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Country report [Republic of Moldova]

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Abbreviations

Abbreviation	Explanation
IWT	Inland Water Transport
GIFP	Giurgiulesti International Free Port
DR	Danube Region
RM	Republic of Moldova
NARM	Naval Agency of the Republic of Moldova
TEN-T	Trans European Neworks Transport
UTM	Tehnical University of Moldova
MIRD	Ministry of Infrastructure and Regional Development
MADRE	Ministr Agriculture, Regional Development and Envirenment
NBS	National Bank Statistic
GAP	Government action plan
EU	European Union
EESC	European Economic and Social Committee
ERBD	European Bank for Reconstruction and Development
FEZ	Free Economic Zone
GDP	Gross Domestic Product
WTO	World Trade Organization
CIS	Commonwealth of Independent States
TEU	Twenty-foot Equivalent Unit
TRACEKA	Transport Corridor Europe Caucasus Asia

Executive Summary

The main goal of the implementation of the Comprehensive Development Plan for the Port of Giurgiulesti is to meet the needs of the Republic of Moldova in foreign economic activity (import/export), to ensure environmental and transport safety during the transshipment of goods in the port and on the approaches to it by forming an innovative infrastructure of the port, creating a joint integrated transport space and a common market of transport services within the framework of the European transport system.

Achieving this goal will make it possible to satisfy the needs of the national economy in services for ensuring the transshipment of goods in all directions through the reconstruction of existing and construction of new facilities, as well as to attract investment in the port of Giurgiulesti, ensuring its comprehensive development.The implementation of the comprehensive plan for the development of the port of Giurgiulesti will allow by 2030 to reach a qualitatively new level, to achieve a safe level of functioning of the port infrastructure that meets international and national requirements.

To achieve the main targets of the Comprehensive Development Plan for the Port of Giurgiulesti, it is necessary to solve the following main tasks:

1. Development of a strategy for the development of the transport infrastructure of the hinterland and ensuring its connection with the European transport system,

2. Increasing port capacities and ensuring the effective development of port infrastructure and logistics;

3. Ensuring the safe functioning of port infrastructure and river transport;

4. Creation of conditions for increasing the competitiveness of the port;

5. Improvement of legislation in the field of economic activities of the port.

The relevance of the implementation of the tasks set is due to the following reasons:

- deepening the integration processes carried out in accordance with the Association Agreement between the Republic of Moldova and the European Union,

- the growing need for foreign trade relations of the developing national economy in the carriage of goods by sea and, accordingly, in their transshipment in ports;

- the need and expediency of reorienting some part of the cargo flows realized by road transport to the river and sea port of Giurgiulesti.

In this regard, one of the most important tasks in the development of the infrastructure of the port of Giurgiulesti is to increase the capacity of berths, berthing depths, improve the mechanization and automation of loading and unloading equipment, develop the port network of rail transport, roads, ensuring the most rational interaction of modes of transport in transport hubs.

It is extremely important to increase the utilization factor of existing berths by rational distribution of cargo flows and reconstruction of capacities types of cargo.

Increasing the level of safety of navigation and transport security in the port water area is carried out in the following areas:

- maintaining a high level of navigational and hydrographic support for approaches to the port and the operation of ship reporting systems (GOFREP, BarentsRep),

- optimization of pilotage areas and provision of port pilotage services,

- creation and maintenance at the proper level of information systems for monitoring navigation,

- development of the material base for the training of qualified specialists in the field of operation of river and sea transport in accordance with international standards.

In the field of increasing the level of environmental protection, the following is carried out:

- implementation of the requirements of international treaties in the field of environmental protection of the Danube region, one of the contracting parties of which is the Republic of Moldova;

- development and implementation of ship waste management plans in the port;

- development of a procedure for the use of funds received from the environmental fee for the maintenance and updating of technical means for the reception and processing of ship-generated waste;

- creation of economic mechanisms to stimulate the transition to environmentally friendly and energy-saving technologies, including the transition to alternative energy sources, shore power supply of transport vessels when they are in port.

Increasing the level of competitiveness of domestic ports ("Giurgiulesti International Free Port", "Giurgiulesti Passenger and Cargo Port", managed by the State Enterprise "Ungheni River Port") is possible by:

- strengthening the innovative component in the development of ports, equipping them with the latest technical means, advanced technologies, modern electronic systems for managing the technological and information processes of the river fleet,

- development of port special economic zones,

- development of port infrastructure and introduction of advanced equipment and advanced technologies,

- improving the tariff policy and attracting to domestic ports a rational share of the domestic cargo base transshipped in the ports of neighboring states.

Improvement of legislation in the field of economic activities of the port is necessary in such matters as:

- increasing the availability of services for passengers and tourists, including the disabled and people with disabilities;

- increasing the level of professional training of specialists for work in ports;

- organization of a modern multilevel and multifunctional automated control system for the operation and development of ports;

- improvement of the country's port management system and legal support of port activities;

- regulation of social and labor relations.

The port infrastructure is the basis for port operations to service ships, cargo and passengers passing through ports. The development of port infrastructure requires capital-intensive investments, long lead times and hence long-term planning. This means that the design of port infrastructure must take into account the needs of the water, logistics and transport sectors.

It is necessary to develop a flexible, intelligent and resilient port infrastructure that can adapt to future requirements.

A comprehensive plan for the development of the port of Giurgiulesti was developed in line with national long-term economic strategies, regional hinterland development plans and port investment plans.

A comprehensive development plan is being developed based on the fact that the port of Giurgiulesti is a strategic national transport infrastructure that provides direct access to the Black Sea.

The development of the Comprehensive Plan for the Development of the Port of Giurgiulesti made it possible to make the following recommendations:

- Determination of the development concept of river transport in the Republic of Moldova, based on the system of priorities of the national economy;
- The reconstruction/modernization of railway lines and motorways that will ensure the connection of Giurgiulesti port with the main industrial and logistic centers;
- Construction on the territory of the Giurgiulesti Free Economic Zone or in the region of the port of warehouses, elevators, terminals and factories with large processing capacities of industrial goods and agricultural products;
- Construction of quays on the banks of the Danube and the Prut to increase transport volumes and expand the list of services provided;
- Modernization of port equipment for loading/unloading operations;
- Maintenance of port infrastructure and territory;
- Developing relations with the Moldovan Railway administration and companies with large transport volumes;
- Improving of operational management;
- The implementation of IT in the navigation system and the management of logistics processes;
- Ensuring ecological norms in port activity;
- Continuous training specialists in line with future changes in the IWT sector;
- Creating of attractive environment for investments in the formation of the modern fleet of ships;
- Revision of naval and customs legislation in order to remove barriers to the development of IWT;
- Organization and management of stable operation of the joint container route: Constanta - Tulcea - Giurgiulesti - Galati – Braila;
- Integration of maritime and IWT logistics;

- Creation of logistics and transport chains;
- Development of cooperative relations with economic agents.

Among the expected results of the implementation of the Comprehensive Development Plan for the port of Giurgiulesti are:

- Improvement of state planning and management in the field of inland water transport, sectoral legislation, application of new organizational mechanisms (concessions, management companies, technological platforms and territorial clusters);

- Increase in port capacities and growth in the volume of cargo transshipment in the port of Giurgiulesti;

- Ensuring the effective development of port infrastructure and increasing the utilization rate of transshipment complexes;

- Increasing of port Giurgiulesti role in ensuring of international commerce of the Republic of Moldova, including countries of the European Union;

- Increasing the level of environmental and transport safety of river transportation in the waters of the Danube region;

- Ensuring the tariff attractiveness of the port of Giurgiulesti by maintaining the amount of port dues per ton of cargo transshipment at a comparable level to the neighbor ports;

- Improving the quality of services provided and the competitiveness of the port of Giurgiulesti by increasing rate of use of specialized complexes and increasing the share of cargo handling services in the total cargo turnover;

- Increasing the level of innovation in the activities of the Giurgiulesti port through the usage of new technologies, resource conservation measures, reducing the negative impact on the environment, and strengthening of the human resources in this industry.

1. Introduction

The water transport system of the Republic of Moldova includes two key inland waterways (IWLs) - the Dniester and Prut rivers and 430 meters of bank on the Danube River. The Dniester and Prut are suitable for navigation only in certain areas as a result of natural silting and the lack of regular dredging.

In 2012, after a 25-year break, navigation along the Prut River was resumed. Navigation is possible only on the Giurgiulesti-Cahul section, 83 km long. The Prut River is used to transport construction materials, in particular sand, crushed stone, gravel, coal, intended for the reconstruction of roads in the south-west of Moldova.

Navigational conditions on the Dniester and Prut rivers allow for the transportation of goods on barges or barge caravans with a total deadweight of 600 tons and 300 tons, respectively. Under the flag of Moldova, 378 vessels sail along the external waterways (sea and river-sea). Most of the vessels are in poor technical condition and do not comply with current norms and standards.

The water transport infrastructure of the Republic of Moldova includes 1 sea port (based on the Danube), 3 river ports (on the Dniester, at the moment loading and unloading operations in the ports) are not carried out, one cargo port in Varnitsa (located on the Dniester, also loading and unloading operations are not carried out), as well as the river port in Ungheni (located on the Prut).

The main port of Moldova is located in Giurgiulesti and provides access across the Danube to the Black Sea region and to international destinations. Significant changes are currently being made to shipping and inland navigation laws to ensure they are in line with international rules and European standards.

At present, there are only a few economic agents in the Republic of Moldova that provide services in the field of naval transport domestically and internationally. Thus, under the Ministry of Infrastructure and Regional Development are the following organizations in the field of shipping: Public Institution "Captaincy of the port of Giurgiulesti"; State Enterprise "Ungheni River Port"; The State Enterprise "Registrul Naval" and the State Enterprise "Bacul Molovata". In addition to those listed, private economic agents providing services in the field of domestic shipping operate on the territory of the Republic of Moldova, the largest of which being SCI "Danube Logistics" SRL, which is the operator of the "Free International Port of Giurgiulesti".

The opening of the port complex in the vicinity of Giurgiulesti has allowed the Republic of Moldova to evolve from a landlocked state (with low development prospects) to a more attractive state for investment and trade, thanks to this port complex.

This port complex is composed of the Giurgiulesti Passenger Port, the operator of which is the State Enterprise “Ungheni River Port”, the Giurgiulesti Free International Port, operated by SCI “Danube Logistics” SRL.

2. Purpose and objectives of the project

Output: T4.7: Integrated Port Development Plan [Republic of Moldova]

An integrated Port Development Plan for Moldova will be developed by UTM which will summarize the findings of the infrastructure development plan for the hinterland connections of Giurgiulesti Port and the fairway maintenance plan for the Prut River.

The fairway maintenance plan will be developed for the navigable section of the River Prut (used by small vessels of 200-300 tonnes), with a dedicated focus on national needs and short-term measures in order to ensure efficient and effective realization of harmonized waterway infrastructure parameters.

A comprehensive plan will be elaborated for the development of hinterland infrastructure and intermodal connections (rail and road) from the Port of Giurgiulesti towards the hinterland.

The importance of considering the development of hinterland links and infrastructure in relation to enhanced corridor needs (be it a domestic trade corridor or a transit trade corridor) will be an essential element in the elaboration of this development plan.

D.T4.5.1. Development Plan for Hinterland Infrastructure

Hinterland connections of ports shall be well integrated into transport development strategic plans at national and international levels. Inefficient hinterland links lead to increased supply chain costs and inefficiencies and greater environmental impacts, therefore ports will suffer a loss of traffic if their connections are inefficient or costly. Validated as a regional logistics hub with access to road, railway, river and sea, the Port of Giurgiulesti is the only direct sea/river-borne transshipment and distribution point to and from the Republic of Moldova. The Technical University of Moldova will elaborate on a comprehensive plan for the development of hinterland infrastructure and intermodal connections (rail and road) from the Port of Giurgiulesti towards the hinterland. The importance of considering the development of hinterland links and infrastructure in relation to enhanced corridor needs (be it a domestic trade corridor or a transit trade corridor) will be an essential element in the elaboration of the development plan.

D.T4.5.2. Prut Fairway Maintenance Plan

Economically viable transport services on the Danube River and its navigable tributaries (e.g. Prut River) are highly dependent on stable and sufficient fairway conditions. The Port of Giurgiulesti is located in the vicinity of the rivers Prut and Danube confluence, therefore good fairway & navigation conditions of the river Prut is an important prerequisite for the goods present at Giurgiulesti port to reach the hinterland represented by the east of Romania, the west of Moldova and even Ukraine. A fairway maintenance plan will be developed by the Technical University of Moldova for the navigable section of the River Prut (used by small vessels of 200-300 tonnes), with a dedicated focus on national needs and short-term measures in order to ensure the efficient and effective realization of harmonize.

3. The role of river transport for the sustainable development of the national economy. Classification of waterways and their characteristics

3.1 The role of the port of Giurgiulesti in the international economic relations of the Republic of Moldova

Free economic zone Giurgiulesti, inalienable part of the International Free Porta Giurgiulesti, located on the offshore section of the Danube in the southernmost point of Moldova. International Free The port of Giurgiulesti is the only port of Moldova on Danube and in the Black Sea basin, which gives direct access to international waterways and is thus convenient point for transshipment of goods to/from Moldova. Located in less than one kilometer from the Romanian/EU border and Ukraine, Giurgiulesti the port is at the intersection international trade routes between EU countries and CIS countries, between regions of the Baltic and Black seas.

Residents of the Free Economic Zone Giurgiulesti can use the developed transport network and multi-modal logistics infrastructure of the International Free Port of Giurgiulesti:

- Feeder delivery service goods in containers to/from any corner of the world through the Port of Constanta;
- Direct maritime navigation in basins of the Black and Mediterranean seas;
- River navigation with 10 Danube states, up to Germany;
- Direct access to European narrow gauge railway and wide railway track;
- National and international road connection.

The following agreements contribute to the successful development of international economic relations of the Republic of Moldova:

- Agreement on the Establishment of a Deep and Comprehensive Zone free trade between Moldova and the EU;

- Free trade zone with countries: Russia, Ukraine, Belarus, Armenia, Kazakhstan;

- Bilateral Free Trade Agreements with countries: Azerbaijan, Georgia, Kyrgyzstan, Uzbekistan;

- Central European Free Trade Agreement (CEFTA) with the Balkan countries;

- Free Trade Agreement with Turkey (since 2015) and others.

3.2 Analysis of the transport services market of the Republic of Moldova

Before talking about the necessary investments in road, rail, river and air infrastructure, there should be made considerable analysis of allocation of the demand for transportion in the national economy. Analysis of the volumes of goods transported (fig. 1, a) and the course of goods (fig. 9, b) by means of transport, based on data from

national statistics, shows that the allocation of transportion demand at national level is classically carried out with small peculiarities (fig. 1 a, 1 b). The interests of air transport are linked to the mobility of the population at long and medium distances. The volume of freight transport is small and occasional. The given fact is linked to the economic factor "cost-benefit". Shipping is specialized in transporting long volumes at long or relatively long distances. In the case of local river transport for medium transport distances, shipping is relatively small because of the specificity of the loads – building materials: sand, gravel, etc.

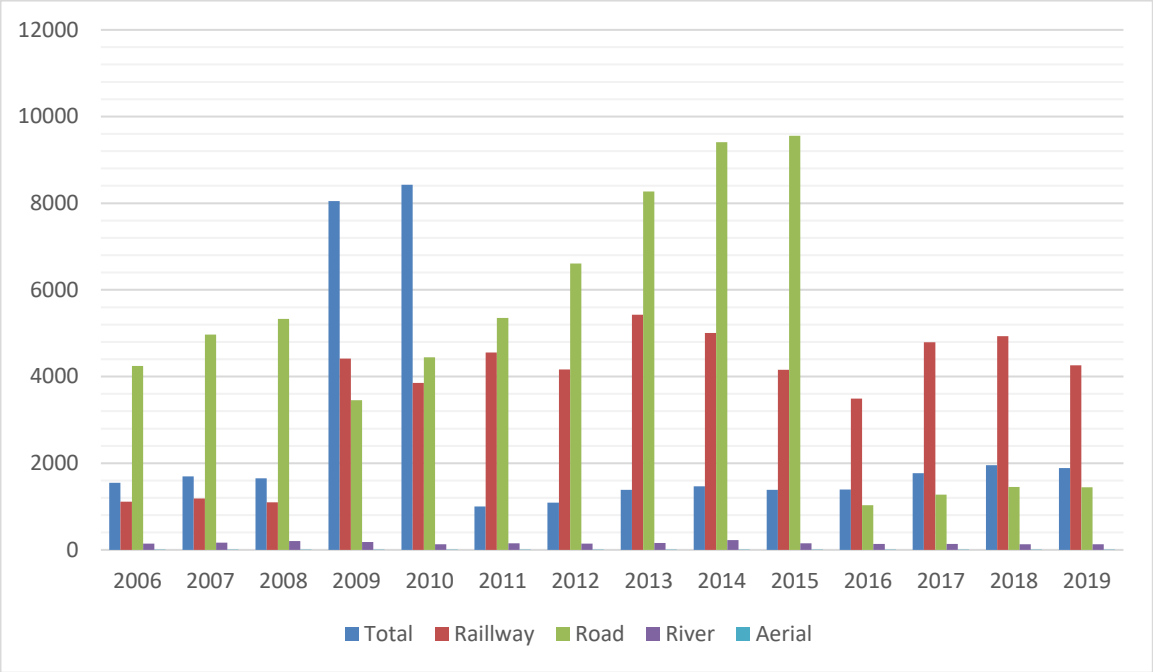


Figure 1 a: Goods transported (thousand tonnes) by means of transport: rail, road, river, air

Under conditions of the specifics of the national economy, when the transport volumes are relatively small, shipping is specialised in transporting fuel, coal, metal, containers, building materials and cereals. The main disadvantage of shipping - increased transport time, is compensated due to the development of logistics infrastructure, which allows convenient conditions for the storage of goods, as well as modern methods of supply.

The analysis of the activity of rail transport brings to the conclusion that the situation in the branch is critical. The work is linked to the sudden reduction in demand (fig. 1 b) for transportation (years 2008-2009) due to the loss of the potential clients.

Traditional rail transport is specialized in high weight loads and long-distance transportation. The disadvantage of rail transport is the relatively long transportation time.

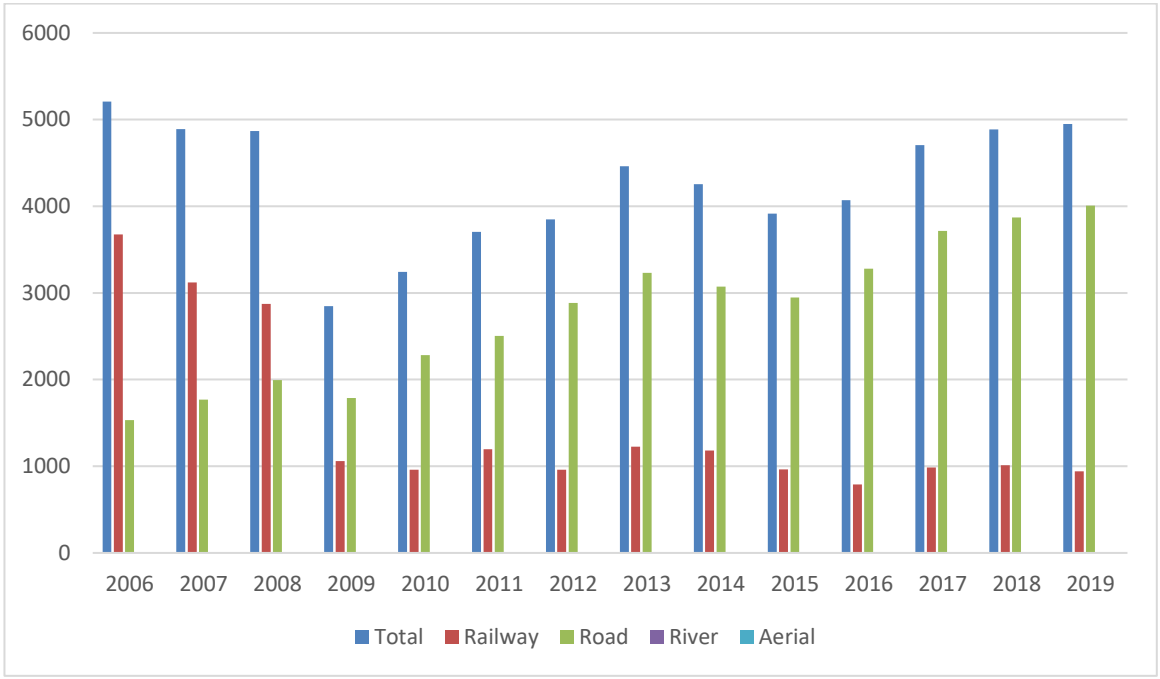


Figure 1 b: Goods transport (million tonnes-km) by means of transport: rail, road, river, air

In the context where all post-Soviet and socialist countries, dissociated from transit networks or disapprove, thus creating legislative, technical, infrastructure, logistical restrictions, etc. Moldovan Railway is facing a major problem in the formation of the package of transport contracts.

The analysis of the Development Programme for the period 2018-2031 of the State Enterprise "Moldova Railway" shows that the management of the railway branch correctly assesses the real situation. In the current situation, "Moldova Railway" focuses on the needs of the internal market, including import/export operations. However, with the conditions of free competition on the transport services market, the competitiveness of rail is very limited. This is due to many factors: the main factor is related to the limited number of enterprises with bulky transport requests and demands. Since the railways are specialised in the same cargo groups as shipping, they complete each other in this respect.

As a result, the Railway Enterprise Development Programme stipulates for fair action concerning investment policy, giving priority to the capital reconstruction of the southern central railway infrastructure "Chisinau-Basarabeasca-Giurgiulesti". Today the port of Giurgiulesti is one of the strategic points of formation of transport volumes for the railway.

The management of "Moldova Railway" is responsible for the reduction of transport volumes. It hasn't had a refrigeration park for a very long time. With the increase in the volume of transportation of perishable production, the railway could compete with road transport, but missed the opportunity. It will currently be problematic to regain positions in the perishable freight services market. Agricultural producers, in order to raise the profitability of the business, invest in refrigerating warehouses and do the delivery of priority production in relatively small volumes, using road transport.

Comparative analysis of the share of the volume of goods transported by different means of transport in 2007 (fig. 2 a) and 2019 (fig. 2 b) and the share of the goods transportation by different means of transport in 2007 (fig. 3 a) and 2019 (fig. 3 b) show that during the last years the structure of freight transport by means of transport has changed dramatically.

