising largely out of ecosystem services provided by marine environment in ports and being an integral part of resource (water) rent. We have highlighted its public dimension justifying further development of related valuation techniques and transparency in the mechanisms for its accountal, distribution and abstraction, including for environmental remediation needs.

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