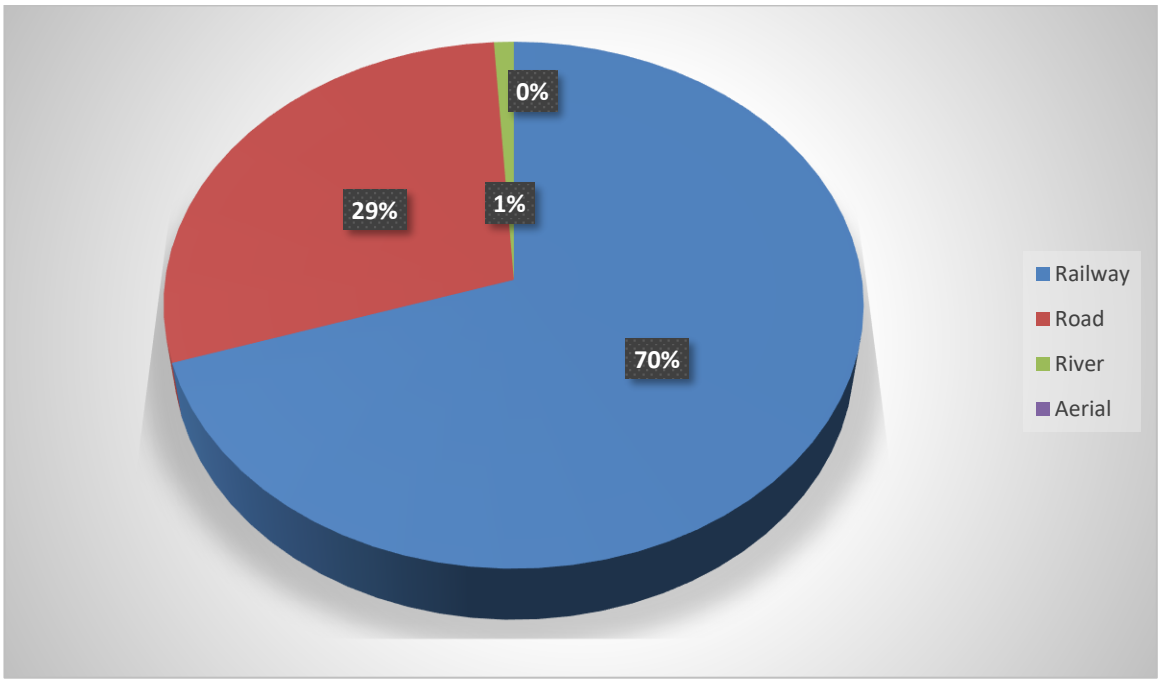


Figure 2 a: Share of volume of goods transported by means of transport, 2007

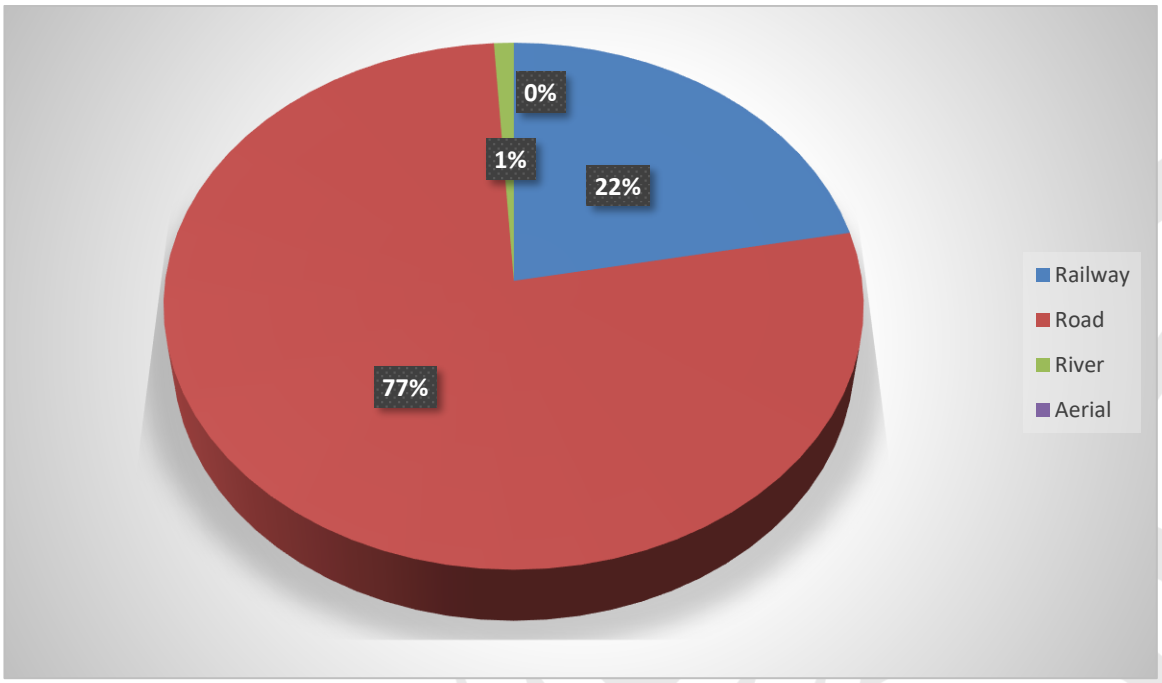


Figure 2 b: Share of volume of goods transported by means of transport, 2007

In 2007 the volume of goods transported by rail and road transport correlated in percentage terms 70/29 (%), then in 2019 as 22/77 (%). Similar reporting for goods is in 2007 – 64/36 (%), and in 2019 – 19/81 (%). The given fact leads to the conclusion that due to slow traffic and expensive services the railway ceded the positions of road transport on the market of transport services to several types of goods, including those transported at long distances.

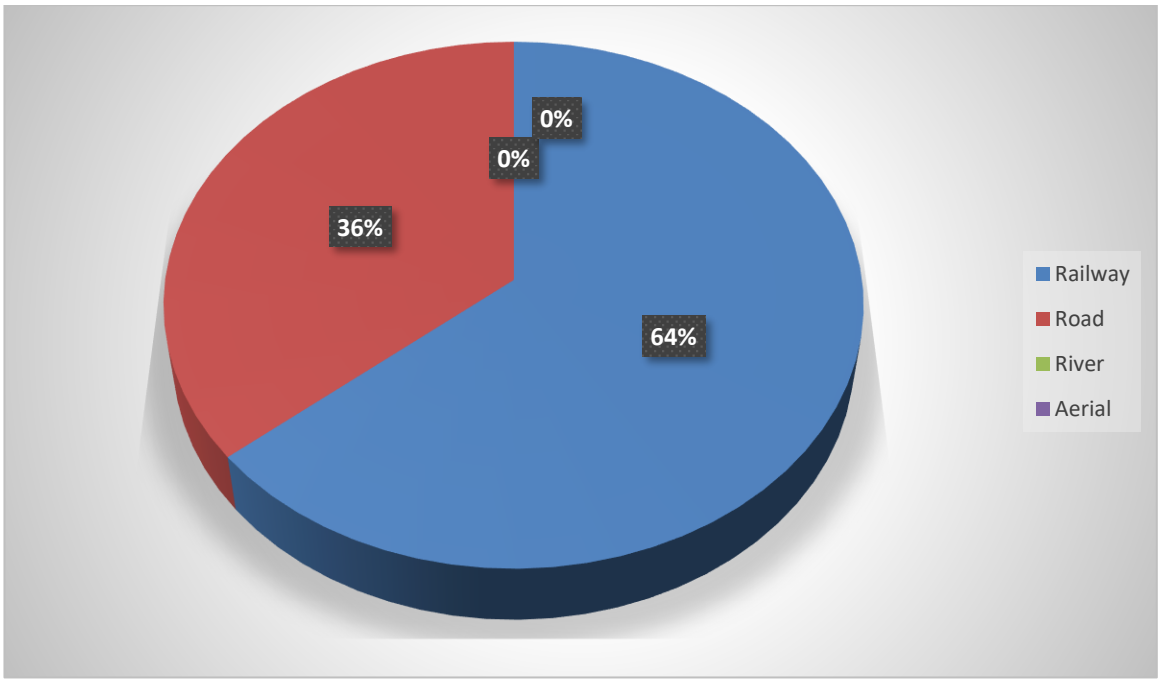


Figure 3 a: Share of volume of goods transported by means of transport, 2007

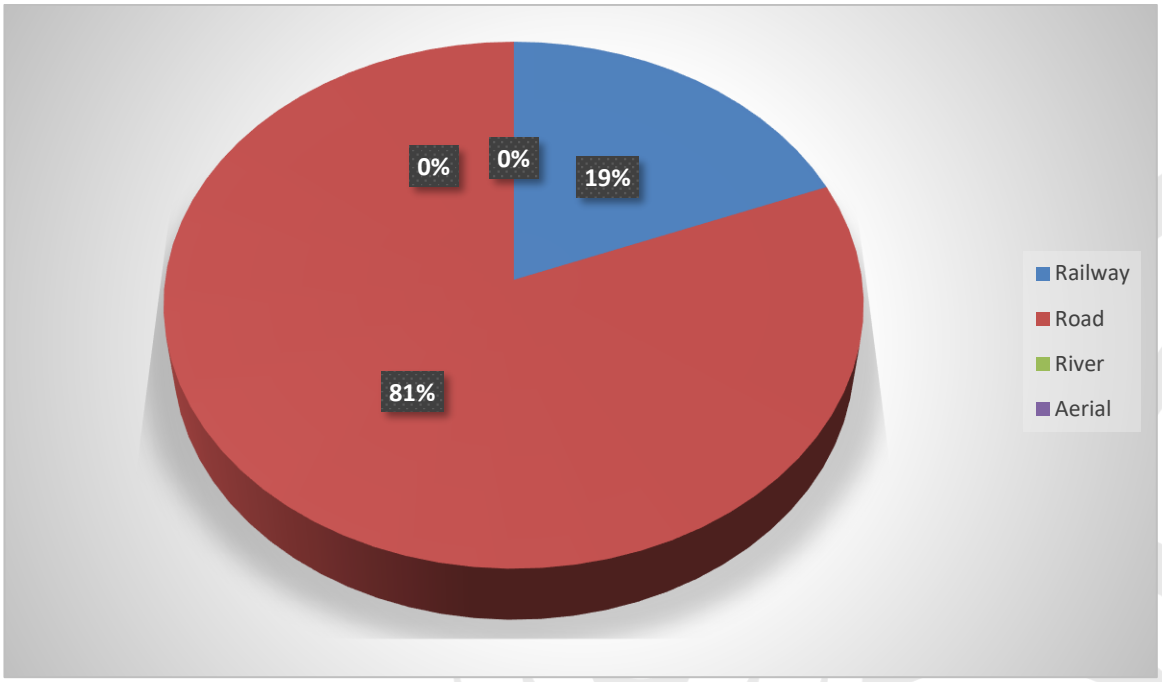


Figure 3 b: Share of goods transported by means of transport, year 2019

On the basis of the above data and the analysis of trends in the development of economic relations, the following conclusions can be drawn:

a) Moldovan Railway can actually increase its transport volumes due to:

- Development of import/export relations with European community countries;

- Convenient tariff policy for producers of large transport volumes, which are concentrated in urban nodes (Chisinau, Balti, Cahul) and railway/fluvial/road terminals (Ocnita, Ungheni, Basarabeasca, Giurgiulesti);

b) For the exit from the critical situation, the provision of competitive services, an optimal number of institutional projects are to be carried out, as follows:

- Rational renewal of the rolling stock: locomotives, cereal wagons, cement transport wagons, containers, tanks;

- Capital reconstruction of South Railway Central Line Infrastructure;

- Capital reconstruction of Western railway central infrastructure (Chisinau-Ungheni);

- Support within the technical parameters of operation of the central railway line Nord (Ungheni-Balti-Ocnita).

c) For a profitable activity the railway enterprise must take measures to optimise expenditure and, first of all, abandon inefficient capital investments in infrastructure.

It should be noted that thanks to the support provided by the Government of the Republic of Moldova to attract investments from the European Bank for Reconstruction and Development and the European Investment Bank in the current year 2020, 12 new locomotives worth 45 million euros arrived.

Thanks to these supplies (acquisitions), to future investments and efficient management in its activity, Moldovan Railway will be able to develop successfully.

Specialists know that for the efficient operationin the field of the transport are necessary:

(a) The demand for transport generated by producers of products;

b) Terminals with the full range of modern logistics services;

(c) Qualified staff;

(d) Reliable, economical and environmentally friendly rolling stock;

e) Transport infrastructure.

The first four conditions are achieved as priority at national level thanks to the efficient policy of the country's government, private investment and the efforts of economic operators.

The improvement and development of transport infrastructure is due to large investments, on long-term redemption, and as a result is achieved thanks to national projects financed from the country's budget, grants and credits.

As mentioned, in the Republic of Moldova more than three quarters of the volume of freight is transported by road transport. It should be added that the increase in the current road transport is stable.

Analysis of the average transport distance of one tonne of cargo (Figure 4) shows that between 2006 and 2012 it had 400-560 km, but during 2013-2019 it was reduced to 300-350 km.

The fact given indicates that in the structure of road freight transport during the years 2006-20012 long distance trip, i.e. tours carried out for export/import arrangements prevailed.

Since 2013 in the structure of road freight transport the number concerning of trips carried out on national roads has risen within the framework of internal freight traffic.

This tangential phenomenon informs us about the growth of the national economy. The work given shall be confirmed by the official statistical data for the growth of gross domestic product (GDP) in Figure 5.

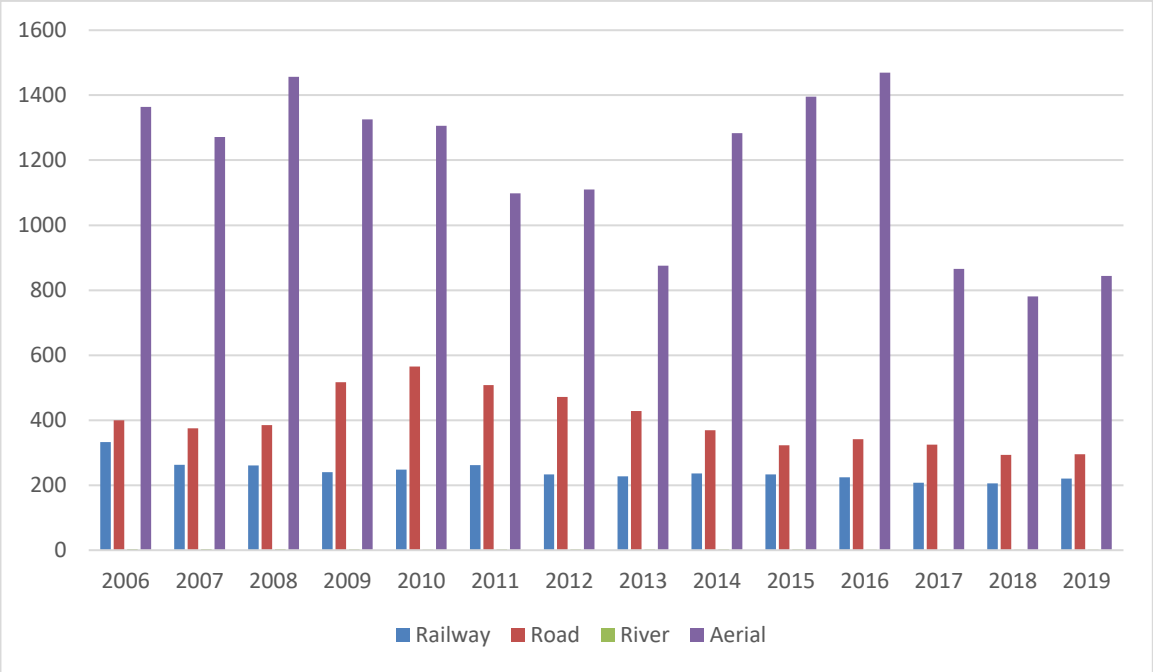


Figure 4: Average transport distance of one tonne of cargo, km

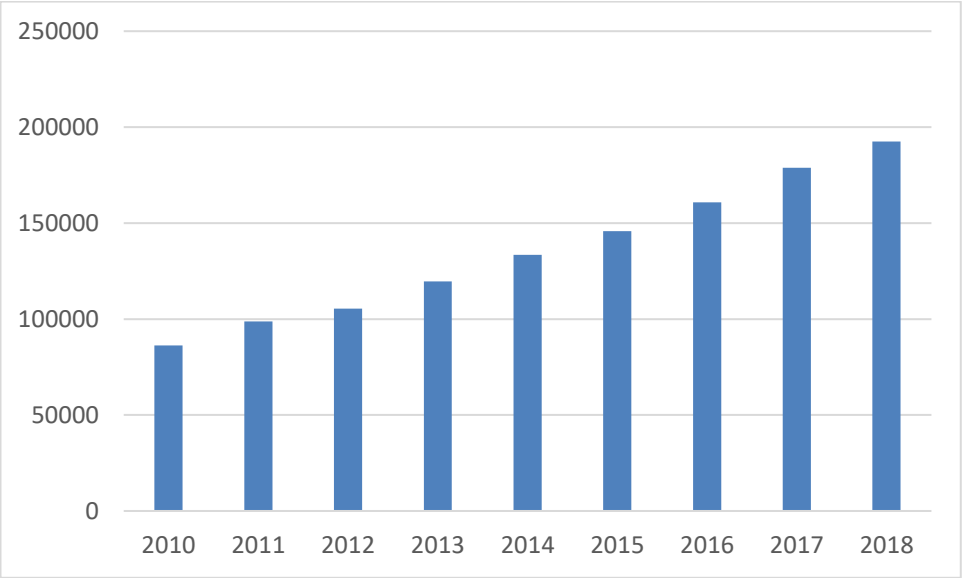


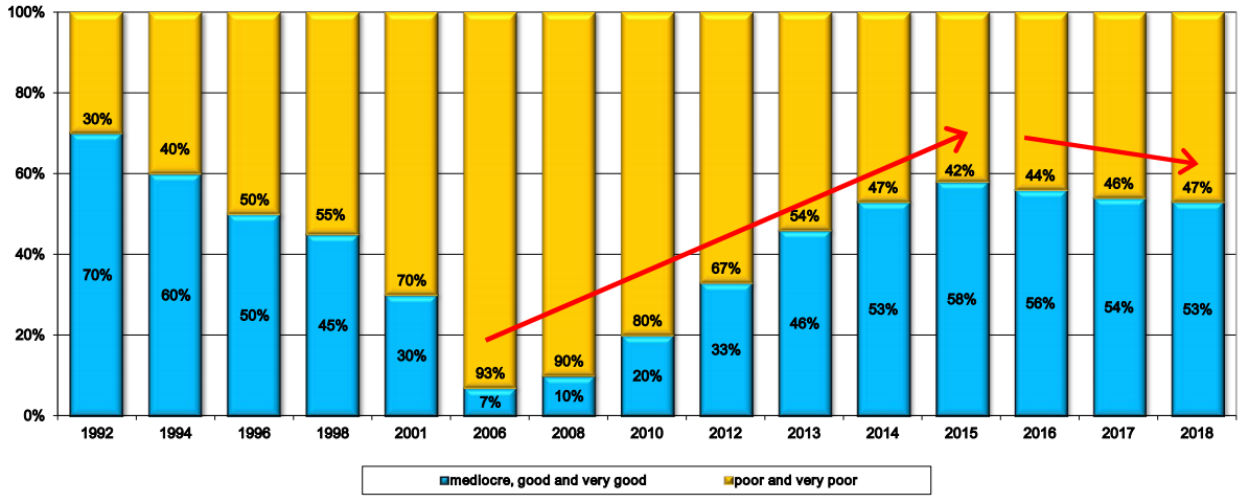
Figure 5: Gross domestic product (GDP) dynamics, millions of lei

Taking into account the current state of public roads for personal transport, we conclude that from the point of view of the development of the national economy, improvement of the comfort and safety in traffic and rehabilitation of road infrastructure represent the most current projects, to be carried out successfully.

Quantitative and qualitative road network feature:

- Public roads 10 635 km;
- National roads 5 857 km;
- Regional roads 2 520 km;
- Local roads 3 708 km (pass with funding to second level);
- 1 070 km are administrated by left side Nistru river local authority.

The estimated assessment of the degree of degradation of national public roads over the last two decades is presented on Figure 6 and currently constitutes 46-47%.



Source: https://mei.gov.md/sites/default/files/roads_sector.pdf

Figure 6: Assessment of the state of national public roads over the years

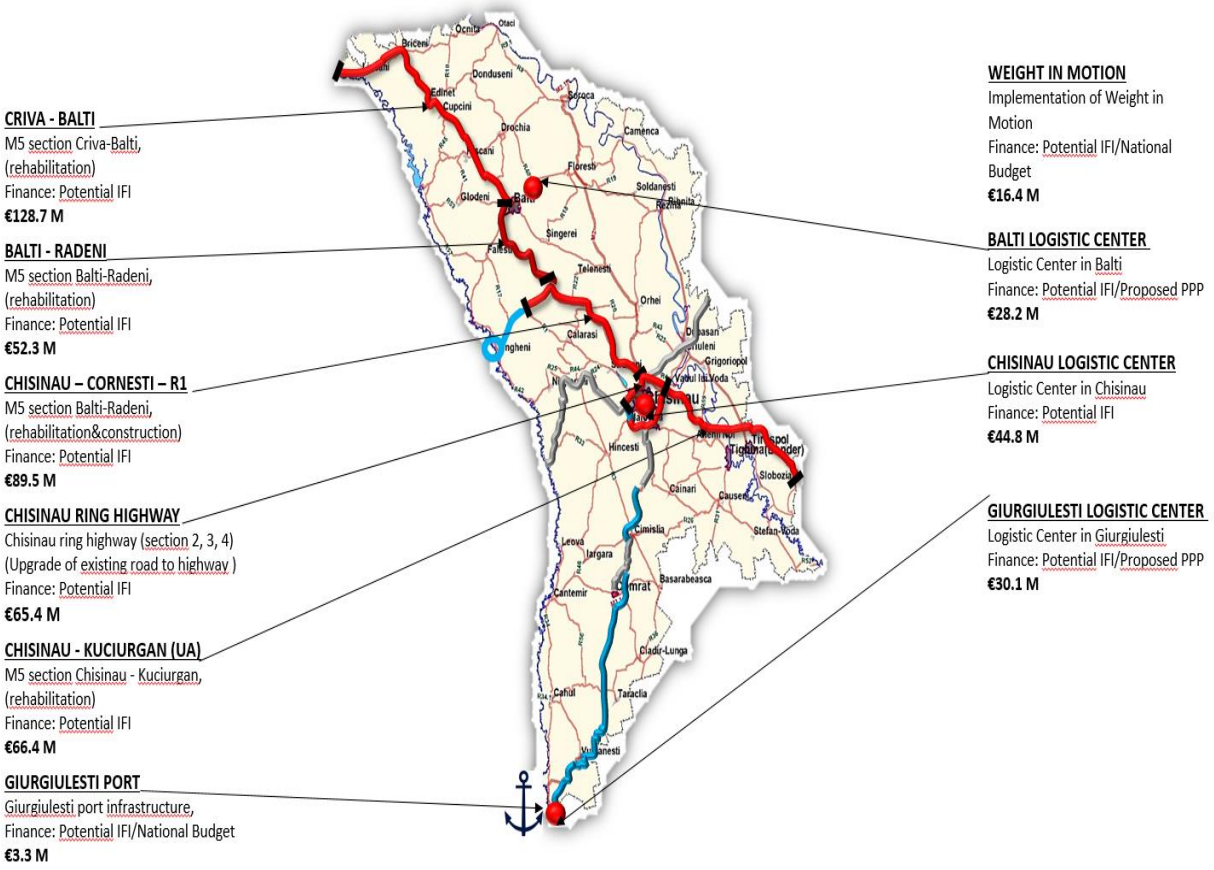
It should be noted that most components of national transport infrastructure (roads, bridges, ports, terminals) were built in a rather short period of time from 1975-1985, and after their term of exploitation expiried, a large volume of repair/reconstruction/rehabilitation works were considered to be carried out at a modern technological level. This constitutes a big burden for the national budget. As a result, investments primarily are directed to solve the most current problems in the rehabilitation of the transport infrastructure namely the central national network. A large number of the projects are carried out thanks to the support of the European Community (fig. 7). Over the last few years, investments in repair and maintenance of public roads have doubled (fig. 8).

The transport infrastructure rehabilitation process was launched between 2005 and 2010, intensified between 2010 and 2020 and is expected to be complete by 2030, after the development of transport infrastructure foreseen in line with the needs of the national economy (8).

In the current year 2020, in Moldova, there have been launched 12 road rehabilitation projects at more than 355 km with the estimated cost of 5.5 billion lei.

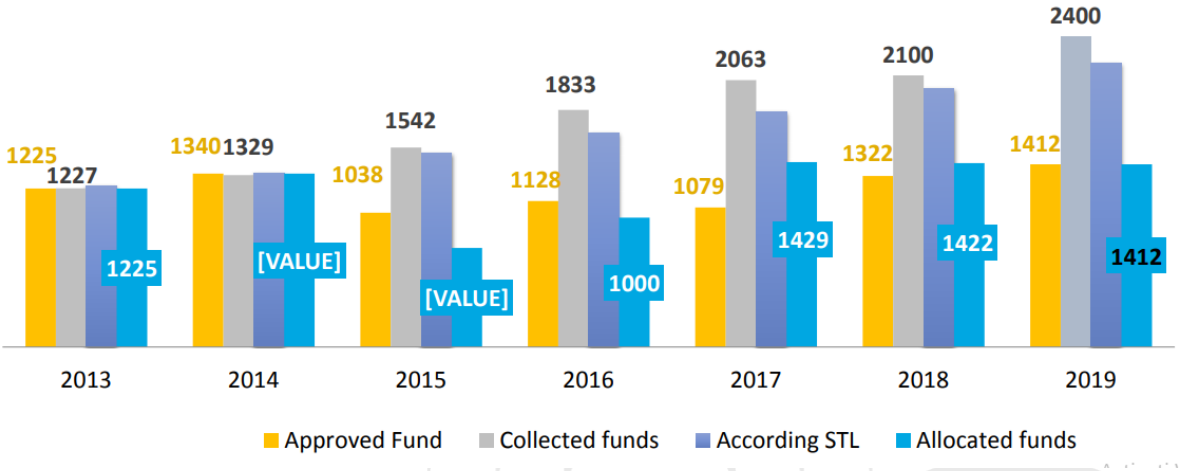
The main and only relevant document that most fully reflects the strategic tasks for the development of the transport industry at the national level is Government Decision no. 827 of 28.10.2013 regarding the approval of the Transport and Logistics Strategy for the years 2013-2022. This transport strategy document was developed in the context of the transition to an economic growth strategy.

The transport strategy is designed to form an active position of the state in creating conditions for socio-economic development, primarily in order to improve the quality of transport services, reduce the total costs of society that depend on transport, increase the competitiveness of the domestic transport system, strengthen the innovative, social and environmental focus of the transport industry.



Source: https://mei.gov.md/sites/default/files/roads_sector.pdf

Figure 7: Investment plans in the infrastructure of the central road network.



Source: https://mei.gov.md/sites/default/files/roads_sector.pdf

Figure 8: Investment plans in the infrastructure of the central road network

At the same time, transport, as a backbone element of the economy and a generator of investment and innovation demand for products, should be considered as an independent point of economic growth.

The main objectives of the national transport strategy are:

- Formation of a single transport space based on the balanced development of an efficient transport infrastructure;

- Ensuring the availability and quality of transport and logistics services in the field of freight transportation at the level of the needs of the country's economic development;

- Ensuring the availability and quality of transport services for the population in accordance with social standards;

- Integration into the global transport space, implementation of the country's transit potential;

- Increasing the level of security of the transport system;

- Reducing the negative impact of the transport system on the environment.

When forming the priority directions for the development of the transport system, the experience of the development and implementation of strategic documents and initiatives in the field of transport development abroad was taken into account.

Transport plays an important role in the social and economic development of the country. The transport system provides conditions for economic growth, increasing the competitiveness of the national economy and the quality of life of the population. Transport plays an important role in the development of the country's competitive advantages in terms of realizing its transit potential. Access to safe and high-quality transport services determines the efficiency of work and development of production, business and social sphere.

Analysis of the dynamics of transported goods (Figure 9) shows that over the past ten years they have increased by one and a half times. Almost all of the growth is accounted for by road transport. This event can be explained by the following factors that determine the needs of the national economy in transport:

- high competitiveness of road transport due to flexible pricing policy, profitability and quality of services provided;

- the time of delivery of goods to the consumer;

- volumes and distance of transportation.

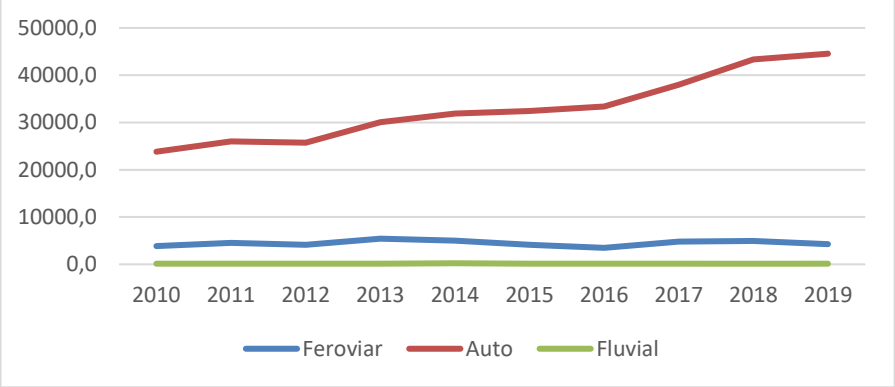


Figure 9: Dynamics of freight transport in the Republic of Moldova, thousands of tons

As a result, the government focuses on the rehabilitation and modernization of highways in its transport infrastructure development plans.

In accordance with the goals set in the national strategy until 2022 the quality of the public road network must be at the level of: good condition - 45%; mediocre condition - 45%; bad condition - 10%.

As follows from Figure 10 on the evolution of public roads in the Republic of Moldova, the emphasis is on rehabilitation, modernization, repair and proper maintenance. The construction of new public roads is a relatively small figure (100 km) and is primarily related to the liquidation of "narrow" places in the road network such as ring roads of urban centers and others.

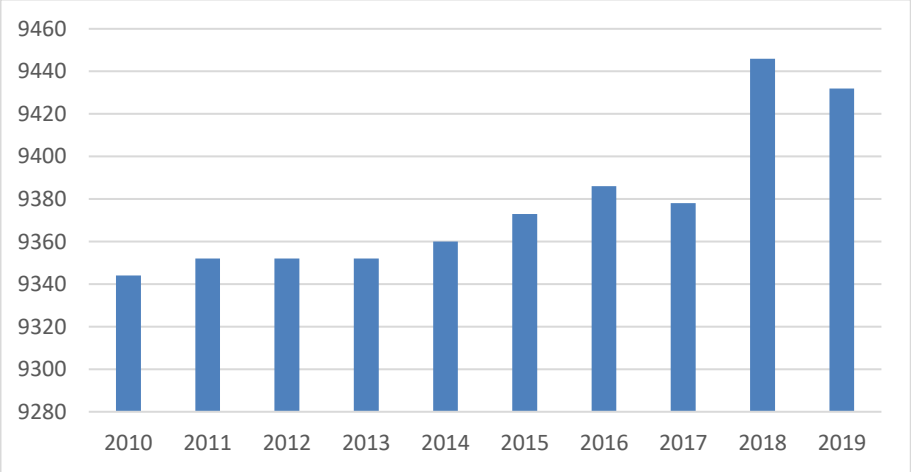


Figure 10: The evolution of the development of public roads in the Republic of Moldova, km

The quality characteristics of the level of transport services are determined by the speed, timeliness, predictability, rhythm, safety and environmental friendliness of the functioning of the transport system. In the context of increasing public attention to

environmental factors, reducing the negative impact of transport on the environment is of great social importance.

Under these conditions, the formation of strategic directions for the development of transport should be carried out on the basis of a comprehensive analysis of the current state and problems of the development of the transport system in close relationship with the general directions and scales of the country's socio-economic development, as well as with global global strategic trends in the economy.

In inland waterway transport, special attention was paid to maintaining the infrastructure of inland waterways in working order, as well as measures to ensure safe navigation conditions.

3.3 Analysis on the market of transport services of the countries from the Danube region.

The prospects for the development of ports in the Danube region largely depend on the functioning of a direct waterway along the Danube with the seaport of Constanta. However, there is fierce competition for the Danube ports from the seaports of the Adriatic and the Aegean, and, to a certain extent, degree, even from North Sea ports. Adriatic (Trieste, Koper, Rijeka, Bar) and Aegean seaports (Thessaloniki, Piraeus) have no direct connection to the hinterland countries of the Danube region. Despite this, their competitiveness and, in many cases, comparative advantage over the port of Constanta. Rail and road transport from these ports and even from the ports of the North Sea is very competitive in terms of transit time and cost compared to barging services to and from Constanta.

This situation applies mainly to high-value and unified containerized cargo. However, when it comes to general cargo, the seaport of Constanta is very competitive compared to other ports. Most of the strategies and policies for the development of EU inland ports are based on the problems of transport in the inland ports of Western Europe. This is because these ports are almost always geared towards intermodality and optimizing their flows to/from the main North Sea docking ports. On the contrary, container traffic converging in the Danube ports from inland waterways is practically non-existent.

Another important prospect for the Danube ports may be focused on specialization, even in the case of relative lack of spatial concentration of ports in certain areas. In general, two kinds of port specialization may happen. The more obvious specialization can be seen in the emergence of a small number of niche ports/terminals that specialize in handling specific cargo (including niche cargo) and perhaps a few other commodities. The subtler specialization is the process whereby cargo shippers/receivers tend to concentrate the bulk of their operations in fewer ports. Ports can also tend to specialize their cargo handling operations around a smaller number of cargo owners.

3.4 The role of river transport in the face of the current demands of the global economy.

Globalization and the modern era have placed enormous pressure on port authorities. To survive and thrive, port authorities must become less static and think outside the box. This means that port authorities must expand their scope beyond that of the traditional middleman, with a centuries-old focus on providing basic and operational infrastructure and facilities for transshipment and storage. Modern water logistics, transport and port operations dictate that ports must play a new strategic role in land use planning, facilitating the movement of production and logistics facilities to or near port areas, integrating supply chains and information systems.

This role requires networking not only between ports, but also between ports and other nodes, operators and market players. While this may not be a panacea for ports, going beyond the port area in terms of physical interventions and organizational capabilities along supply chains has a good chance of gaining a competitive advantage for ports in the medium to long term.

The most important in the development of inland ports is the different geographical distribution of cargo flows, different levels of quality of the transport infrastructure of various modes of transport, including the throughput of access to the hinterland. Therefore, no pan-European single development strategy for all inland ports can be really useful, since fundamental differences remain: geographical; climatic; economic; trading.

Ports are integrated into supply chains through intermodality and organizational integration. It is known that intermodality simplifies cargo handling and reduces damage, losses and layover times, resulting in faster, more reliable and cost-effective transport overall.

In the Unified Transport System of the country, water transport provides transportation of goods in areas directly gravitating towards inland waterways, as well as mixed transportation of foreign trade goods. The use of multimodal transport in many cases saves transport costs.

The place and role of water transport in the unified transport system of the country is largely determined by its technical and economic features. The most important of them include:

- large carrying capacity of vehicles;

– high capacity of waterways;

- relatively small capital investments in the organization of navigation on waterways;

– relatively low energy intensity of cargo transportation;

– relatively low cost of transportation, especially over long distances.

3.5 Development guidelines for river transport and ports in the Republic of Moldova.

The definition of the main tasks for the development of inland water transport in the Republic of Moldova, as well as the order of their implementation, largely depends on the current state of the industry, the demand for transportation and investment opportunities.

The analysis of statistical data indicates very modest total volumes (Figure 11) of transported goods, as well as carried out cargo turnover (Figure 12). However, it should be noted that, compared with the crisis period of the 1990s, there is some progress and signs of stable development.

The reasons for the current situation are the low competitiveness of inland water transport in comparison with the level of services provided by road transport, as well as low investments from the state to maintain navigational routes in working order (Figure 13).

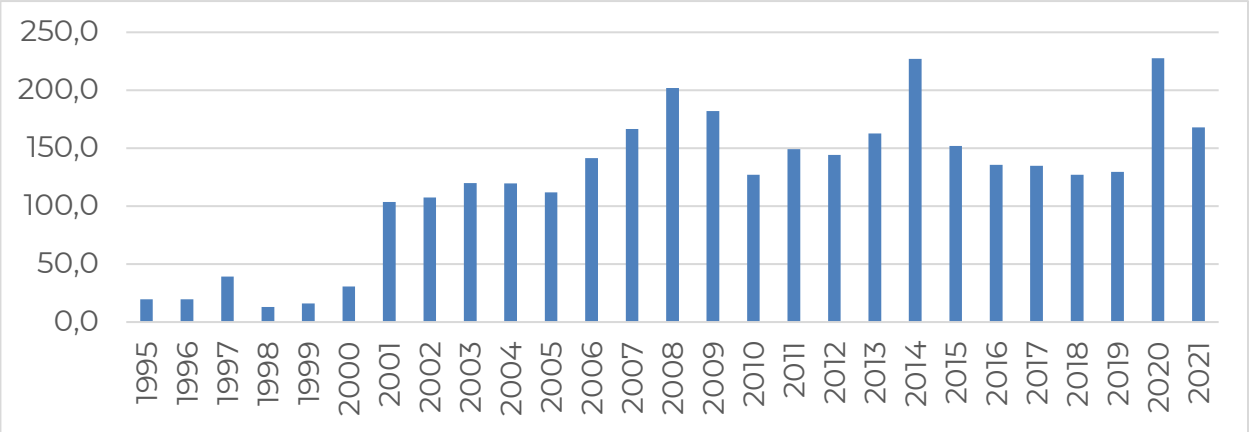


Figure 11. Dynamics of transported goods (thousand tons) by inland waterways

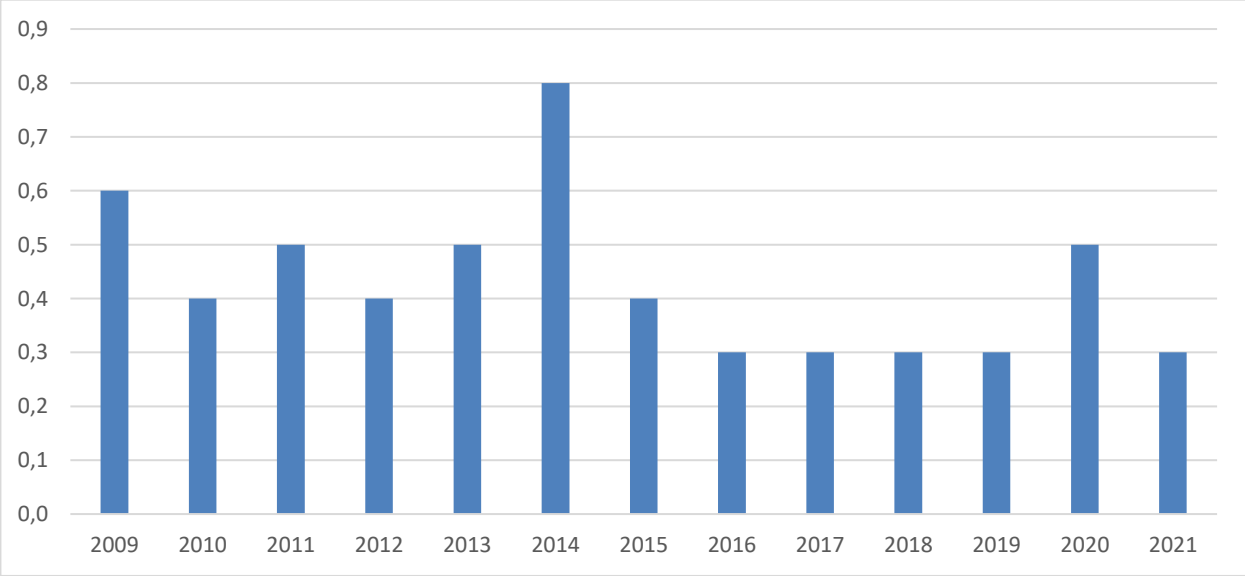


Figure 12. Dynamics of cargo turnover (million tons * km) in inland water transport

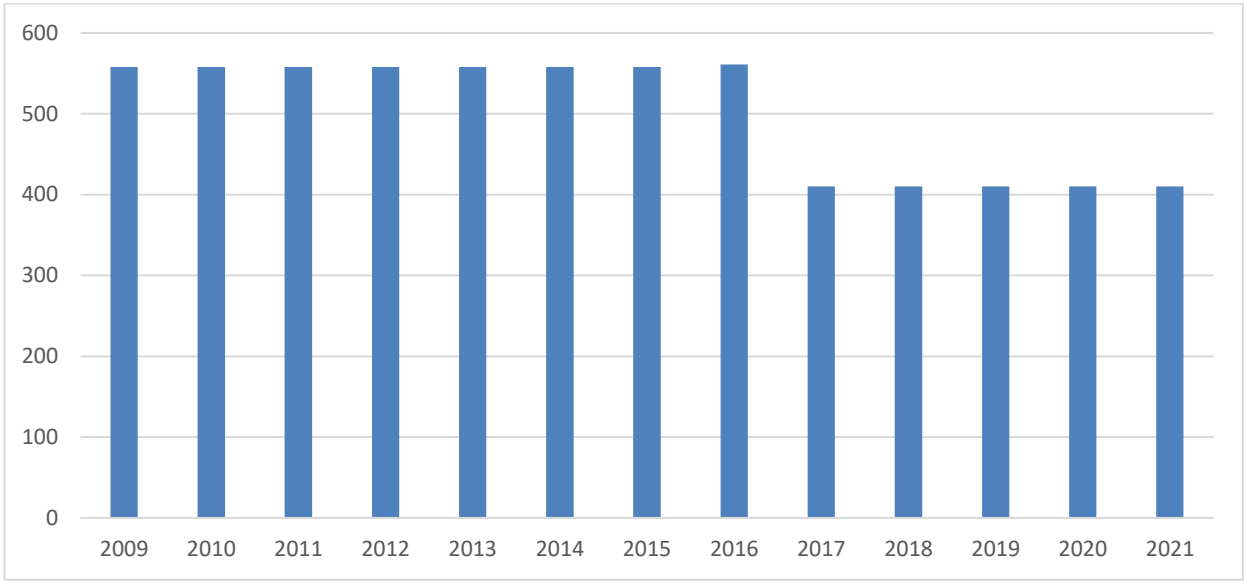


Figure 13. Dynamics of inland waterways (km)

Based on the need to solve global problems in the field of ecology and energy, it seems promising to transform inland water transport into a modern efficient industry and introduce its common transport complex.

To achieve the goals set, the state bodies and economic agents operating in the field of water transport need cooperation and interaction in solving problems in two main ways:

- Creation of favorable conditions for the effective functioning of water transport and increasing the competitiveness of economic agents in the water industry;

- Development and expansion of the market of services in the field of water transport.

The main goals in developing the competitiveness of the industry are:

1) improving the conditions of navigation on inland waterways, taking into account the prospects for the development of the market for the provision of inland water transport services and increasing safety requirements, including:

• equipping the navigation of inland waterways and improving the operational parameters of hydraulic structures;

• increasing the length of sections of inland waterways with guaranteed depths and equipping the navigable environment;

• modernization of the technical fleet and its more efficient use in order to improve the operational parameters of waterways;

• survey of inland waterways and preparation of pilot charts indicating all navigational signs of the navigation situation, which will have to comply with the European rules of navigation, as well as the introduction of modern systems of navigation and vessel traffic control;

• development of coastal infrastructure for inland water transport that meets the requirements adopted on international transport corridors; development of tourism and recreation conditions;

• Ensuring the development of inland waterways and coastal infrastructure in accordance with the goals and needs in the creation of transport infrastructure in the country as a whole;

2) development of the transport fleet in accordance with market requirements, including:

• renewal of ships, timely repair and modernization of the fleet at shipyards;

• replenishment of the fleet by acquiring new modern vessels;

• decommissioning of floating craft that are not subject to reconstruction and prohibition of operation of ships with high physical wear and tear, which can provoke emergencies;

3) reconstruction of ports and reform of port activities, including:

• improvement of the technical condition of existing berths in ports;

• provision, modernization of obsolete unloading equipment and other technical means and installations;

• construction of new berths and specialized terminals for handling containers, mineral fertilizers and chemical cargoes;

• modernization of road and rail access roads to berths;

4) development of industry enterprises by attracting investments, increasing the efficiency of work by reforming and merging them in order to create strong, competitive enterprises in the market for the provision of water transport services;

5) development of interaction with other modes of transport, through the introduction of new logistics schemes and technologies in the organization of the transport process of transportation, primarily multimodal and intermodal transportation;

6) ensuring the safety of navigation on inland waterways, including environmental safety, by the method:

• creation of vessel traffic control systems in the field of water transport;

• regulation and coordination in the performance of state supervision functions by competent state bodies to improve the efficiency of their activities, subject to minimizing interference in the economic activities of economic agents;

• acquisition of specialized ships and technical means for collection, processing and disposal of various types of waste from the operation of ships or in the aftermath of accidents with water transport, including sunken property;

7) development of insurance in the field of water transport, including:

• insurance of passengers and crew members of ships;

• ensuring civil liability of third parties in the course of transportation of dangerous goods and performance of pilotage operations;

• Ensuring civil liability for environmental pollution as a result of the operation of water transport.

The strategic direction of the development of international transport should be the entry of inland waterways of the Republic of Moldova into a single international European transport system. The main mechanism in this area is the creation of an appropriate regulatory framework for organizing transportation along international transport corridors.

Due to the implementation of the project "Support for the reform of the transport sector in the Republic of Moldova", financed by the European Union (EU), documents, rules and procedures have been applied for the Naval Agency of the Republic of Moldova that will allow it to become more functional and operational term of supervision and regulation of the field. The naval agency personnel were trained on the subject of modern and competitive naval management, especially on the administration of an open-type ship register.

Among the current directions for the development of the Giurgiulesti port complex are:

1) Increasing port capacities and ensuring the efficient development of port infrastructure. Of great importance is the efficient and reliable operation of the loading and unloading complex, where ships are loaded and unloaded, and the ability to accept and process waste from ships. However, other infrastructure facilities, such as customs and screening terminals, also need to operate at high levels of efficiency.

2) Ensuring the navigational accessibility of the port and the safe functioning of the port infrastructure and transport. Two characteristics largely determine navigational accessibility: the physical dimensions of the approach channel (depth, width, length) and climatic conditions (freezing of the port, etc.).

3) Ensuring inland accessibility for secure and efficient transport of goods to and from points of consumption and origin of goods located inland. Ports must be connected by a network of roads and railways, inland waterways. Without a stable and reliable connection between the port and the hinterland, ports cannot provide cargo owners and operators with services of the proper quality. Therefore, the availability and quality of internal accessibility of a port are very important characteristics that affect the assessment of the competitiveness of ports.

4. Strategy and policy for the development of IWT in the European Union

The European Commission identified the low level of competition and investment efficiency in transport and made a specific recommendation for the development of a comprehensive long-term transport plan.

The NAIADES II program aims to achieve long-term structural change in the inland water transport sector.

The goal of NAIADES II is for the inland water transport sector to be well managed, innovative and efficient, environmentally friendly, integrated into the intermodal chain and staffed with a skilled workforce.

The European Economic and Social Committee supports transport multimodality and smart shipping, pointing out that inland waterway transport is essential for the future and needs to be supported and developed.

The European Commission pays constant attention to the development of European transport in accordance with current and future needs, especially in view of changes in demand and the trend towards increased port traffic. The key features should be the principle of multimodality and smart delivery, i.e. taking advantage of different modes of transport to achieve the best possible results while improving safety and reducing environmental impact.

The European Economic and Social Committee supports efforts to increase the share of inland water transport (IWT) in passenger and freight transport. There is a huge potential in this area, which is still not used. The TEN-T network also needs to be updated to keep up with new transport trends."

The European Economic and Social Committee considers that the development of transport and port infrastructure is a priority goal for the development and maintenance of inland water transport. The achievement of this goal requires large investments in the implementation of well-reasoned projects. Otherwise, shipowners will not risk investing in a modern fleet, and local authorities will not be interested in creating intermodal terminals.

This policy is a key instrument for the development of a coherent, interconnected and high quality transport infrastructure across the EU. It stimulates the sustainable and more efficient transport of people and goods, provides access to jobs and services, and promotes trade and economic growth. It also strengthens the EU's economic, social and territorial cohesion by creating seamless cross-border transport systems without missing links or bottlenecks.

5. Development strategy and policy of IWT in the Republic of Moldova

The general objective of the strategy is the balanced development of the national transport system to ensure a modern and sustainable infrastructure and transport services, the sustainable development of the economy and the improvement of the quality of life.

The priorities in the field of maritime transport are focused on the development of the maritime transport infrastructure, ensuring traffic safety, simultaneously with the consolidation of ports as intermodal logistics centers, which serve as support for the progressive development of the intermodal freight transport network and safer and more reliable maritime transport services. more environmentally friendly.

In order to achieve these priorities, the following actions regarding ports will be considered:

- Consolidation of the function of ports as logistic centers and their integration into the intermodal transport system, with a balanced cooperation and fair inter-port competition;
- Development of the naval transport infrastructure and port facilities;
- Development of security and rescue services;
- Development of fluvial information systems;

Expected benefits and results:

- Increasing and diversifying the transport of goods;
- Increasing the quality of transport services;
- Increasing the transport capacity, safety and security of passengers and goods;
- The gradual realization of an accessibility index similar to that of the metropolitan regions of Europe;
- Increasing the contribution of the transport sector to the Gross Domestic Product;
- Creation of new jobs following investments in the transport sector.

The TEN-T Regulation establishes the guidelines for the development of the TEN-T network which includes a global network (Comprehensive) and the central network (Core). Giurgiulesti Port is located on the central network. Regarding the fulfillment of the development objectives for the central network until 2030, a series of measures will have to be adopted, such as the implementation of specific requirements at the network level regarding infrastructure, telematics applications, equipment and services.

The requirements for the river and sea port, which must be met by 2030, are:

- Ensuring the appropriate connections with the road and railway infrastructure;
- It will have at least one cargo terminal open to several operators in a non-discriminatory manner and will implement a transparent tariff policy system;
- Will implement telematics applications, including RIS;

• It will promote sustainable transport on inland waterways;

• It will modernize and develop the capacity of the infrastructure, necessary for transport operations in the port region.

Being a port with maritime access, Giurgiulesti will have to implement appropriate measures to ensure the following requirements for maritime ports, established in the TEN-T Regulation until 2030:

• The equipment associated with the maritime transport infrastructure includes equipment for managing cargo traffic, reducing negative effects, including negative effects on the environment, equipment for ensuring navigability throughout the year;

• Connections with the railway network and the road network

• Connections with inland waterways;

• It will have at least one cargo terminal open to all operators in a non-discriminatory manner and will implement a transparent tariff policy system;

• Reception facilities for waste and residues from ships in accordance with Directive 2000/59/EC of the European Parliament and of the Council;

• Introducing new technologies and innovation to promote alternative fuels and energy efficient maritime transport, including LNG.

Giurgiulesti Port is the only port that has both European (1435 mm) and Russian (1520 mm) gauge railway lines, thus offering an advantage in terms of efficient and uninterrupted traffic between the railway systems in the West (Romania) and the systems from the East (Ukraine) as well as for the improvement of the intermodal transport activity within the port.

The development of the connection across the Prut river, between the localities of Giurgiulesti (Republic of Moldova) and Galati (Romania). is a strategic one and involves the development of the export potential of the Republic of Moldova, including the development of a Regional (International) Logistics Center in the Giurgiulesti region.

6. Accessibility of Giurgiulesti port to the transport corridors of the central network TEN_T and RM.

6.1 Characteristic of existing core networks.

In accordance with the Association Agreement between the European Union and the Republic of Moldova (Title IV, Chapter 15, Article 80, 81) the Parties will "work to strengthen the main transport links between their territories". The main focus of cooperation is the development of sustainable national transport policies covering all modes of transport with a view to ensuring efficient transport systems and their interoperability.

For economic competitiveness, balanced and sustainable development the Republic of Moldova needs to carry out projects to integrate national infrastructure into the European network in various modes of transport.

The EU's Eastern Partnership Policy stipulates the strengthening of political association and economic integration, including increased investment in transport infrastructure.

The mechanism for Europe Interconnection clearly sets out the conditions to support projects of common interest in the transport infrastructure sectors and promotes the development of the trans-European transport network (TEN-T) by implementing the core network corridors.

The development of the trans-European transport network stipulates the connection to the national network of the Republic of Moldova as follows:

a) TEN-T/road (Figure 14):
- Iasi (RO) – Sculeni (MD);
- Albita (RO) – Leuseni (MD);
- Galati (RO) – Giurgiulesti (MD);
- Oancea (RO) – Cahul (MD)

b) TEN_T/railway (Figure 14):
- Iasi (RO) – Ungheni (MD);
- Galati (RO) – Giurgiulesti (MD)

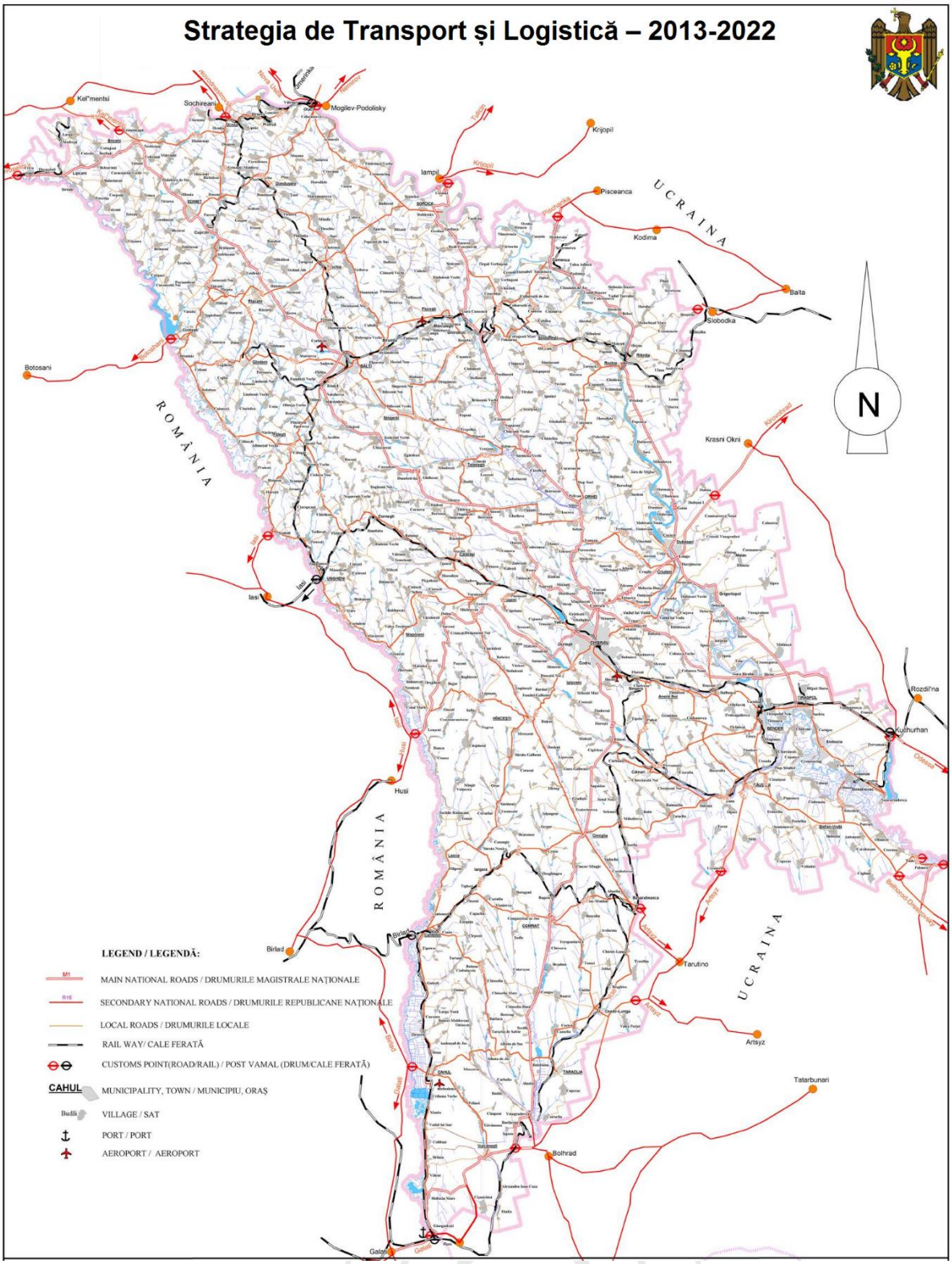
c) TEN-T/maritime (Figura 15) – Giurgiulesti port.

Source: Regulation (EU) NR. 1315/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2013 on the Union guidelines for the development of the trans-European transport network and abrogation of Decision 661/2010/EU

Figure 14: Central and global network (corridor Rhine -Danube)

Source: Regulation (EU) NR. 1315/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 11 December 2013 on the Union guidelines for the development of the trans-European transport network and abrogation of Decision nr.661/2010/EU

Figure 15: Central and global network of inland waterways and ports (Rhine-Danube)

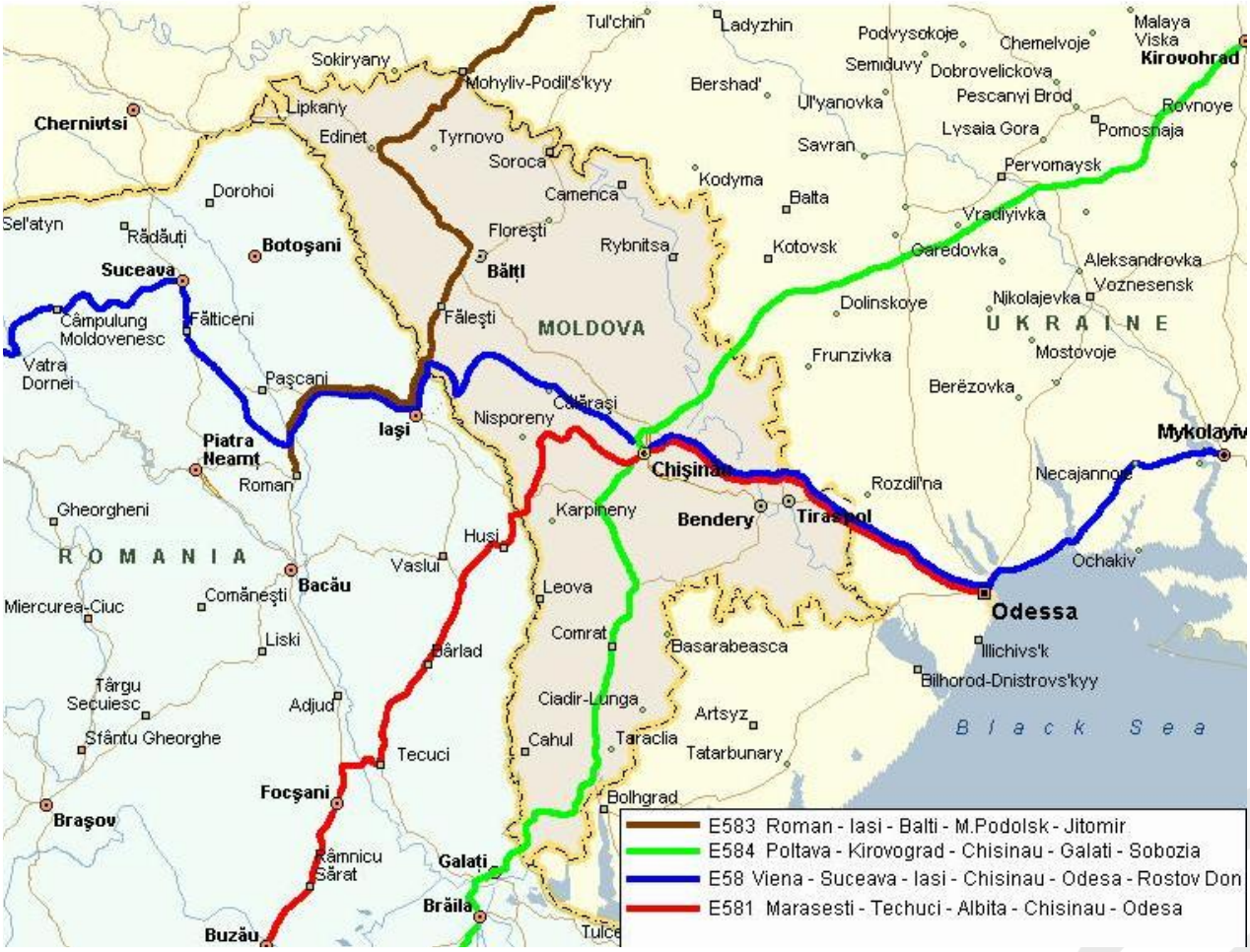


Source: Governmet Decision nr. 827 of 28 October 2013 „Transport and Logistics Strategy 2013-2022".

Figure 16: Transport network of Republic of Moldova.

The national transport network (Figure 16) is approved in the last version by the Government Decision of the Republic of Moldova No. 827 of 28.10.2013 "Transport and logistics strategy for 2013-2022".

The main roads of the European road network crossing the country (Figure 17) are established by the European Agreement by the main international traffic arteries which the Republic of Moldova has ratified 25 May 2006.



Source: https://mei.gov.md/sites/default/files/roads_sector.pdf

Figure 17: Infrastructure development and improvement of the connection with European Transportation Networks

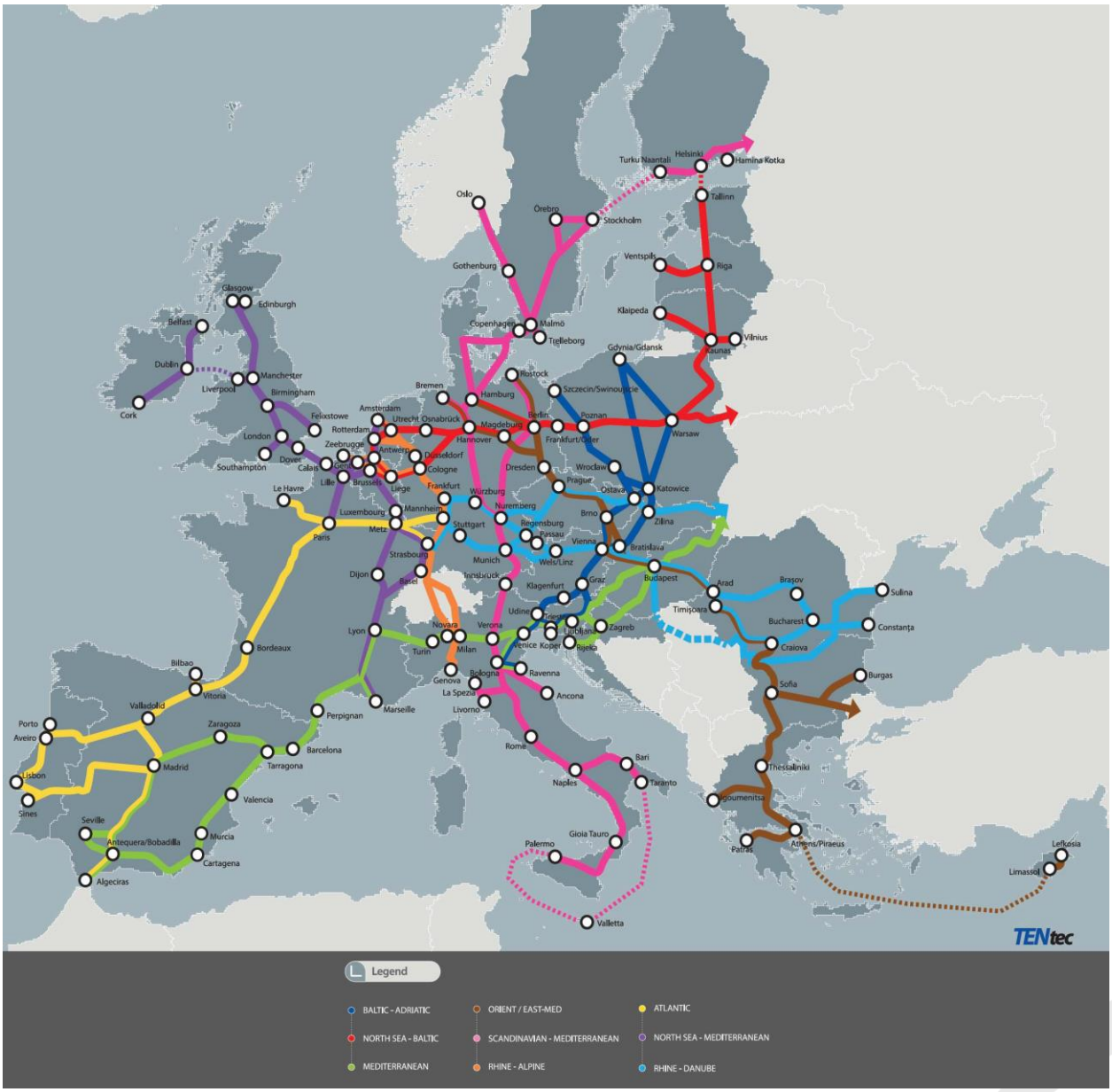
Core and common national network connected to the Trans-European Networks Transport (TENT-T) is showh in Figure 18.

The national central network provides direct connection to corridor 7 "Orient/East-Mediterranean" and corridor 9 "Rhine-Danube".

Source: https://mei.gov.md/sites/default/files/roads_sector.pdf

Figure 18: Core and comprehensive national network transport

Due to these connections Republic of Moldova obtains indirect access to virtually all TEN-T corridors (Figure 19).



Source: COMMISSION COMMUNICATION Construction of the central transport network: the corridors of the central network and the Interconnection Europe Mechanism {SWD(2013) 542 final}. (ec.europa.eu).

Figure 19: Indicative schematic map of the core network corridors, as provided for in Article 44 (2) of the TEN-T Regulation.

Cross-border mobility of passengers and goods is achieved through the following international border- crossing points of the Moldovan-Romanian state (Figure 18):

a) the railway crossing point:
- Ungheni – Nicolina;
- Giurgiulesti – Galati;

- Stoianovca – Falciu
- (b) the road crossing point:
- Leuseni – Albita;
- Sculeni – Sculeni;
- Cahul – Oancea;
- Giurgiulesti – Galati;
- Lipcani – Radaut Prut

b) River crossing point:

- Giurgiulesti Port

c) Airline crossing point:

- Chisinau International Airport.

The road axis of the central network "Nord-Sud" created by national public roads M3 and M5 provides the connection of the main urban nodes such as Balti-Chisinau-Comrat-Cahul and exit to the main border crossing points Sculeni, Leuseni, Giurgiulesti.

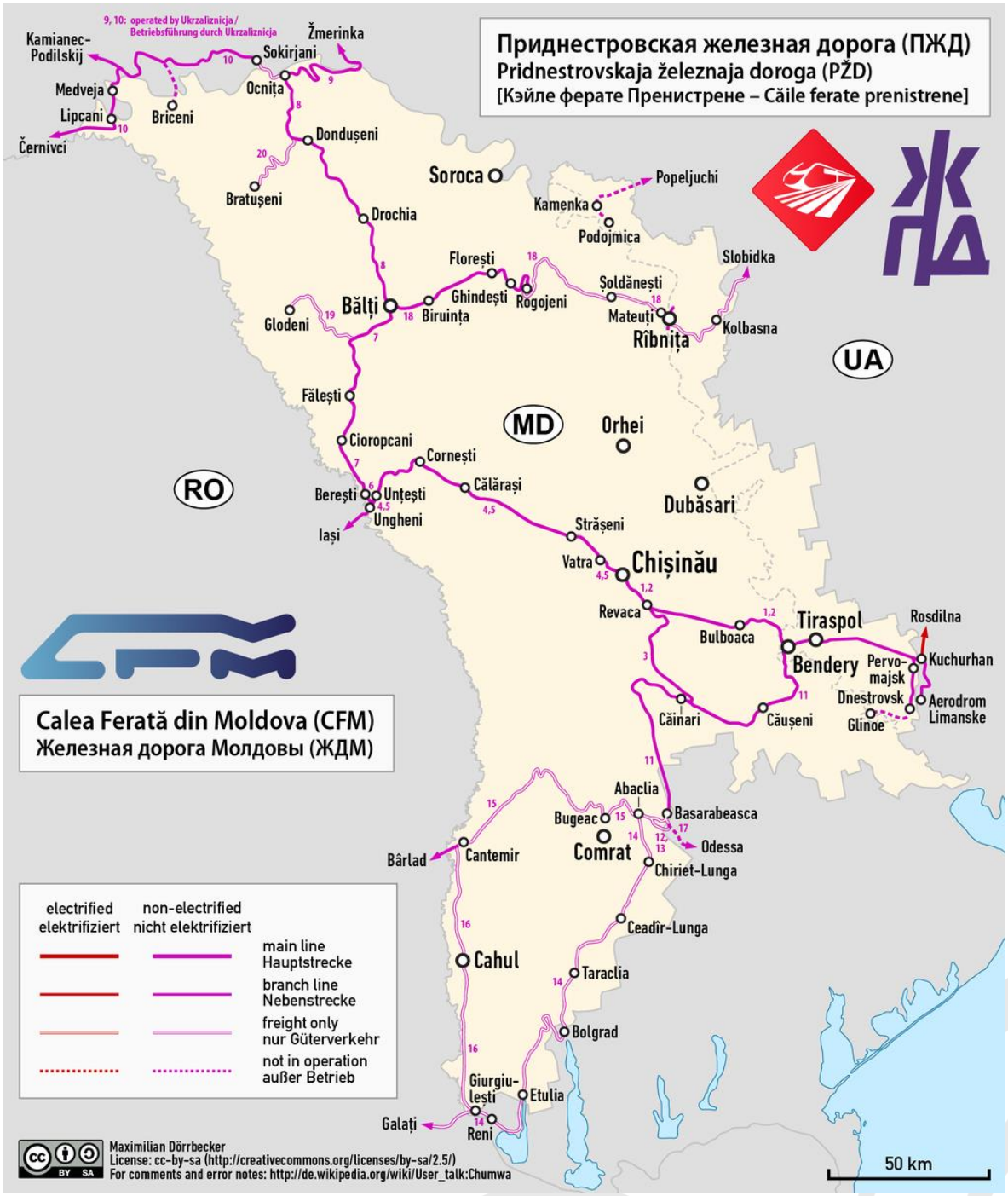
The second main road arteries "West-East" provide connection to the urban nodes Ungheni-Chisinau-Tiraspol.

The central node of the national transport network of Chisinau has direct connections with the capitals of Eastern and Central European countries, as well as Ukraine.

It should be especially noted that one of the serious transport problems faced by the Republic of Moldova after the collapse of the USSR is related to the seizure of traffic volumes at the national level and, as a consequence, to a sharp decline in transit traffic. This problem is associated with the lack of interest and cooperation between the Republic of Moldova and Ukraine in the development and implementation of mutually beneficial transport infrastructure facilities.

The central line "Nord-Sud" of the national rail network (Figure 20) provides connection to the following urban nodes: Ocnita-Balti-Ungheni-Chisinau-Basarabeasca-Cahul-Giurgiulesti.

The second central railway line "Vest-Est" provides connection to the urban nodes Ungheni-Chisinau-Tiraspol.

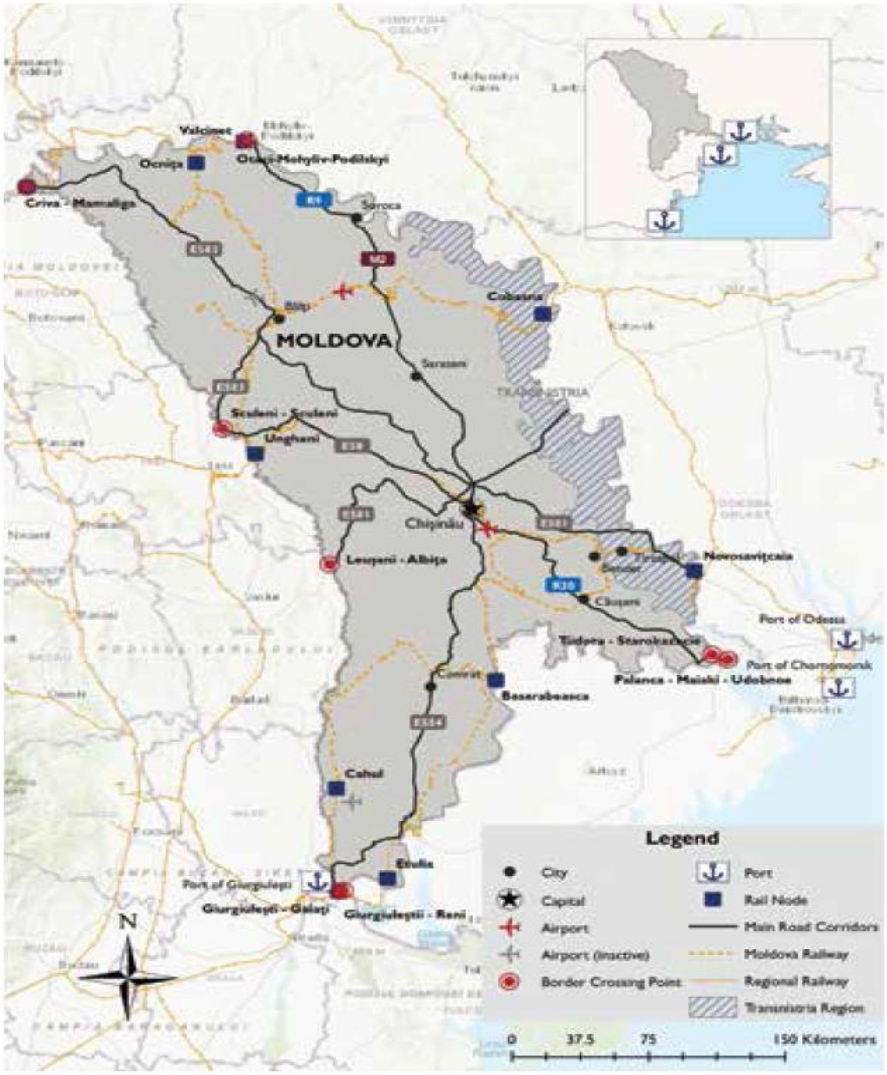


Source: Railway of Moldova

Figure 20: Core and common national railway network

The main urban node of the central national network, undoubtedly, is Chisinau, the capital of the country . The Chisinau node has strong rail-road terminals, as well as an international airport which provide large volume of transport. Within the national extensive transport network the main nodes forming freight volumes (Figure 21) are the cities: Balti, Ungheni, Comrat, Orhei, Cahul.

SWOT analysis of nodes with multimodal terminals is presented in Table 1.



Source: Nathan 2018

Figure 21: Map of the commercial corridors of the Republic of Moldova

Table 1: SWOT analysis of the main nodes with the multi –modal terminals

Chisinau	
Strengths	***Weaknesses***
- Point of intersection of road and railway routes; - Presence of infrastructure components (Revaca train station);	- Lack of a free trade area; - The unevenness of the goods transported; -Morally worn-out infrastructure;

- Large number of economic agents; - Large volumes of goods transported through import/export; - Lack of strong competitors	Lack of connections with maritime transport; - Volumes of goods reduced by transit
Opportunities	***Threats***
- Possibility of attracting private investment; - Possibility of creating freight processing platforms; - Possibility of direct contracting of final customers	- Modification of preferences on how goods are transported; - Introducing economic restrictions on the part of external partners; - Redirect transport flows to other routes
Balti	
Strengths	***Weaknesses***
- Point of intersection of road and railway routes; - Presence of infrastructure components (Balti train station); - Large number of economic agents; - Large volumes of goods transported through import/export; - Lack of strong competitors; - Presence of the free trade area	- The unevenness of the goods transported; - Morally worn-out infrastructure; - Lack of connections with maritime transport; - Volumes of goods reduced by transit
Opportunities	***Threats***
- Possibility of attracting private investment; - Possibility of creating freight processing platforms; - Possibility of direct contracting of final customers	- Modification of preferences on how goods are transported; - Introduction of economic restrictions from external partners; - Redirect transport flows to other routes
Giurgiulesti	
Strengths	***Weaknesses***
- Point of intersection of road and naval routes;	- Unevenness of the goods transported;

- Large volumes of goods transported through import/export/transit arrangements; - Lack of strong competitors; - Presence of the free trade area; - Territory availability for expansion	- Relatively large distance from the main industrial areas and urban settlements
Opportunities	***Threats***
- Possibility of attracting private investment; - Possibility of creating freight processing platforms; - Possibility of creating complex and efficient infrastructures	- Modification of preferences on how goods are transported; - Introduction of economic restrictions from external partners; - Redirection of transport flows to other routes

The absolute majority of the terminals in the national network (Figure 21) are bimodal "rail-road" (Balti, Ocnita, Ungheni, Tighina, Basarabeasca). Central urban node mun. Chisinau offers the trimmodal accessibility: rail-road-aerien. The Giurgiulesti border node is also trimodal: river-rail-road.

At the same time, since the main categories of exported goods are products of vegetable origin, alcoholic beverages and tobacco articles, it would be welcome to create specialized logistics centers that would allow the processing of goods, and could operate on a seasonal basis. Depending on the type of goods produced at regional level, this would reduce the period of processing of goods, in particular perishable ones, and would enable producers to more effectively manage the stocks of available goods, creating the link between the producer and the beneficiary.

In this context, it is proposed to create specialized centers as such in localities like Ocnita (agricultural products), Basarabeasca (alcoholic beverages) and others. These logistics centres will not have large transport capacities but will be equipped with modern means of processing and storage of goods. Depending on the type of goods processed, these logistics centers will be given access to routes for different types of transport (depending on infrastructure).

The advantages of these centres are, that they will enable producers to market their goods and exporters to simplify transport procedures by creating larger parties of goods and storage of the necessary raw material.

At the same time, there is a risk that these centres will be requested only at certain times of the year when there is raw material, in order to compensate for these inconveniences these centers will also be able to process imported goods on the territory of the Republic of Moldova. The creation of this network of logistics centres will enable the decentralisation and development of economic relations at regional level.

6.2 The position of Giurgiulesti port.

Coordinates: 45° 28' 18'' N, 28° 12' 31'' E

Decimal: 45.4716945, 28.2086241

The code: MDGIU

Giurgiulesti International Free Port is situated at 133.8 km / 72.2 nautical miles from the Black Sea on the maritime section of the river Danube, with available water depths of up to 7m. GIFP benefits from its strategic location in close proximity to Moldova's borders with Romania and Ukraine. Due to its easy access to the Black Sea with maritime vessels, to countries located along the Danube with river barges as well as inland rail connections to both the CIS and EU countries, GIFP is developing into a major logistics hub not only for Moldova, but for the entire region. GIFP is capable of receiving both inland and sea going vessels. GIFP serves its client as a regional logistics hub on the border of the EU with access to road, standard-gauge railway and broad-gauge railway, as well as to river and sea vessels. It is the only direct sea/river-borne transhipments and distribution point to and from the Republic of Moldova and due to its strategic location an excellent location for business development with a unique customs and tax regime (Figure 22; 23; 25).

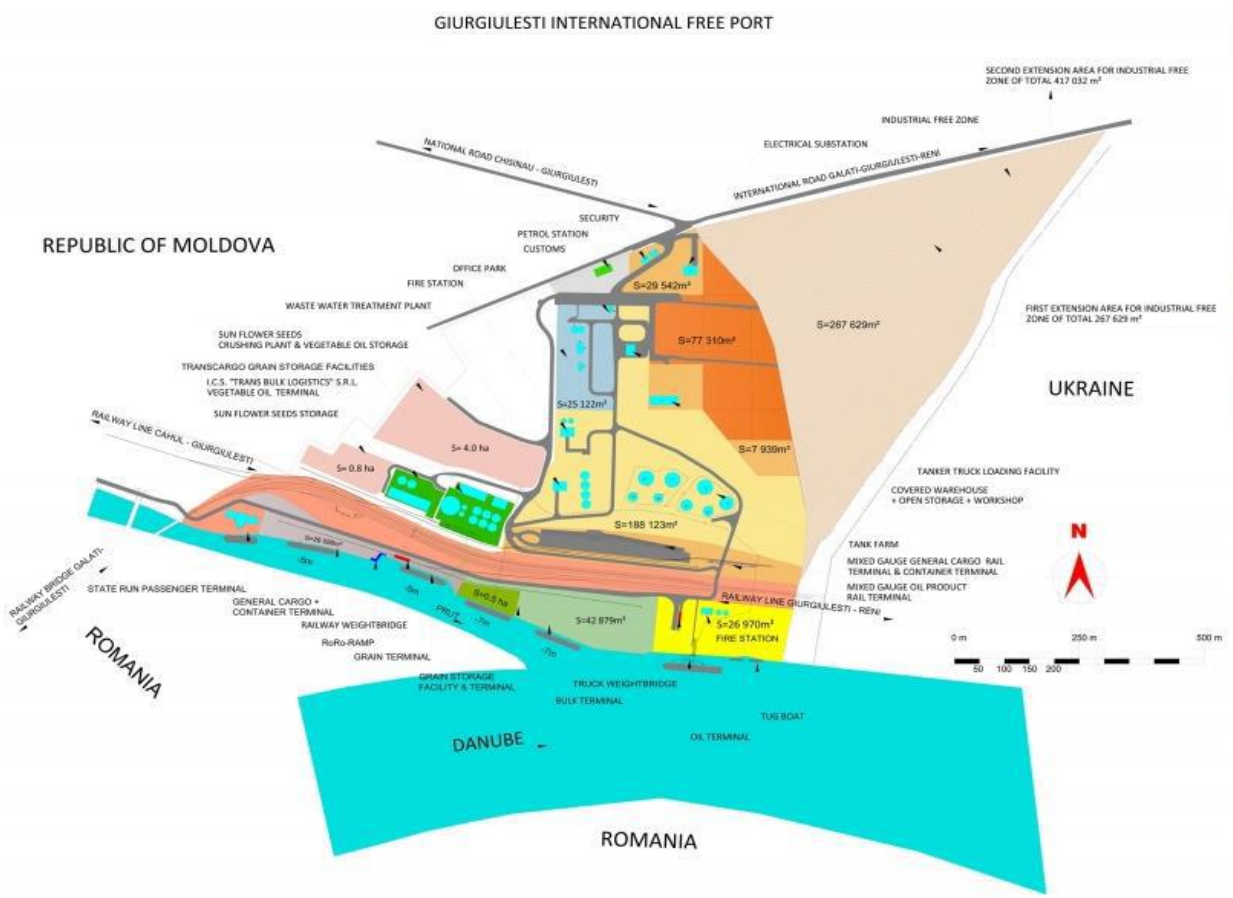
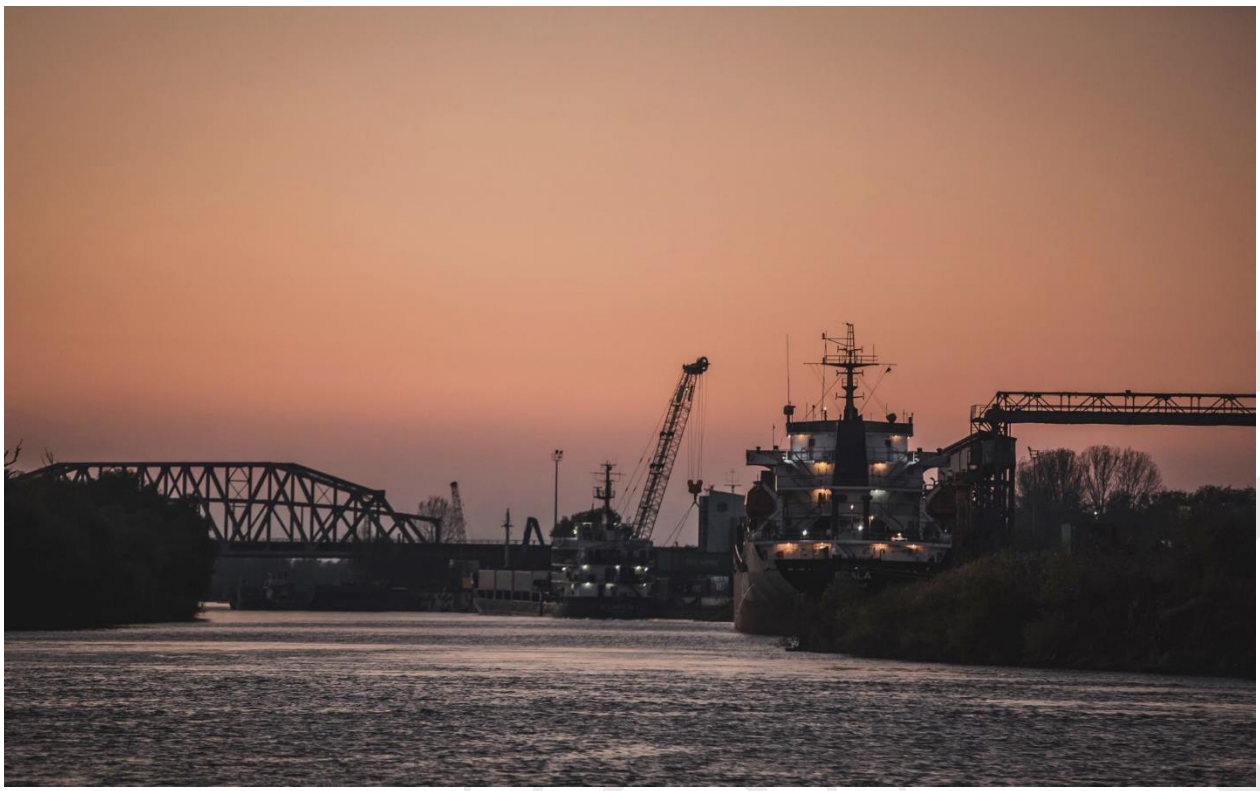


Figure 22. Position Giurgiulesti International Free Port

The Giurgiulesti port complex is geographically quite successful (Figure 23).

Source: www: maps.google.ru

Figure 23: Geographical location of Giurgiulesti Port Complex



Source**:** www: gifp.md

Figure 24: Giurgiulesti port complex

	Distance
GIFP	0 km
Black Sea	134 km
Turcoaia, RO	50 km
Constanta, RO	228 km
Ruse, BG	357 km
Belgrade, RS	1,034 km
Budapest, HU	1,506 km
Bratislava, SK	1,731 km
Vienna, AT	1,786 km
Linz-VA, AT	1,993 km
Passau, D	2,094 km

Source**:** www: gifp.md

Figure 25: GIFP connection with Danube ports

At regional level, the Port of Giurgiulesti is placed as a logistics centre at the border with the European Union, with access to car, rail, river and sea communication routes (Figure 26).

For the Republic of Moldova, this port complex is very important, which due to its geographical location falls within the pan-European corridor VII, the TRACECA corridor and can be used not only for the import and export of goods to/from the Republic of Moldova but also for the transit of goods to/from the European Union and other states of the Danube basin.

Source: http://gifp.md/ro/transportation-links/maritime/

Figure 26: Direct access of the Giurgiulesti Free International Port to international waterways and the Black Sea

The Giurgiulesti port complex consists of:

- Port of passengers and goods Giurgiulesti, the operator of which is the State Enterprise "Ungheni River Port",

- Giurgiulesti International Free Port, the general operator of which is "Danube Logistics" SRL.

Giurgiulesti Passenger and Freight Port - is composed of the following main components:

- The 120 m long coastal quay, river-sea navigation passenger ship (with two levels to be used depending on the ship's height and water level in the Prut River), width – 16 m, draught – 4,5 m.

- 4-storey administrative block;

- Treatment plant;

- Parking for cars;

- Passenger landing /disembarkment station in/from buses

- Access road;

- Crossing at the railway station in Giurgiulesti.

The capacity to service passengers in the Giurgiulesti Passenger Port is about 300 people per day. The administrative building includes the waiting room to perfect customs and border procedures, the offices of the port administration and the permanent places of service of the customs and border authorities which are specialised in the performance of its duties in river-sea ports.

At the same time, the subdivision is located on the premises of the administrative building. "Captain of the port of Giurgiulesti", the traffic routing and monitoring service on the Moldavian sector of the Danube River and the estuary of the Prut River, this centre is equipped in accordance with the requirements of International Maritime Organisation Resolutions A.578 and A.85, the requirements of the Danube Commission, with the help of this centre, traffic monitoring and routing is assured which gives the possibility to ensure the safe operation of the entry/exit of ships in/out of the port.

6.3 Hinterland connections

Giurgiulesti International Free Port (GIFP) is located in the southernmost geographical point of the Republic of Moldova. This creates some problems for organizing sustainable links with the hinterland of the country. It should be borne in mind that before the opening of the port in 2005, the settlement of Giurgiulesti was not a cargo-forming center.

Giurgiulesti International Free Port is the only three modal (Road, Rail, IWW) transport hub in the country.

Near the port there is a railway junction (station Giurgiulesti) of the state enterprise "Moldovan Railway".

Through this station, external communications with Romania are provided (for this there is a mixed track from 1520 mm to 1435 mm) and with Ukraine through the nearest station Reni.

In connection with the growth in traffic through GIFP and in order to reduce the transit time for trains through Ukraine, the Cahul-Giurgiulesti railway line was opened in 2008.

Currently, the port of Giurgiulesti has a direct connection with all the main internal railway stations: Chisinau, Basarabeasca, Ungheni, Balti, Ocnita.

The M3 highway of international importance (Chisinau - Giurgiulesti) is the only road connecting the port with the hinterland of the country and with the Danube region of the European Union. With the growth in the volume of cargo transportation from the port by road transport, the asthma in its restructuring has sharply increased.

With the opening of the Giurgiulesti International Free Port and the growth of the country's economic potential, interest has increased in the rehabilitation of navigation along the Prut River along the entire Giurgiulesti-Ungheni section. Currently, there are only local sections with local navigation on the Prut River.

Railways of relevance for IWT

The sustainable operation of the Giurgiulesti International Free Port (GIFP) largely depends on the current state of the railway and the prospects for its development.

Three railway sections have a direct impact on the functioning of the port:

a) providing communication with the hinterland of the country;

- Giurgiulesti-Reni-Etulia-Basarabeasca;

- Giurgiulesti-Cahul;

b) providing external communication with Romania:

- Giurgiulesti-Galati.

- Giurgiulesti-Galati.

Railway section Giurgiulesti - Basarabeasca .

The section under consideration provides a connection between two important railway junctions of strategic importance for the development of the country's economy.

The Basarabeasca junction station is one of the main ones for the formation of trains in the direction of Romania and Ukraine.

Delivery of goods to the port of Giurgiulesti is carried out in transit through the Ukrainian section of the railway along the route: Basarabeasca-Etulia-Reni-Giurgiulesti.

Transportation of goods in transit through Ukraine creates additional logistics costs.

One of the main disadvantages of the section in question is the large time required for transportation. This is due to the low speeds of trains and the long process of forming trains.

The main reasons for low speed are:

- highly rugged terrain;

- significant wear and tear of railway tracks.

Currently, the average speed is 30 km / h.

The main transported goods include containers, grain, agricultural fertilizers, fuel, coal, metal.

Table 2: Giurgiulesti - Basarabeasca railway section parameters

Section	Parameter	Value	Unit	Reference in Regulation 1315/2013
Giurgiulesti - Basarabeasca	Length	153	km	n/a
	Electrification	1	% of km	§12 except for isolated networks
	Track gauge 1435mm	0	% of km	§13 as priority for RR infrastructure development
	Line speed >= 100km/h	0	% of km	§39 requirement for core network
	Axle load (>=22.5t)	0	% of km	
	Train length (740m)	0	% of km	

Railway section Giurgiulesti - Cahul .

The 1520 mm gauge railway Giurgiulesti - Cahul was built in 2008 with the aim of increasing the volume of cargo transported through the port. However, its construction was carried out with a number of violations of building codes. From time to time, during spring floods on the Prut River, railways are damaged in some sections. All this sharply reduces traffic safety and the intensity of operation.

Table 3: Giurgiulesti- Cahul railway section parameters

Section	Parameter	Value	Unit	Reference in Regulation 1315/2013
Giurgiulesti- Cahul	Length	50	km	n/a
	Electrification	0	% of km	§12 except for isolated networks
	Track gauge 1435mm	0	% of km	§13 as priority for RR infrastructure development
	Line speed >= 100km/h	0	% of km	§39 requirement for core network
	Axle load (>=22.5t)	0	% of km	
	Train length (740m)	0	% of km	

Railway section Giurgiulesti-Galat.

At the moment, the Republic of Moldova has two existing railway sections for the implementation of external relations with Romania: Ungheni and Giurgiulesti. Both railway junctions have a double track of 1520 mm and 1435 mm. Between the Giurgiulesti-Galat stations, there is a double track along the entire length of the railway section. The immediate significance of this section for the port of Giurgiulesti is not significant. But for direct rail transport between neighboring friendly countries, this section is of strategic importance.

Table 4: Giurgiulesti-Galat railway section parameters

Section	Parameter	Value	Unit	Reference in Regulation 1315/2013
Giurgiulesti-Galat	Length	12	km	n/a
	Electrification	0	% of km	§12 except for isolated networks
	Track gauge 1435mm	100	% of km	§13 as priority for RR infrastructure development
	Line speed >= 100km/h	0	% of km	§39 requirement for core network
	Axle load (>=22.5t)	0	% of km	
	Train length (740m)	0	% of km	

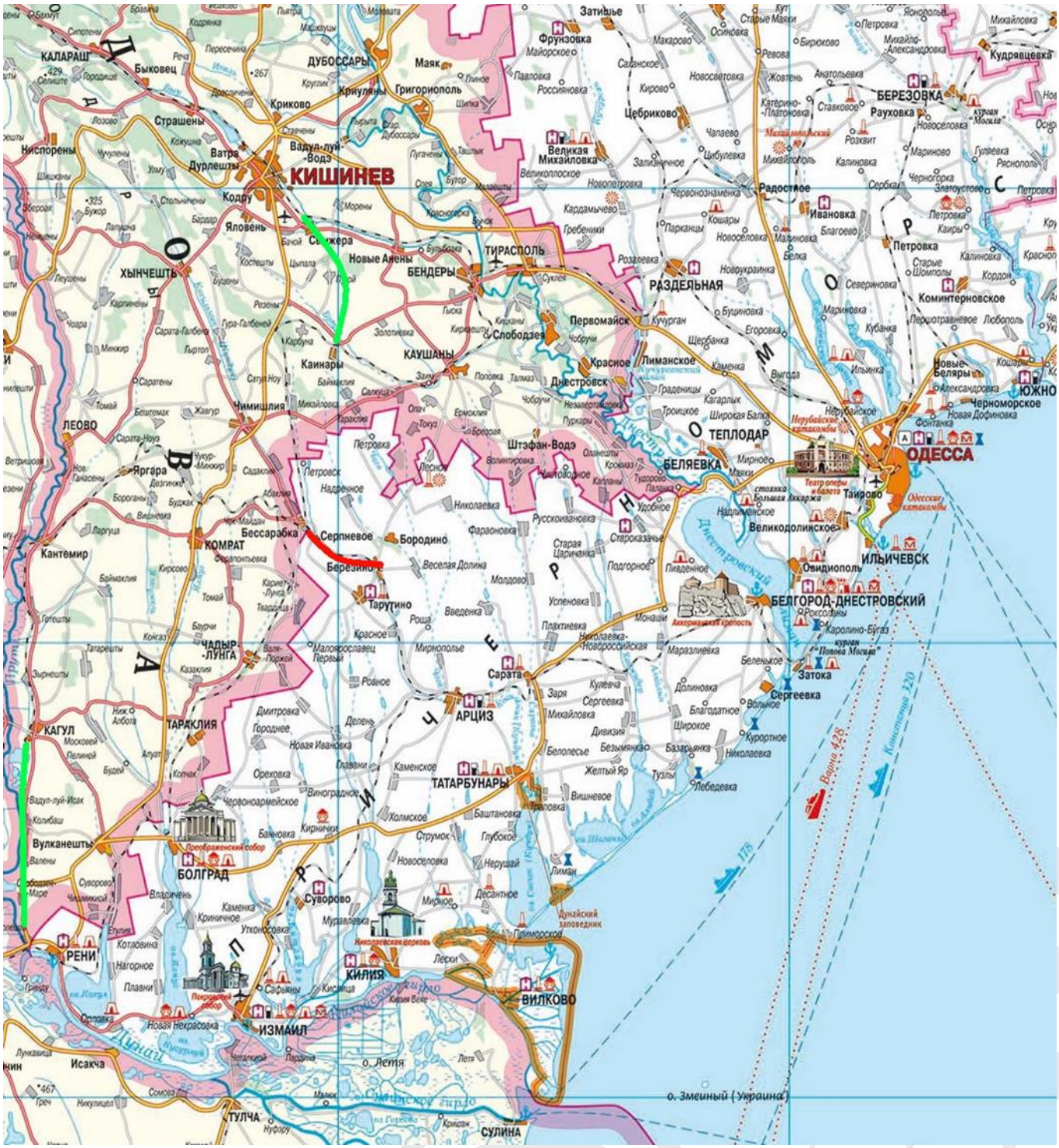


Figure 27. Map of railways of Moldova and Odessa region of Ukraine. (Green marks the new railway lines built by Moldova, Revaca-Cainara (2005) and Cahul-Giurgiulesti (2008)).

Roads of relevance for IWT

The connection of the Giurgiulesti International Free Port with the main cargo-forming centers of the country is carried out by the only road along which, due to its high bearing capacity, the movement of heavy vehicles is allowed: Giurgiulesti-Slobozia Mare-Vulcanesti-Comrat-Kisinau (Figure 27).

The international road M3 Giurgiulesti-Kishinev is an integral part of the national transport network. Its importance is strategically important for the development of the economy of the south of the country and for external relations with the Danube region.

Road section Kisinau – Giurgiulesti.

Before the opening of the port of Giurgiulesti, the section in question was not very much in demand for heavy vehicles, especially on the section: Vulcanesti-Slobozia Mare-Giurgiulesti. However, in recent years, due to a sharp decline in the competitiveness of the state-owned enterprise Railways of Moldova, the volume of road transport has increased significantly. Taking into account these trends, it is necessary to envisage an increase in the bearing capacity of the M3 road in the long-term plans for the development of transport infrastructure, and the planned projects for the rehabilitation of certain sections of the road should be revised.

There is only one alternative to the M3 section under consideration. This is the road of republican significance R34: Giurgiulesti-Cahul-Kantemir-Liova-Hîncesti-Kisinau (Figure 28).

But due to the difficult terrain and the large number of crossed settlements, it is significantly inferior to the M3 highway in many important criteria, including investment efficiency and environmental friendliness. As a result, most of the road rehabilitation and construction projects currently being implemented are related to M3.

Table 5: Cisinau-Giurgiulesti road section parameters

Category / Section	Parameter	Value	Unit
Expressway M3: Kishinev - Comrat - Giurgiulesti - border with Romania	Length	220	km
	Number of lanes (total, in both directions)	2	lanes
	Maximum speed allowed	90	km/h
	Axle load for trucks allowed	10	t/axle

Multi-modal container transportation to / from the Republic of Moldova is carried out mainly through the foreign ports of Ilyichevsk (Ukraine) or Constanta (Romania) or Giurgiulesti International Free Port.

Figure 28. Map of main roads of Moldova

Multimodal terminals outside of ports

Thus, at present, the Republic of Moldova has the only port with three modal terminals, specializing in container transport.

In the period (2016-2019) before the crisis years, TEU traffic through the port of Giurgiulesti was 8-9 thousand containers per year.

Transportation of containers from the ports of Odessa and Constanta, as a rule, is carried out by road transport directly to the consignee.

Delivery of containers to customers from the port of Giurgiulesti is carried out by road or rail.

Both transportation options face certain challenges.

In the case of road transport of containers, the problem is associated with high loads on the axle of the vehicle and the weak bearing capacity of the road in some sections. In this situation, it would be necessary to prohibit the transportation of containers by road and administratively oblige their transportation only by rail. However, the main

problem of the railway is an unreasonably large loss of time for transportation, as well as an unacceptable service for the client in terms of quality / cost.

From the port of Giurgiulesti, containers are transported along the railway line: Giurgiulesti-Reni-Etulia-Basarabeasca-Kisinau and further along the western or northern railway corridor to the destination station (Figure 29).

On the section of the southern railway corridor, which is directly connected to the Giurgiulesti International Free Port, it is strategically important for the normal functioning of the Basarabeasca junction station located on the border with the Republic of Ukraine. It is through the Basarabeasca station that it is possible to carry out a railway connection between Odessa and Kishinau with the capitals of the European countries of Romania and Bulgaria.

Figure 29: Junction railway station Basarabeasca

6.4 Identification of problems in the transport network and solutions to eliminate them.

Ports and intermodal terminals in ports

Giurgiulesti International Free Port is the only river port in the Republic of Moldova located on the Danube. On average, the port annually promotes international trade of Moldovan companies with more than 50 countries.

It is the only regional logistics hub on the border with the European Union with a 3-modular transport infrastructure, low costs and a unique tax and customs regime.

All these listed advantages create sufficient conditions for the development of a successful business in this Danube region with free access to the markets of Romania and Ukraine.

However, at the moment the material, technical and economic potential of the Giurgiulesti International Free Port has not been fully realized.

It is proposed to develop a project for the integrated development of the Giurgiulesti International Free Port until 2030. The project should include a SWOT analysis of the port's activities, legal and regulatory documents governing its activities, as well as the development of ways to improve the productivity and efficiency of the port.

Railways

In connection with the critical situation that has developed due to the decrease in the volume of freight traffic, the latest development programs of the state-owned enterprise "Moldovan Railway" must be revised.

In this situation, the investment should be aimed at increasing the competitiveness of the services provided by "Moldovan Railway". The strategic task for the state economy is the modernization of the central railway network and the preservation of the rolling stock.

The priority projects include the rehabilitation of railway tracks in the TENT-T direction, namely:

- central corridor: Chisinau-Ungheni;

- southern corridor: Chisinau-Tighina-Basarabesca-Etulia-Giurgiulesi.

These areas are the most in demand. They connect the main industrial and logistics centres.

Roads

An analysis of the national transport network shows that the Republic of Moldova has three main directions for joining TENT-T (Figure 31) with the flows of freight and passenger traffic that have been established in recent years:

1 - Northern Europe: Chisinau-Lvov-Krakow-Berlin and beyond;

2 - Western Europe: Chisinau-Iasi-Budapest-Venice and beyond;

3 - Southern Europe: Chisinau-Bucharest-Budapest-Ljubljana-Venice and beyond.

It should be noted that the national transport network fits quite well in the Black Sea Ring Highwag.

In the direction of Ukraine, transport flows have changed a lot over the past 10 years. There is a steady demand for freight and passenger transportation in the direction of:

1 - Kisinau -Odessa;

2 - Kisinau -Kyiv and beyond.

It is proposed to revise the central transport network as shown in Figure 32.

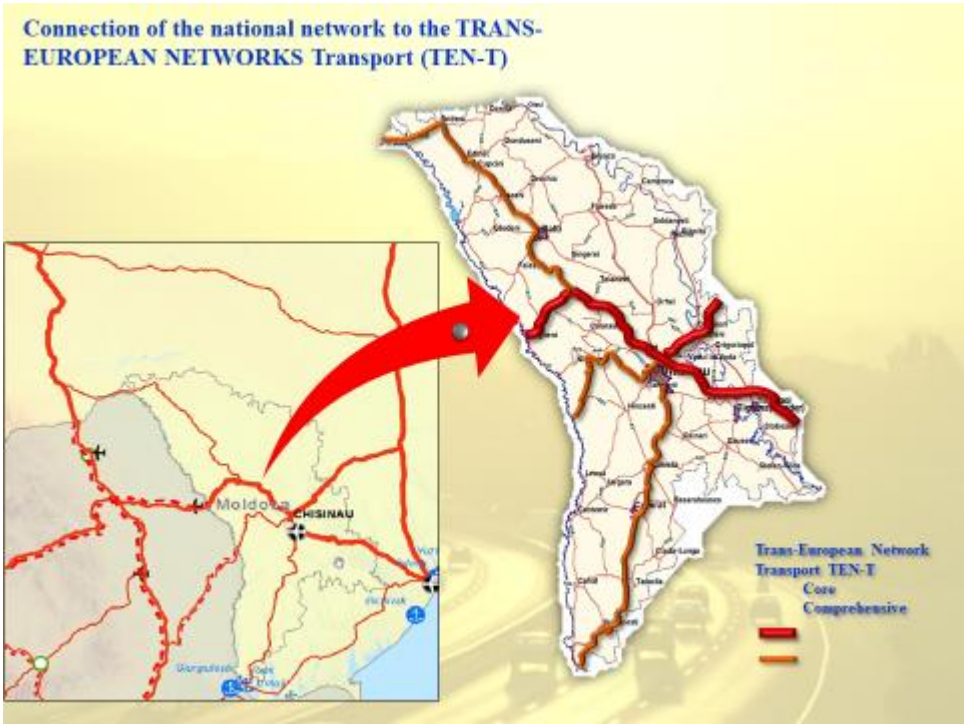


Figure 30. Connection of the national network to the TRANS-EUROPEAN NETWORKS Transport (TEN-T)

Figure 31. Revision proposals Connection of the national network

Inland waterways

Due to the current situation on the national market of transport services, the strategic documents defining the state policy practically do not pay attention to the development of inland waterways.

It is proposed to assess the potential for the development of navigation on the Prut River in the section Ungheni-Giurgiulesti port.

Summary of gaps and proposed solutions

Overview of identified gaps and proposed solutions is given in the table 6.

Table 6: Analysis of problem areas of the transport network and proposed solutions.

Mode	Gaps	Proposed solutions
Ports and intermodal terminals in ports	Lack of the strategic project for the development and raising of the potential of GIFP in current conditions on the transport services market.	It is proposed to develop a project for the integrated development of the Giurgiulesti International Free Port until 2030. The project should include a SWOT analysis of the port's activities, legal and regulatory document, as well as the development of ways to improve the productivity and efficiency of the port.
Railways	The development program of the state enterprise "Moldovan Railway" for the period 2018-2030 is elaborated based on the optimistic evaluation of the current economic situation	It is proposed to develop the business plan to raise the competitiveness of the LJG. Priority investment projects are to rehabilitate the railway lines in the Central and South corridors.
Roads	Elaboration of perspectives for the development of the basic national network based on the existing ones and not according to the transport demand	It is proposed to revise the central transport network as shown in Figure 13.6.b.
Inland waterways	Lack of strategic development plans of inland waterways.	It is proposed to assess the potential for the development of navigation on the Prut River in the section Ungheni-Giurgiulesti port.

6.5 Realization of Moldova and EU connectivity and integration projects.

In accordance with the association agreement between the European Union and the Republic of Moldova, the development projects of the national transport infrastructure are foreseen in order to integrate with TEN-T (Figure 32).

During the last years, several projects have been carried out that directly or tangentially contribute to the integration of the port of Giurgiulesti in TEN-T.

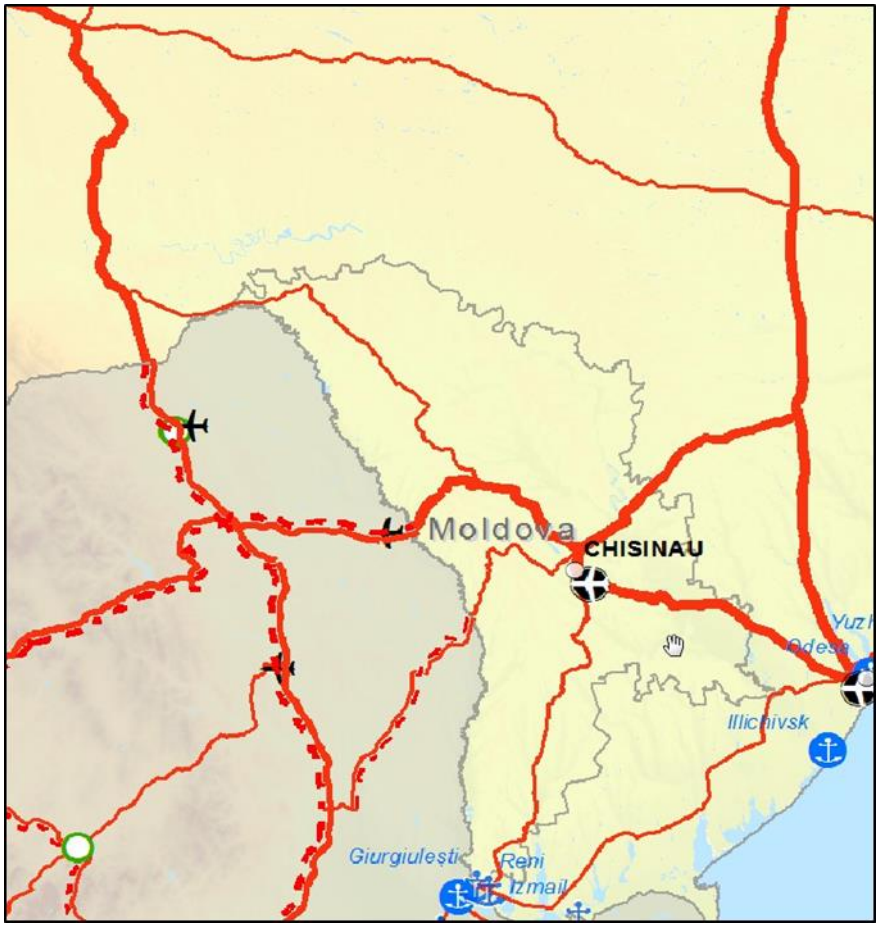


Figure 32. Connection of the national network to the TRANS-EUROPEAN NETWORKS Transport (TEN-T)

Ports – including intermodal terminals within ports

Port: Giurgiulesti International Free Port

Project category: Capacity improvement

Duration: 2018-2020

The total value of investments in the International Port, during its entire period of activity, according to the situation as of December 31, 2019, amounted to 72.8 million US dollars, of which 3 million 1.4 million US dollars are due to investments made during the period. management. In recent years, the annual increase in total investment is about 2%. The main investors for the development of port infrastructure are SCI "Danube Logistics" SRL and SC "Trans Cargo Terminal" SRL.

In order to increase the capacity for transhipments of river and sea vessels, the following facilities were modernized and built:

- terminal for general cargo and containers with railway traffic;

- railway terminal of mixed gauge for loading and unloading oil products, the line of Russia and Europe;

- electrical substation 110 kV and several substations 10 kV;

- platform scales and other works.

Every year the port administration carries out works on cleaning and deepening of the fairway.

The volume of investments for the period under review is 3.6 million dollars.

Railways

Currently, the state-owned enterprise Railways of Moldova is in a crisis state due to a strong decrease in traffic volumes. At the same time, the port of Giurgiulesti is one of the main cargo-generating enterprises for the railway. As a result, in the development program of the state enterprise "Moldovan Railway" for the period 2018-2031, priority attention is given to the project of rehabilitation of the railway infrastructure in the Southern corridor: Bender-Basarabeasca-Etulia-Giurgiulesti.

Railway section: Southern corridor: Bender-Basarabeasca-Etulia-Giurgiulesti.

Destination: Traction rolling stock

Project category: Capacity improvement

Duration: 2018-2020

During the examined period, the main investment project carried out by "Moldovan Railway" consists in the purchase of 12 new locomotives with a capacity of up to 3500 kW each. The volume of investments made under the EBRD agreement is 52.5 million euros.

The renewal of the locomotive fleet will allow the improvement of the process of transporting the goods from Giurgiulesti port.

Roads

In recent years, road transport has been the leader in the volume of freight transport. As a result, the main investments are made in road infrastructure. The purpose of the investments is to rehabilitate the roads and first of all those that are part of the central national network, ensure accessibility to logistics centres, including the port of Giurgiulesti (Figure 33).

As of 2020 there are the following projects:

- On-going roads rehabilitation and construction projects - 540 km. Estimated cost – 360 mils. euro;
- Ready for launch in 2020 (rehabilitation) - 460 km. Estimated cost - 330 mil. euro;
- Medium-term planned (stage I, FS & Design) - 850 km. Estimated costs of works – 730 mils. Euro.

The national central network provides direct connection to corridor 7 "Orient/East-Mediterranean" and corridor 9 "Rhine-Danube".

Figure 33. Core and comprehensive national network transport

Road section: RSP / W9 / 02: Construction of the M3 Porumbrei-Cimislia road, sector km 0 + 000 – km 19 + 010
Section length (km): 19,010
Project category: Connectivity and integration

Duration: 01.02.2019-31.02.2022
The amount of the contract is 29903744 euro. The project is financed under an agreement with the European Investment Bank.

At the moment, earthworks are being carried out, partial construction of bridges and footbridges. The main problem solved was the expropriation of land.
The M3 international road is the comprehensive part of TEN-T. Therefore, the realization of the project will raise the ability to cross the road especially for heavy vehicles and, of course, promote economic integration.
Road section: RSP / W9 / 03: Construction of the M3 road, bypassing Comrat, sector km 0 + 000 - km 18 + 263.

Section length (km): 18,263

Project category: Capacity improvement

Duration: 01.02.2019 - 31.01.2022

The amount of the contract is 29497220 euros. The project is financed under an agreement with the European Investment Bank.

Figure 34. Construction of the Comrat bypass road

The realization of the project will allow the unloading of the city of Comrat from transit traffic and, as a result, solving the problem of traffic jams and air pollution (Figure 34).

The essential Comrat ring road will increase the crossing capacity on the international route M3. The fact gives very current tests for the city of Comrat where in recent years several industrial enterprises, logistics centres and intensive development of the agricultural sector have opened.

Road section: RSP / W10 / 01: Rehabilitation of the M3 road Chisinau - Giurgiulesti, sector km 96 + 800 - km 171 + 290 and km 179 + 650 - km 190 + 750

Section length (km): 85,590

Project category: Connectivity and integration

Duration: 01.02.2019-31.01.2022

The amount of the contract is 29932874 euros. The investments are made due to the financial agreement with the European Bank for Reconstruction and Development.

The international route M3, being the comprehensive part of TEN-T, is in high demand. The flow of road traffic is quite high and especially of high capacity vehicles. The rehabilitation of the M3 road promotes the economic and social development as well as the integration of the Southern region of the Republic of Moldova in development projects of the Danube Region.

Road section: RSP / W9 / 05: Construction of the M3 road, bypassing the locality of Slobozia Mare, sector km 0 + 000 - km 18 + 290

Section length (km): 18,290

Project category: Capacity improvement

Duration: 27.05.2019 - 26.05.2022

The amount of the project is 18284399 euros.

The road sector examined is quite problematic (narrow) on the M3 route. At the moment, the road traffic of high capacity trucks is carried out through localities in quite complicated conditions. As a result, both villagers and drivers are dissatisfied. Giurgiulesti International Free Port is facing serious problems with large volumes of transport, including containers.

Therefore, the realization of the project will solve the problem of the inhabitants, will raise the capacity to cross the M3 route, as well as the competitiveness of the Giurgiulesti port.

Inland waterways

Due to the geographical and logistic characteristics of the national economy, inland waterway transport is poorly developed. The main features include:

- lack of demand in the domestic freight market for transportation in large volumes for small transportation;

- the need for large investments in river vessels and infrastructure, as well as a long payback period;

- problems related to navigation and others.

Due to the same features, over the past 10 years, the freight market belongs to 77% of road transport.

Giurgiulesti International Free Port occupies a special position in the freight and logistics services market. The advantages of the port are:

- this is the only port in the country with international status and access to the Black Sea;

- the port provides transport services for the transportation of “large volumes over long distances”;

- pricing policy with favorable tariffs for the client in comparison with other modes of transport.

Attractive investment projects for the development of inland waterways include:

- opening of navigation on the Prut river in the section of the city of Ungheni, port of Giurgiulesti for the carriage of goods;

- development of navigation on the Dniester river for tourist cruises.

Currently, in connection with the receipt by the Republic of Moldova, the status of a sea power, the project “Improving Flag State Control” is relevant.

IWW section: “Improving Flag State Control”

Project category: Traffic management and digitalization

Duration: 2020-2021

The aim of the project is to develop legal and regulatory documentation in accordance with international acts and practice, as well as its approval to regulate the activities of sea vessels, develop a methodology for calculating tariffs for services and others.

Railways

Railway section: Southern corridor: Bender-Basarabeasca-Etulia-Giurgiulesti.

Section length (km):

Project category: Capacity improvement

Duration: 2022-2025

From the list of projects planned by the "Moldovan Railway", the main one for the port of Giurgiulesti is the one related to the rehabilitation of the railway infrastructure within the Southern corridor. According to the development program, the typical approximate costs for the capital reconstruction of the railway infrastructure and railway systems (centralization and blocking systems and communications) constitute for the South Corridor - 75.7 million euros. The duration of the rehabilitation project is 4-5 years. The realization of the project can be essential to raise the level of competitiveness of the port of Giurgiulesti (Figure 35).

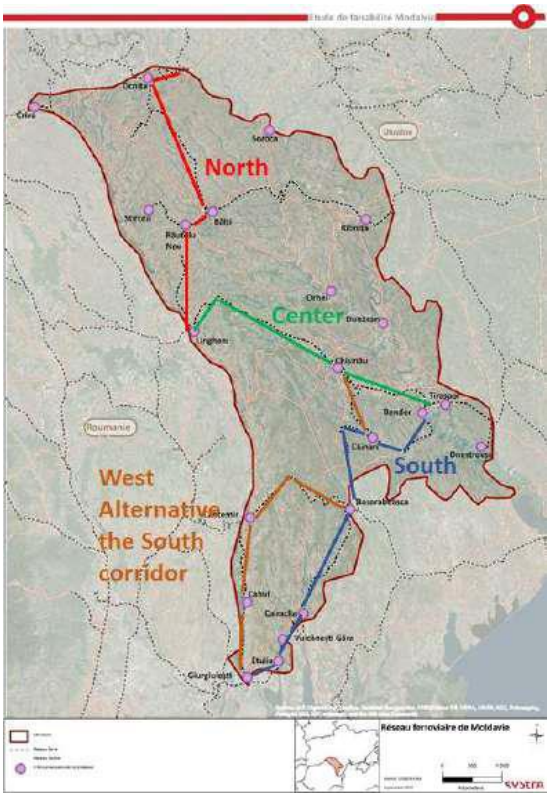


Figure 35. Rail corridors in the north, center and south

Roads

One of the planned and essential for the integration of the port Giurgiulesti into the national and European transport network is the construction of a bypass road around the city of Cimislia.

Road section: M3 bypass Cimislia (construction) TEN-T, km 0+000 – km 7+200

Section length (km): 7.200

Project category: Capacity improvement

Duration: 2021-2024

The estimated cost of the project is 11 million euros.

The realization of the essential project will raise the capacity to cross the international route. The problems of the city of Cimislia with the traffic of high capacity vehicles and the pollution of the environment will be solved.

Inland waterways

IWW section: DIONYSUS - Integrating Danube Region into Smart & Sustainable Multi-modal & Intermodal Transport Chains

Section length: Giurgiulesti - Ungheni

Project category: Connectivity and integration

Duration: 01.06. 2020 – 31.12.2022

It is known that the potential of freight traffic is highly dependent on the waterway, in particular on the conditions of the fairway.

Shallow water limits the efficiency of water transport due to increased operating costs and longer travel times.

Within the framework of the project, a comprehensive plan for the development and maintenance of the fairway on the Prut River is being developed.

A fairway maintenance plan will be developed for the navigable section of the Prut River (used by small vessels with a displacement of 200-300 tons), with particular attention to national needs and short-term measures to ensure the efficient and effective implementation of the harmonized waterway.

The port of Giurgiulesti has an excellent location for business development, it is located on the sea section of the Danube and can receive both inland and sea vessels.

Pilot studies of these respective ports should provide substantiated documents that can form the basis for investment decisions, consisting of specific development projects that have a real opportunity to be implemented until 2030.

7. Prut Fairway Maintenance Plan

7.1. The general characteristic of the Prut River

7.1.1. The Prut river basin

The hydrographic network of the Republic of Moldova is rich and varied (registering about 10 thousand hydrographic units, from rivers to ponds and springs), but at the same time it is unitary, because most rivers large and small are located geographically within a single general basin - the Black Sea.

The Prut river is the second as length hydrographic basin in Moldova. The surface of the Prut river basin occupies 27,540 km^2, river fall - 1,577 m, average slope - 1.63%, meandering coefficient 2.13.

It should be noted that, following modern modeling by GIS means, the surface of the river basin (in Romania and with the related areas on the territory of Ukraine and the Republic of Moldova) makes up a total area of 28,460.43 km^2.

The Prut originates on the eastern slope of Mount Hoverla, in the Carpathian Mountains in Ukraine (Ivano-Frankivsk Oblast) at 15 km to south-southeast of the village of Vorokhta, of the Chernogory massif of Forested Carpathian Mountains, and falls into the Danube River to the south of the village of Giurgiulesti, at a distance of about 164 km from the Danube mouth (Figure 37).

At first, the river flows to the north. Near Yaremche it turns to the northeast, and near Kolomyia to the south-east. Having reached the border between Moldova and Romania, it turns even more to the south-east, and then to the south. It eventually joins the Danube near Giurgiulesti, east of Galati and west of Reni.

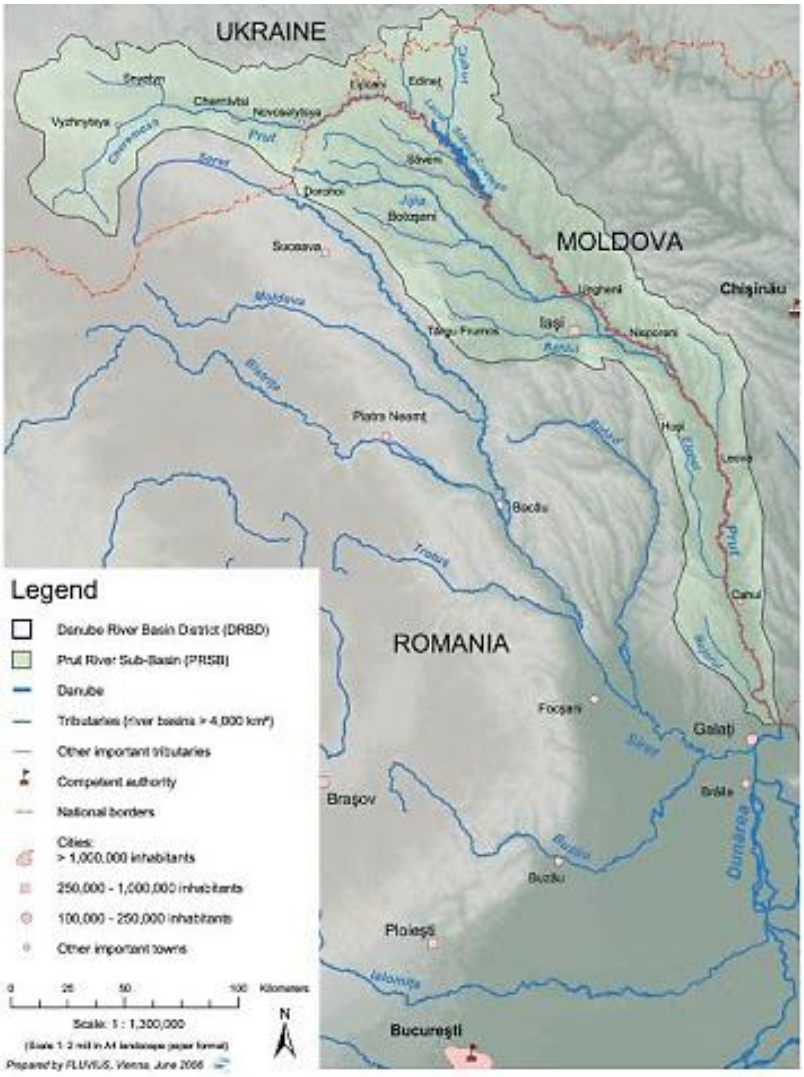
Between 1918 and 1939, the river was partly in Poland and partly in Greater Romania (România Mare). Prior to World War I, it served as a border between Romania and the Russian Empire. After World War II, the river once again demarcated a border, this time between Romania and the Soviet Union. Nowadays, for a length of 31 km, it forms the border between Romania and Ukraine, and for 711 km, it forms the border between Romania and Moldova. From its hydrographical basin 10,990 km^2 are in Romania and 7,790 km^2 in Moldova. The largest city along its banks is Chernivtsi, Ukraine.

The Costesti-Stinca Dam, operated jointly by Moldova and Romania, is built on the Prut. There is also a Hydro-Electric Station in Sniatyn, (Ukraine). Ships travel from the river's mouth to the port city of Leova (southern Moldova).

The lowermost part of the basin is strongly marshy. The average discharge at its mouth is 110 m^3/s (3,900 cu ft/s). The average discharge at the city of Leova is 69.2 m^3/s. The slope of the river varies from 100 m/km (near the source) to 0.05 m/km (near the mouth). In the upper reaches (to Delyatyn) it has a mountainous character, with a steep

right bank, sometimes the cross-sectional profile of the channel has the form of a ridge. Near the city of Yaremche is the waterfall of Probiy.

The basin of the Prut River, being a transboundary basin, is located in the territory of three countries: 28% in Moldova; 33% in Ukraine; and 39% in Romania. Within Moldova the length of the river is 695 km, i.e., 71.9% of its total length. The Prut basin comprises 41 small river basins; these rivers are longer than 15 km; of them 13 are first-order tributaries. The maximum altitude of the basin is 429.5 m; the minimum one is 2.6 m.



Source: http://www.apelemoldovei.gov.md/pageview.php?l=ro&idc=139

Figure 37: Prut River Basin overview map

7.1.2. Hydrological and meteorological factors

7.1.2.1. Water level regime

The Prut River Basin is characterized by a dense hydrographical network. The density of the river network is 0.94 km/km^2. The density of the network due primarily to two factors: a large dissection of relief and at the same time a significant amount of rainfall. Prut starts in the north-eastern slopes of the Carpathians at an altitude of 1750 m. On the surface of the Prut river basin on the territory of the Republic of Moldova there are about 1,100 reservoirs and accumulation lakes (the lakes are mainly in the lower course of the river). Throughout the basin, from the Carpathians to the Danube, the Prut collects the waters of over 800 rivers, streams and brooks, including 580 of them on the territory of the Republic of Moldova.

On the territory of our country, the Prut River has only left tributaries, among which are Racovat, Larga, Vilia, Lopatnic, Draghiste, Ciuhur, Camenca, Nirnova, Lapusna, Sirma, Sarata, Tigheci, Larga.

Thus, within the Prut river basin, 83 surface water bodies were delimited, with a total length of 2152 km. The average length of river-water bodies is 26 km and only one body of water has a length exceeding 100 km, the average surface of river-basin basins is 99 km^2, 55 they have an area of less than 100 km^2.

Within the Prut river basin from the territorial limits of the Republic of Moldova are located 7 bodies of water-lakes. One of them (the ponds of the Cahul fish farm) has been identified as artificial water body.

Table 7: Parameters of water bodies lakes

Lake	Position	Origin	Type	Surface, m^2	Depth, m
Costesti-Stinca	Riverbed	WBL	Water storage	42,56	>15
Badelnic	River meadow	Natural	Natural lake	1,443	3-15
Dracele	River meadow	Natural	Natural lake	2,774	3-15
Rotunda	River meadow	Natural	Natural lake	2,329	3-15
Beleu	River meadow	Natural	Natural lake	8,538	3-15
Antonesti	River meadow	Natural	Natural lake	0,986	3-15
Cahul	River meadow	Artificial	Water storage	12,597	3-15

Source:
https://ieg.asm.md/sites/default/files/RO_MoldPlan_Prut_MD_final_Red_13.05.2016%20%28vb.17.05.2016%29.pdf

The maximum depth of the river Prut varies between 6-8 meters in the river meadow or near lakes and at the mount to Danube and 3 meters on average.

In the lower part of the river, after the embankment of the riverbed, the levels increased, reaching higher values. Thus, until the dam, the high flood levels were 490-500 cm per hour. Ungheni, 410-430 cm at or. Leova, and after damming 500-530 cm and 400-520 cm respectively.

High levels are also observed during the high spring waters. The increase of levels takes place very intensively (up to 4 m/day in 1901 in Yeremcea). As a rule, the level increases of high spring waters on the sector in the Republic of Moldova fall within the limits of 0.5-2.5 m above the average.

7.1.2.2. Water flow

The average annual volume of drainage of the Prut River is equal to 2.7 km^3 and varies from 1.2 km^3 in years with insufficient humidity up to 5 km^3, values obtained in the years with the high provision of water resources. The average annual flow is equal to 78 - 94 m^3/s, the fluctuations vary between 40 and 162 m^3/s.

The surface water resources in the Danube-Black Sea basin are quite modest. The region accounts for only about 1% of the country's total available surface water resources. The increase of water levels usually starts in mid-late March due to snow melting in the mountains, or fallout rain and sets the beginning of river floods in the Carpathians. Flood takes place in several waves, particularly during warming and often complicated or aggravated by rain. The highest spring flood are observed on small rivers usually in the second or third week of March. Maximum spring flood not always has the highest annual level, most of all the highest level is a level of rain floods. The intensity of spring flood level rise depends mainly on the water content in snow.

On the territory of the Republic of Moldova, the river has an average multiannual flow of 83.2 m^3/s (at Ungheni). The annual flow of the Prut from the source to the discharge is 2.9 km^3 of water. The volume of the leakage (annual leakage norm) and its variability are: at the village of Corpaci - 82.0 m^3/s and 234 mm, the coefficient of variation - 0.33; at the mouth - 92.0 m^3/s and 108 mm, the coefficient of variation - 0.37.

The duration of floods is much shorter than that of large spring waters. On the Prut River their general duration is 13-25 days, with an increase period of 4-8 days and a decrease of 9-17 days. The duration of spring flood is 1.5 -2 months (table 8).

Table 8: Typical water flow on the network of hydro-meteorological service

Prut river	Pre-flood flow, m^3/s	Maximum flood rate, m^3/s	Growth duration, days	Duration of the decrease, days	Total duration, days
Corpaci	86	994	4	0	13
Ungheni	100	450	6	13	18
Leova	118	297	8	17	25

Source: https://plural.upsc.md/wp-content/uploads/2016/03/04-Vlad-Mischevca.pdf

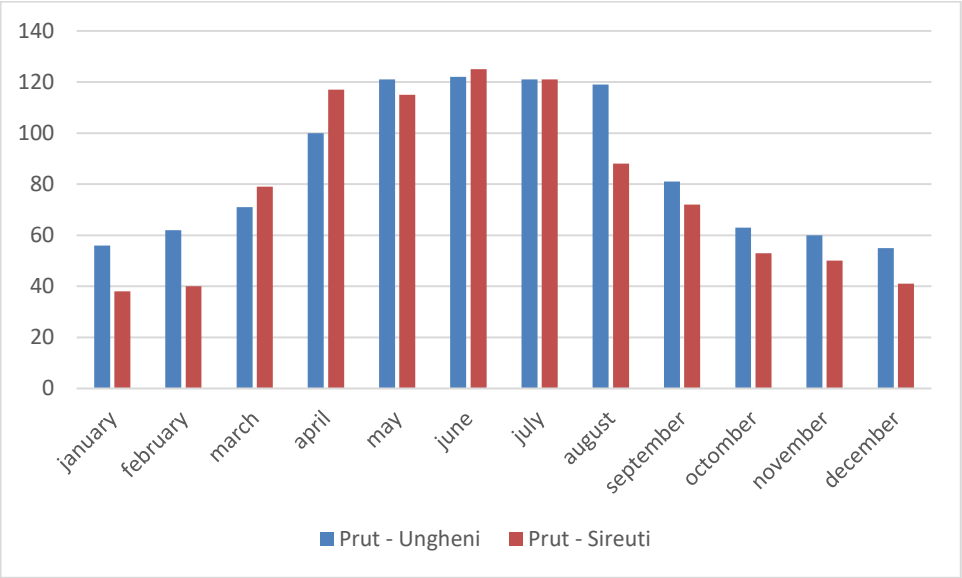
During the period of run off between June and August, which is the lowest, the waters of the Prut cannot be used for water supply (partly due to water consumption and retention in ponds), which is why they have been recorded for the last 50 years. years of hydrometric activities the characteristic values of the minimum average flows with the values for the characteristic insurances. Thus, according to the latest summaries, the minimum insured flow, after the commissioning of all accumulations, is at least 35 m^3/s on the Prut at Ungheni.

In the Prut basin, during the winter, the minimum runoff is influenced by strong frost phenomena (frosts or snow). The great spring waters begin in the first days of March and end in the middle of the third decade of April. The intensity of the level increase is on average 20-24 cm/day.

The summer rain floods usually begin after the spring flood. Their maxima usually exceed the spring flood level at 0.5 - 1.5 m. Incessant autumn rains cause considerable level rise, sometimes reaching 2-3 m (table 9, figure 38). Reducing the level lasts until August - September and reaches the lowest value at the end of September - October. Floods can be from 5-8 times to 10-12 times and more in some years. Is observed increase in autumn, which lasts for winter. In autumn can be very high and even catastrophic floods. Winter regime of levels is characterized by instability due to frequent thaws. The water level rises to 1.0 - 1.5 m, and sometimes by 2.0 - 3.5 m compared with the period before the flood.

Table 9: Typical values of water flow at the hydrological stations located in Prut river basin

Discharge characteristics (m^3/s)			Gauging station	Period of time
Q_{av}	Q_{max}	Q_{min}		
81-105	658-755	1,8-22,2	Sireuti, Ungheni	1950-2010



Source: http://www.meteo.md/images/uploads/Hydro/anuar_2019.pdf

Figure 38: Monthly distribution of average flows

The typical maximum annual runoff modules for the Carpathian rivers are 20 - 30 l/s km^2. The modern exogenous geodynamic processes in river valleys of Prut basin are: water erosion from heavy rain and lateral erosion of slopes, on slopes - natural denudation and erosion, complicated in some treeless areas, landslides, avalanches, screes and quick sand. As a result of these processes in rivers and streams many diverse-grained materials are transported by waterways. The solid of suspended sediment can be dominant. The largest part of the solid runoff of mountain rivers is associated with mud flow.

7.1.2.3. Deformation of the riverbed

The Prut river basin located in the eastern part of Romania (Romanian sector), is a contact basin between the Moldavian Plateau, in Romania, in the west and the Podolic Plateau, on the territory of the Republic of Moldova, in the east. The evolution and geographical aspects are related to those of the Moldavian Plateau, some authors considering this unit a subdivision of this plateau.

In this aspect, the Prut basin overlaps on three structural units: The Moldavian Platform (up to the Falciu-Plopana fault); the Barlad Platform (between the Falciu-Plopana and Adjud-Oancea faults); the Covurluiului Platform. Each one of them presenting a base with corrugated formations covered by a quilt, with monoclinal arranged formations.

The relief is presented as a set of extensive interfluves with the appearance of bridges, hills and hills separated by wide valleys, carved in the monoclinal sedimentary cover.

The general inclination of the relief, to the south – southeast, in the same sense as the orientation of the more important valleys, reflects an obvious adaptation to the structure. The monoclinal structure favored the appearance of positive forms and subsequent valleys.

The main steps required in morphology have values of 300-500 m in the northwest, 300-400 m in the central part, 150-200 m in the northeast and south and have a relatively balanced distribution. Altitudes above 500 m are low and isolated. The lowest elevations are found along the Prut corridor (130 m at Oroftina, 32 m near Ungheni and less than 15 m towards the confluence).

Mountain rivers are characterized by not deep valleys with steep slopes. River valleys are located across mountain ranges. The river valleys are mostly narrow, often with steep slopes and bluff. River valleys are expanding only in areas of soft outputs Oligocene rocks, forming a round or oblong canyon. These mountain rivers differ from lowland rivers in which landscape and geo-botanical terms are throughout more or less the same (azonal). The depth of the valleys in the foothills is 150 - 250 m and in the mountains it is 600 - 800 m. The slope is usually 60 - 70 m/km in the upper and 5 - 10 m/km in the lower parts of stream. The beds of the rivers are not deep. The width of the bed is mostly 3 - 5 m, in the upper part of the river it is 10 - 12 m and in the mouth part 80 - 100 m. The river beds have usually one river horn and covered of pebbles. The downstream parts of rivers usually have many river horns.

The upper part of Prut River is a typical mountain river, relatively small, with steep slopes, with boulders and pebbles as sediments. In this upstream section, the river flows through a deep valley, which resembles in canyons at times. The section is largely forested. Trees are often observed as debris in the water stream, especially at bridges. The river course is primarily flowing from south-west to north-east. At the town of Yaremche, the river forms the cascading waterfall of Probiy. The position and geographical configuration of the river on the territory of Moldova determine a remarkable diversity of geological structure, geomorphological characteristics and climatic conditions. The specificity of these environmental components significantly determines the characteristics of the biota, soils, hydrological and hydro chemical characteristics of groundwater and surface water (figure 3). The average value of the absolute altitude of the rayon landscape is 142 m, a typical value for the low regions.

On the territory of Moldova, the course of the Prut River can be conventionally divided into several sectors, described below.

I. Lipcani-Costesti

The river valley is winding, up to the village of Dumeni in the shape of a Latin V, downstream - in the shape of a crate; the width varies from 0.8 km (Sirauti village) to 9 km (Costesti town), predominates 2-4 km. The slopes are concave, steep, sometimes vertical, with meadow vegetation, often with hints of mother rock, sometimes convex,

slow and moderately steep, capitalized (arable land). In the villages of Sirauti, Pereryta, Bogdanesti, they are covered with alder sub-trees and forest blackberries.

The meadow is observed only at the meanders of the river, with lengths of 0.5-2.0 km and Width from 120 m to 2.7 km. It is intersected by numerous streams, covered with shrubs, made of sandy clays.

The riverbed is very winding, branched. The islands, which are present sandy islands with lengths of 150-250 m, width of 30-80 m and which rise above the water by 0.5-2.5 m, being covered by shrubs. Sandbanks are frequent, every 2-3 km there are ridges with a length of 100-150 m, depth of 0.5-0.7 m, water flow speed - 0.8-1.3 m / s. In the places of confluence with other courses, injection cones are formed.

The predominant width of the river is 69-90 m, maximum - 140 m. Average depth 1-2 m, maximum - 5.3 m, minimum - in fords - 0.3 m. Water speed varies from 0.2 to 1.3 m / s. Remains of drowned trees are often found in the riverbed.

The riverbed is irregular, with sand and pebbles, at the edges - pebbles and rocky gravel.

The banks predominantly merge with the slopes of the valley and only on some small sectors they reach the height from 1.5 to 6.0-8.0 m, they are steep, eroded, covered with shrubs, made of clayey sands.

On this sector is located the Costesti-Stinca accumulation lake, the hydro technical node being put into operation in 1978. The dam is built at 576 km from the mouth of the Prut river.

The total volume of the accumulation lake is 1285 million. m^2, active volume - 450 mln. m^3.

The reservoir is used for irrigation, flood mitigation, hydropower, water supply for various uses, fish farming and less recreation.

II. Costesti - the confluence with Jijia district

The valley is weakly winding, box-shaped, with an average width of 6-9 km, maximum - 11 km (Costuleni village), minimum - 5.5 km (Chetris village). As the downstream distance decreases, the height of the slopes increases from 70-100 m to 120-160 m. The slopes are dismembered, concave (downstream of Sculeni village the left slope is convex), steep and very steep, covered with steppe vegetation, capitalized in agriculture. Landslides, particularly intense downstream of Macaresti village, are frequent throughout the sector. On some sectors there are terraces with a width of 0.5-2.0 km, with steep steps, even vertical, with a height of 8-12 km.

The meadow is bilateral, consistent on both banks, with a width of 3-6 km, at the junction with the Jijia river meadow it widens up to 8 km. The surface is irregular, the sector afferent to the riverbed is a little high, forested or covered with shrubs, the

central part and from the foot of the slopes of the valley - lowered. The meadow is predominantly pointed, interspersed with numerous stables up to 30 m wide and up to 2 m deep. Some depressions are swampy, covered with reeds and shrubs. It consists of sandy clays and clayey sands.

The riverbed is very winding, unstable, often breaking the banks at the meanders. In 1955 the narrow isthmus from Taxobeni village was blown up and as a result the length of the river was shortened by 5 km. Frequent islands with a length of 50-150 m, width of 10-15 m, height of 1.5-2.5 m, are of alluvial origin, covered with shrubs. The largest island is located 2.7 km upstream of Bisericani village and has a length of 800 m, a width of 150 m. There are often sandbanks, many islets; the branches of the river, which bypass the islands, are 10-40 m wide. The dominant width of the river is 50-80 m, maximum - 140 m (at the beginning of the sector), minimum - 28 m (Braniste village). The depths are of the order of 0.8-2.5 m, maximum - 7.1; the velocities of the watercourse vary within the limits of 0.4-0.7 m / s.

In 1970, 0.5 km upstream of Barboieni village, a landslide created a natural ridge with a length of 150 m, the water speed here is 2.5 m / s. The bed of the riverbed is irregular, sandy, rarely with pebbles.

The banks are steep, with a height of 3-5 m, eroded, consisting of clayey and sandy-clayey rocks, in the softer places - sand and pebbles. The coastal sector is forested.

III. Confluence with Jijia district - Stoianovca village

The river valley is a little winding, in the shape of a crate, with a width of 7.0-8.5 km, in the village of Tochile-Raducani it widens up to 11 km, in the village of Leuseni it narrows up to 5.2 km. The slopes are steep and very steep, concave (the left ones in many convex places), with a height of 100-140 m, at Toceni village - 180 m. Between the villages Poganesti and Sarata-Razesi on the left side there is strong erosive activity of the ravens. Landslides are observed every 3-4 km. The slopes are plowed or covered with steppe vegetation.

The riverbed is bilateral, up to the village of Poganesti, more expressed on the left bank, dammed, it shows, downstream more pronounced on the right bank, with some dammed sectors. Downstream of Sarata-Razesi village, in the meadow there are small lakes and swampy lands, on the coastal strip the forest is replaced by shrubs. The meadow consists of sandy clays and clayey sands.

The riverbed is very winding, without branches; at low water levels, muddy sandbanks appear every 2-5 km. The predominant width of the river is 50-70 m, 2 km downstream of the Sarata river outlet - 120 m. The depths vary from 0.7 to 7.3 m; 3-5 m predominates. The speed of the watercourse does not exceed 0, 6 m / s.

The banks are steep, with a height of 3-4 m, the mother rocks rarely appear in daylight, they are forested.

The bed of the riverbed is irregular, sandy and sandy-muddy.

IV. Stoianovca - confluence with the Danube river

The valley is a little winding, box-shaped, with a width of 5.0-8.5 km, towards the mouth of the river it widens up to 12 km. The slopes are concave, with a height of 80-120 m, steep and very steep, practically everywhere very dismembered by ravines and ravines, in the village of Brinza the left slope is almost vertical. The predominant right slope is plowed, the left one covered with steppe vegetation. Between Falciu and Rinzesti, on the right side, at Zirnesti village and town. Cahul on the left side, the terraces with a width of 1.0-1.5 km, with steep steps and a width of 6-12 m are well expressed. The slopes and terraces are predominantly made of clay rocks.

The meadow is bilateral, consecutive on both banks, with a width of 5-7 km. Downstream of Valeni village, it widens up to 8.2 km. In the sector between the villages of Stoianovca and Crihana Veche, Vadul-lui-Isac and Brinza on the left bank and Oancea and Sivita on the right bank, it is drained by drainage channels, dammed, it shows. In the rest of the sectors the meadow is swampy, with many lakes with a length of 1.0-2.5 km and a width of 0.5-1.0 km. The largest is Lake Brates located in the sector related to the mouth, on the territory of Romania; its length is 12 km, width - 7 km, maximum depth - 5.1 km, surface - 72 ha. The meadow consists of sandy clays and clayey sands.

The riverbed is winding, especially in the sector of Cucoara village - Slobozia-Prut village. Branch branches are not observed. It has a width of 60-80 m, maximum - 104 m, near the village of Crihana. The depths are 2-4 m, maximum 15 m (2 km upstream of Zirnesti village). The speed of the watercourse varies between 0.4-0.6 m / s, maximum - 1.0 m / s (s. Crihana).

The bed of the riverbed is sandy-muddy, irregular.

The banks of the river are very steep, even vertical, with a height of 1-2 m, in many places they merge with the slopes, they are forested.

Source: https://media.springernature.com/lw685/springer-static/

Figure 39: Evaluation and terrain of the Prut River Basin

7.1.2.4. Seasonal factors

The territory of the Prut River Basin is characterized by a temperate continental climate. In some years there are dry periods, which have a significant effect on the flow and hydrological regime of rivers of the Prut River Basin. The basic regularity of annual precipitation is their decrease with distance from the mountains.

There is an irregularity of rainfall in time. It so happens that one-month annual norm falls half, and on some day monthly rainfall. This defines the flood regime of the river and the formation of floods. In the Prut RB there are observations during 1990-2013 that showed a change in average monthly and average annual air temperature in comparison with the standard climatic norm. Over the past 24 years the average annual temperature has increased by 0,2-1,9 °C. The largest increase in air temperature was observed during the winter months (January, February). In the summer months (July, August) temperature has increased by an average of 0,7-1,9 °C.

In the long cycle for the years 1990-2019 the average long-term rainfall in the PRB compared to the standard, increased from 9 to 93 mm, except for the meteorological station Sireuti, where long-term average rainfall has decreased by 23 mm. The highest rainfall was recorded in 1998, 2001, 2007, 2008, 2010 (exceeding the norm ranged within 280-450 mm). It was formed the catastrophic floods during these years. Rainfall that exceeds the norm in most cases falls on the month of March, June, August and November. The "wet" years have also months of precipitation significantly lower than normal. This is usually for months April, May and August.

Ice phenomena – another seasonal factor- usually begin with ice on the shore, the fall of autumn ice lasting 3-6 days, often ice generally does not form. At ridges and rapids, for a period of 1-1.5 weeks, ice caps are kept, which contribute to the formation of bottom ice. The ice bridge is formed by increasing the ice surface on the shores, merging it, most often in late December - early January. The river often does not freeze, with only ice on the shore (winters from 1947-1948, 1654-1955, etc.). In the case of long-lasting monks, the succession of the ice bridge with the thawing of the river and the drainage of the rivers are observed, and in some years even the complete release of the ice river.

Duration of ice phenomena in the Ungheni and Leova are on average 40 days, maximum - 132 days (in winter 1908-1909); minimum - no ice.

The surface of the ice is predominantly smooth, due to frequent thaws - with an average thickness of 10-25 cm, maximum, reached at the end of February, 50-60 cm (winters from 1964-1965, 1953-1954). The clearing of the ice river takes place at the beginning of March and begins with the melting of the ice on the banks. Drainage of ice floes takes 1-3 days.

The average turbidity of the water – also a seasonal factor – increases in the direction of the river: in Yaremcea it is 180 g / m3, in Chernivtsi - 420 g / m3, in Ungheni - 750 g / m3. In 1969 with the highest leakage of suspended alluvium, the average annual turbidity in Chernivtsi was 3100 g / m3, in Corpaci - 1000 g / m3. Very high turbidity is observed during the passage of intensive rain floods. An example is the flood of June 1965, when the degree of saturation with suspended alluvium at Ungheni was 12,000 g / m3.

The river carries a maximum amount of suspended alluvium during high spring waters (45-50%) and summer floods (35-45%). In some years, the flow of alluvium in the summer can exceed that in the spring. Thus, at Yaremcea, in 1969, only in June the alluvial runoff constituted 94% of the annual amount. In dry years up to 70-80% of the annual alluvial runoff is formed in the spring-winter period. The number of days in the year with increased turbidity, as well as the concentration of suspended alluvium, increases from the source to the mouth of the river. In 1965 a turbidity higher than 500 g / m3 in the city of Yaremcea was maintained for 4 days, in Chernivtsi - 57 days, in Ungheni - 105 days, in Leova - 121 days.

7.1.3. Hydro construction

Within the Prut River Basin in the Republic of Moldova, there is only one Hydroelectric Power Station (HPS) located near the city of Costesti, 576 km away from the source of the Prut River. It was built on the Prut River in collaboration with Romania in 1978 and put into operation in 1979. Costesti-Stinca HPS was built to regulate the flow of floods and produce electricity, as well as to provide agriculture and industry with water resources. Electricity production is evenly distributed between the Republic of Moldova and Romania.

7.2. Navigation on the Prut River on the Giurgiulești-Ungheni segment

7.2.1. The history of river navigation

During the reign of Alexandru Ypsilanti in Moldova (1786-1788) there was talk of "the construction of a navigable canal that will pass through Iasi", with the intention that Siret be connected to the Prut for navigability. The idea was officially resumed in the Organic Regulations (1832). The chapter on the Roads provided for the navigability of some rivers in the Principality of Moldova, including the Prut and the Siret, including their union through the Bahlui River: “The Siret and the Prut ... needs to be cleaned and made more skillful for floating or making communication channels through the Bahlui river, which would also be very useful for the capital's trade”.

The set of hydro technical works of strategic importance in water management began to take shape in the second half of the 17th century. Political and economic problems have delayed their realization. Only in 1785 was a large-scale scheme designed to solve the problem of navigation between the Baltic Sea and the Black Sea by connecting the Vistula with the Dniester, through the Breast and an artificial canal with a length of about 6.4 km. Further through a set of works, the Dniester would be connected with the Prut.

In the Middle Ages, the Prut was permanently navigable, and after 1856 the activity of the Moldavian fleet intensified, but only from 1870 can we speak of an organized navigation. The Convention concluded in Bucharest, on 3 (15) December 1866, between the Governments of Austria, Romania and Russia, entitled "Stipulations on Navigation on the Prut", was the founding act of the Joint Commission of the Prut.

The Convention provided for the freedom of navigation on the Prut for ships under all flags and the obligation for them and their crews to comply with the rules of navigation established by the "stipulations". Article 7 provided for the establishment of a Standing Joint Commission, composed of delegates from Russia, Austria and the United Principalities.

In 1859, in the act of the Union, there was an article stipulating that in order to give up the position of the capital in Iasi “the navigable Prut will be made and it will be connected with Iasi, which will acquire the status of city porto-franco”.

In 1933, Professor Andreescu Cale presented a well-founded scheme - with solid technical and economic arguments - which, in addition to solving the navigability of the Prut, Bahlui and Bahluiet, proposed solutions for flood protection, water resources and capitalization of hydropower potential.

The first attempt to remove impediments for the river navigation took place only in 1968. It is important to mention that the initiative belonged to the Russians, who, after obtaining Romania's consent, began to clean the Prut riverbed over an appreciable

distance, in two stages, first from the Danube to Ungheni, then upstream, to the Hydrotechnical Node from Costesti-Stinca. Also during that period, the Russians began research on the navigable potential of this river.

Everything was interrupted in 1973, when there was a large landslide on the left bank, more precisely at kilometer 337. The Bucharest authorities have been involved, since 1970, in their own hydro technical studies, concluding that the ships, even those with a capacity of 1,000 tons, could rise to almost the northeast of the country, until the accumulation from Costesti-Stinca.

If downstream only the maintenance of the riverbed was needed, by dredging, upstream locks should have been built, so that the vessels could cope with the difference in level between the various areas crossed by the river.

In 1977, the Romanians and the Russians agreed on the idea of restoring navigation on the Prut, and a Hydrotechnical Convention was signed between the two states. All sorts of studies and discussions followed, but by 1989 nothing concrete had been done.

Following the geopolitical changes that characterized the area, through a 1995 agreement, Bucharest was given the task of drafting a Convention between Romania and the Republic of Moldova. A project is also being made related to the organization of the future Prut Navigation Administration. Two research expeditions took place, in 1992 and 1993, to see the state of the riverbed. Two studies are recorded, the first in connection with "the possibility of reactivating Romanian naval transports on the Prut River", and the next on "the pre-feasibility of resuming navigation on the Prut". The latest study was approved by the Technical-Economic Council of the Ministry of Transport.

7.2.2. Legal aspects of cross-border cooperation

In general, aspects of cross-border cooperation are governed by Moldovan-European legislation, namely:

- REGULATION (EU) 2021/1060 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 June 2021 laying down common provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund, the Fair Transition Fund and the European Maritime Fund, Fisheries and aquaculture and the establishment of financial rules applicable to these funds, as well as the Asylum, Migration and Integration Fund, the Internal Security Fund and the Financial Support Instrument for Border Management and Visa Policy;
- REGULATION (EU) 2021/1058 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 June 2021 on the European Regional Development Fund and the Cohesion Fund;
- REGULATION (EU) 2021/1059 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 June 2021 on specific provisions for the European Territorial Cooperation

(Interreg) objective supported by the European Regional Development Fund and the external financing instruments;

- REGULATION (EU) 2021/947 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 June 2021 establishing the Instrument for Neighborhood, Development Cooperation and International Cooperation - "Global Europe", amending and repealing Decision No 466/2014 / EU of the European Parliament and of the Council and repealing Regulation (EU) 2017/1601 of the European Parliament and of the Council and Regulation (EC, Euratom) No 1605/2002 480/2009 of the Council.

These also include aspects of cooperation for the development of the Prut river basin region. In a narrow sense, we refer to the EU's neighborhood policies, more specifically to the application of these policies by the Romanian side.

In terms of cross-border cooperation on the Prut River, it is interesting to discuss the possibilities for euro development in the regions including the Prut River. Here we should mention the collaborations with the Romanian side that cover quite large areas; in Romania - Botosani, Iasi, Vaslui, Galati counties, also the upstream Prut counties, and in the Republic of Moldova - the entire Prut river basin. The objective of cross-border cooperation in this regard is the following: Improving accessibility in regions, developing transport and common transport networks and systems with the main priority: Development of cross-border transport infrastructure and ICT infrastructure. This objective led to the formation of three Euro regions - "Lower Danube", "Upper Prut", as well as the Romanian Euro region "Siret-Prut-Nistru". Thus, over 70% of the territory and 60% of the population of the Republic of Moldova are part of the Euro regional framework of Moldovan-Romanian cooperation. For this reason, in the context of achieving the goal of integration into the European Union, for the Republic of Moldova the intensification of cross-border cooperation with Romania is beneficial and necessary.

Although the benefits of cross-border cooperation are well known, cross-border cooperation initiatives between the Republic of Moldova and Romania are still sporadic and are limited to individual and local initiatives rather than consistent policies. After almost 25 years of activity of the Moldovan-Romanian Euro regions (the Lower Danube Euro region was created on August 14, 1998) we can see that the evolutions of cross-border cooperation on this segment of the European border remain modest. Effective cooperation has been and remains permanently blocked by a lack of political will on the part of the central authorities on both sides of the Prut and a host of other objective and subjective factors.

The Upper Prut Euro region is an administrative structure for cross-border cooperation between Romania, the Republic of Moldova and Ukraine, materialized in the form of a Euro region. The current constituents of the "Upper Prut" Euro region are the Chernivtsi and Ivano-Frankivsk region of Ukraine, Botosani and Suceava counties in Romania, Balti municipality and Briceni, Edinet, Riscani, Glodeni, Falesti, Singerei, Donduseni, Ocnita districts of the Republic of Moldova.

The motive for its creation is both the interest of the European Union to get involved in its own border area, located in the vicinity of areas of instability, and that of the participating states. Thus, if the Romanian state is interested in institutionalizing support for a significant minority outside its own borders, the Ukrainian state is interested in recognizing the borders inherited from the Soviet Union and establishing gates for European integration, and the Moldovan one is interested in improving its security prospects, development and anchoring in an international cooperation mechanism. The Upper Prut Euro region, which has a role to play in promoting economic stability and preventing possible ethnic conflicts, differs from the Western European Euro regions. These differences are due to the emphasis on education, science and culture and in particular on the protection of national minorities across borders, as well as the creation of opportunities to help address ethnic issues in the area.

Following the agreement which laid the foundations of the Euro region on 22 September 2000, its development has led to the initiation of cultural and social exchanges as well as the implementation of cooperation projects on economic development, infrastructure and environmental protection. However, this development has not been without difficulties, controversy and syncope.

The difficulties were related to the sometimes ambiguous framework of the basic treaty between Romania and Ukraine, the economic situation of the component countries, the differences between the various national systems, the excessive administrative centralism, and the territorial architecture that included additional regions in order to avoid the predominance of a certain national specificity. In addition, the change in the character of the Romanian border into the eastern border of the European Union has increased the difficulty of creating an integrated system of cross-border space. Added to this were the controversies over the distribution of European money between states, as well as the different capacities to carry out cross-border cooperation projects or the lack of development of major projects.

For the time being, this Euro region is not a self-sustaining structure.

The aim of the "Siret-Prut-Dniester" Euro region Association is to expand and improve relations between communities and local authorities in the economic, educational, cultural, scientific and sports fields and to ensure a sustainable development of the region in the context of alignment with European standards.

The association also aims to respect, defend and guarantee the rights and interests of the territorial administrative unit members of the Siret - Prut - Dniester Euro region, being a non-governmental organization, with full structural, organizational and functional autonomy from any political and apolitical, governmental or non-governmental in the country or abroad.

The "Siret-Prut-Dniester" Euro Region Association has the following objectives:

- transforming borders from dividing lines instead of communicating between neighbors;
- overcoming mutual prejudices and divergences between people in the Euro region;
- overcoming psychological barriers through permanent information exchanges as premises of understanding and trust;
- consolidating democracy and developing territorial administrative units;
- overcoming the national peripheral position and isolation;
- stimulating economic growth and development and improving the standard of living;
- rapid assimilation and, respectively, an approach to the ideal of European integration;
- consulting, assistance and coordination of cross-border cooperation;
- the continuous improvement of the transport and communications infrastructure in and between the border regions, which lays the foundations for long-term cross-border cooperation and for new economic activities;
- diversification of activities in rural areas to prevent population migration and increase the number of commuters across the border;
- qualitative improvement of human resources;
- development of strategic cross-border agricultural marketing concepts, waste recycling, tourism and regional development;
- adopting cross-border urban and rural development policies;
- preservation of cultural heritage;
- solving everyday border problems and creating new crossing points.

Members of the Siret-Prut-Dniester Euro Region Association: Iasi, Prahova and Vaslui counties in Romania, Anenii Noi, Basarabeasca, Calarasi, Causeni, Cimislia, Criuleni, Drochia, Dubasari, Falesti, Floresti, Glodeni, Hincesti, Orhei, Rezina, Riscani, Soroca, Straseni, Soldanesti, Stefan Voda, Telenesti, Ungheni and Balti, Moldova.

The Lower Danube Euro Region Cross-Border Cooperation Association has as founding members Galati County Council, Tulcea Council and Braila County Council in Romania, Cahul District Council and Cantemir District Council in Moldova, Odessa Regional Council, Odessa Regional State Administration and Reni District Council from Ukraine.

The Lower Danube Euro Region operates under the Convention signed on August 14, 1998. It represents a partnership between Romania, through Tulcea, Braila and Galati counties, the Republic of Moldova, through the districts of Cahul and Cantemir and Ukraine, through the Odessa Regional Council.

Conceptual notes on the financing of projects within the Romania-Ukraine and Romania-Moldova Cross-Border Cooperation Program were submitted within this Cooperation Association. The members of this Euro region will also work together to implement projects funded under the Black Sea Cross-Border Cooperation Program.

In the past in terms of cross-border cooperation, the Moldovan authorities have included the Prut River in the following agreements and programs:

- AGREEMENT between the Government of the Republic of Moldova and the Government of Romania on cooperation for the protection and sustainable use of Prut and Danube waters;
- PROTOCOL of the 3rd meeting of the group of experts from the Republic of Moldova and Ukraine on the issues of protection and use of living aquatic resources in border watersheds;
- JOINT OPERATIONAL PROGRAM of the Black Sea 2007-2013;
- JOINT ROMANIA-UKRAINE-MOLDOVA OPERATIONAL PROGRAM. The Romania-Ukraine-Moldova Joint Operational Program was one of the European Union's ENPI financing instruments, which was to be implemented at the external borders of the enlarged Europe in the period 2007-2013.

7.2.3. Current navigation situation

Republic of Moldova has two free flow inland waterways (rivers Nistru and Prut) which are in accordance with the European Agreement on main domestic shipping routes of international importance, done at Geneva on 19 January 1996 (Decision Parliament nr.1431/24.12.97 ratifying the European Agreement on main domestic shipping routes of international importance, Official Gazette 5/17, 01.22.1998), classified as routes of international importance.

I. E 80-07 - River Prut, the estuary up to Ungheni (407.0 km);

II. E 90-03 - Dniester River from Belgorod-Dnestrovsk port (Ukraine) to the port of Bender (228 km).

In 2005, in the agreement was concluded between Moldova and Romania on navigation on inland waterways of the Republic of Moldova and Romania. In 2006 bilateral agreement was concluded between the Government and the Cabinet of Ministers of Ukraine on navigation on inland waterways of Moldova and Ukraine, which allows Moldovan economic agents operating ships, to exploit the inland waterways of Ukraine and Romania.

Inland waterways of the Republic of Moldova is possible to transport goods through gaskets made of pusher craft and barges to load capacity to 600 tons on the river Prut.

Giurgiulesti Port Complex development creates prerequisites for the development of his part of the Prut river, which is a tributary of the Danube, for the transportation of goods transshipped from ships into the river, and goods transported directly through the inland waterway transport.

Given available to the Government for rehabilitation works of inland waterways of the Republic of Moldova and Moldova's internal needs (making construction and rehabilitation of national roads) was necessary use the Prut for transportation via inland waterway transport, directly in Romania in the first stage of dragging until Cahul. Prut use for direct transportation via inland waterway transport is due to the fact that domestic shipping is the most economical advantageous and environmentally gentle.

In order to restore navigation on the river Prut (the first stage up to Cahul) no major investments are needed. At the moment Giurgiulesti - Cahul are five thresholds that need to be removed. The estimated cost of these works is - 5.00 million lei. Material extracted from specified thresholds can be used in construction; mines FAP will cost to maintain the navigable channel. Also use Prut for transporting goods from port Giurgiulesti will wear demine roads and will save some funds for repairing and maintaining roads considerable. Fairway maintenance will flood risk to communities and agricultural land adjacent rivers, diminishing damage compensation costs incurred by the state budget (about 500 million USD for 2008 and 2010).

Noted that in areas adjacent Prut existing infrastructure works allows loading / unloading without making any investment. Given the above, low cost investment in inland waterways restoration, fairway maintenance, repair current low cost means for performing floating and transporting cargo and expenditure compared to investments in infrastructure and other transport equipment show attractiveness and the need to develop inland waterway transport.

Navigation on the Prut River was resumed in June 2012 on the Cahul Giurgiulesti section, when a barge with 600 tons of gravel reached Cahul from the port of Constanta. In 2012, the Ungheni river port invested about 800 thousand lei to clean the Prut riverbed on the Cahul - Cantemir segment over a distance of 70 km. The port of Giurgiulesti has the capacity to receive ships with a length of up to 120 meters. The area has, among others, an oil terminal, another for cereals, but also spaces for passenger ships.

7.2.4. Infrastructure for river navigation

7.2.4.1. Ports

The navigational system of the Republic of Moldova includes 2 ports of international importance:

I. P 80-62 - Giurgiulesti port (133 km) as the port complex under construction on the Danube;

II. P 90 - 03 - 02 - port Bender (228.0 km) on the river Nistru.

Another port on the Prut river, but still of local importance is Ungheni River Port, and is specialized in freight/goods transportation in vessels up to 600 tones capacity.

In the last 15 years, there has been a significant increase in economic and naval infrastructure in the Giurgiulesti Port Complex, located in the extreme south of the Republic of Moldova. The Giurgiulesti port complex is the only port in Moldova that offers direct access to international waterways and the Black Sea, which serves as a favorable point for entry and exit of goods into/from Moldova. Located less than a kilometer from the border with Romania/EU and the border with Ukraine, the port of Giurgiulesti is located at the crossroads of several international trade routes between EU countries and Eastern European states, states in the Baltic Sea and Black Sea region. The distance from Giurgiulesti to Chisinau is 223 km, to Galati - 10 km, Bucharest - 247 km, Lviv - 776 km, Kiev - 686 km, Minsk - 1,238 and Moscow - 1,532 km. At the regional level, the Port of Giurgiulesti is positioned as a logistics center on the border with the European Union, with access to car, rail, river and maritime communication routes.

7.2.4.2. Mooring

On the Prut River, with the exception of the ports indicated above, there are undeveloped quays located upstream of the Giurgiulesti port complex and at Leova. These quays are without capital engineering constructions. The Naval Agency of the Republic of Moldova actually calls them temporary quays. The quays on Prut can serve as moorings for cargo ships.

7.2.4.3. Bridges

Today, on Prut there are nine bridges, of which six are roads: Lipcani-Radauti Prut; Costesti-Stinca; Sculeni-Sculeni; Leuseni-Albita; Cahul-Oancea; Giurgiulesti-Galati; and three railways: Ungheni-Iasi; Stoianovca-Falciu and Giurgiulesti-Galati. However, no train has been running at Stoianovca-Falciu for more than four years.

7.2.4.4. Problematic places

Inland waterway transport is often hampered by the presence of problematic places. These problematic places can be formed by: bridges; fairway; locks; missing links on the river. Bridges and fairway may cause impediments for navigation on the Prut River. Thus, the bridges built downstream of Ungheni which falls into this category of impediments are at: Leuseni-Albita; Cahul-Oancea; Giurgiulesti-Galati; Stoianovca-Falciu and Giurgiulesti-Galati. The ones from Giurgiulesti are not problematic, because they are already sailing there. The others can be problematic if the navigable channel after digging and cleaning will allow the access of ships with a tonnage of over 600 tons or with bigger dimensions. So bridges at the moment are not a major problem for river navigation on the Prut. But the Prut's waterway is a problem, because the depth, the width of the river in places where the Prut has narrow bends or river meanders do not allow the navigation of heavy or big sized barges. Such places where the meanders constitute potential problems for navigation we can see near Ungheni, Macaresti, Barboieni, Balauresti, Leuseni, Poganesti, Sarata Razesi, Leova. In the listed places another problem other than small angle meanders are the small width of the river.

These problematic places limit the dimensions and loading capacities of ships, so it is required a careful selection of the ships that will be allowed to navigate.

7.2.5. Prospects for the development of navigation on the Prut River

Speaking about the prospects for the development of navigation on the Prut, we mention the complex process of cooperation between the Republic of Moldova and Romania regarding the sustainable use of aquatic resources on the Prut and the Danube.

The Republic of Moldova and Romania continue to cooperate on the sustainable use of water resources in the Prut and Danube. Thus, the Governments of both parties are continuously updating the policies and instruments regarding the implementation of the Moldovan-Romanian Agreement on cooperation for the protection and sustainable use of the Prut and Danube waters. The document was signed in Chisinau in 2010.

The purpose of updating the policies in the field is determined by the need for the protection and sustainable use of water resources, the operation of the Costesti-Stinca Hydro Technical Node on the Prut River, as well as the application of other provisions of the Agreement.

The new sessions of the Intergovernmental Hydro Technical Commission on the territory of the Republic of Moldova will also be initiated.

Another Moldovan-Romanian agreement that would affect the use of the Prut River is the Agreement between the Government of the Republic of Moldova and the Government of Romania on technical, financial, legal and organizational issues regarding the consolidation of the border road bridge between the two states, over the Prut River between Giurgiulesti (Republic of Moldova) and Galati (Romania), signed in Chisinau on February 11, 2022. A new round of negotiations and discussions that took place in December 2021, contributed to the final form of this agreement.

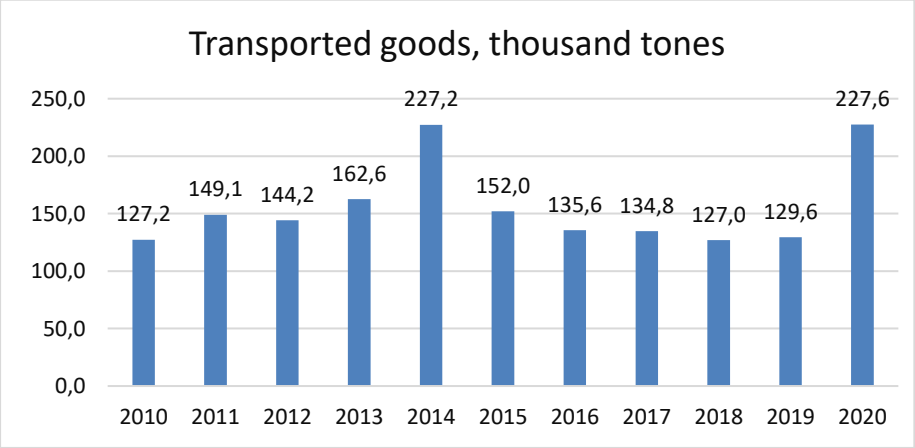
The purpose of the Agreement is to ensure the consolidation of the border road bridge, which will interconnect the road infrastructure between the two states on the alignment of the following roads: on the territory of the Republic of Moldova the national road M3 Chisinau - Comrat - Giurgiulesti - Romanian border and on Romania, DN2B. The draft Agreement includes regulations on the signatory parts of the Agreement, definitions, type of consolidation works, traffic flow measures, environmental protection, the establishment of a Joint Commission to coordinate all activities related to the consolidation of the objective, its entry into force, its amendment and its termination. The level of the Agreement is intergovernmental.

7.2.5.1. Evaluation of transport structure and volumes

The structure of inland waterway transport is characterized by low descriptive parameters. Bulk construction materials such as gravel, pebbles, sand are most often transported on inland waterways. Another category of transported goods are cereals that are grown in the country and intended for export through the port of Giurgiulesti or for storage in other places than where they are grown.

The volume of goods transported by inland waterways is represented in the figure below (figure 40).

The information presented contains data on domestic shipping throughout the country. From the analyzed data we see an increase in 2020 of the volume of transported goods, which proves that the internal naval transport acquires a certain



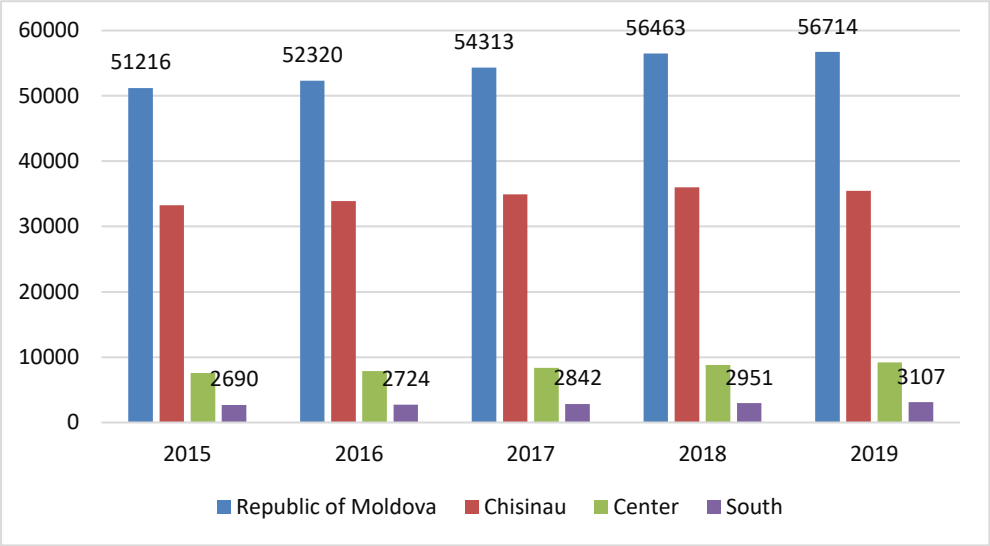
popularity among the economic agents.

Source: adopted data from https://statbank.statistica.md/

Figure 40: The evolution of freight transport by inland waterways

7.2.5.2. Evaluation of shippers and consignees

Currently, the shippers and consignees of goods transported on the Prut River include a small number of local and foreign economic agents, so it is advisable to study potential customers of river transport services on the Prut.

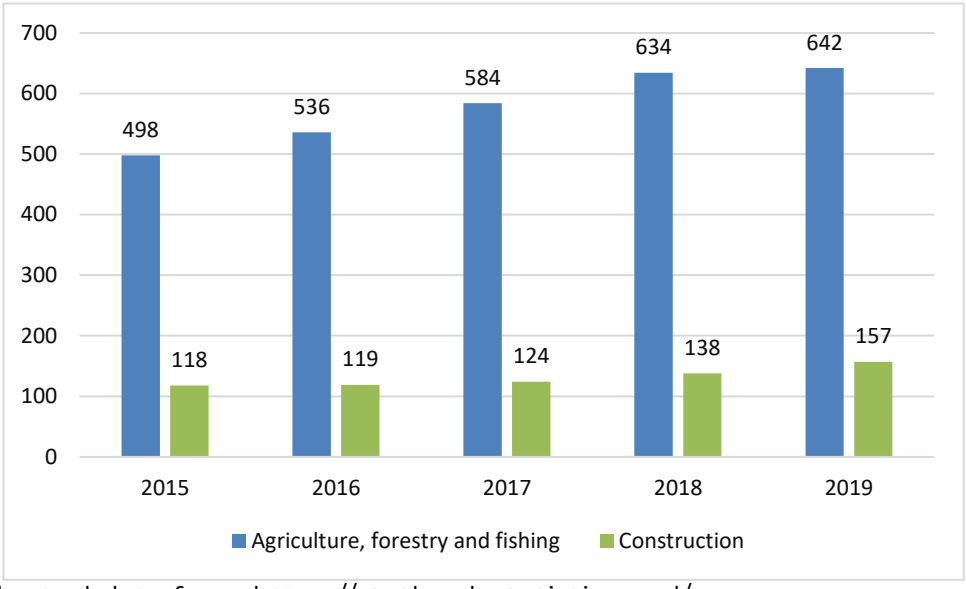


Source: adopted data from https://statbank.statistica.md/

Figure 41: Comparison of the total number of enterprises by regions of interest (2015-2019)

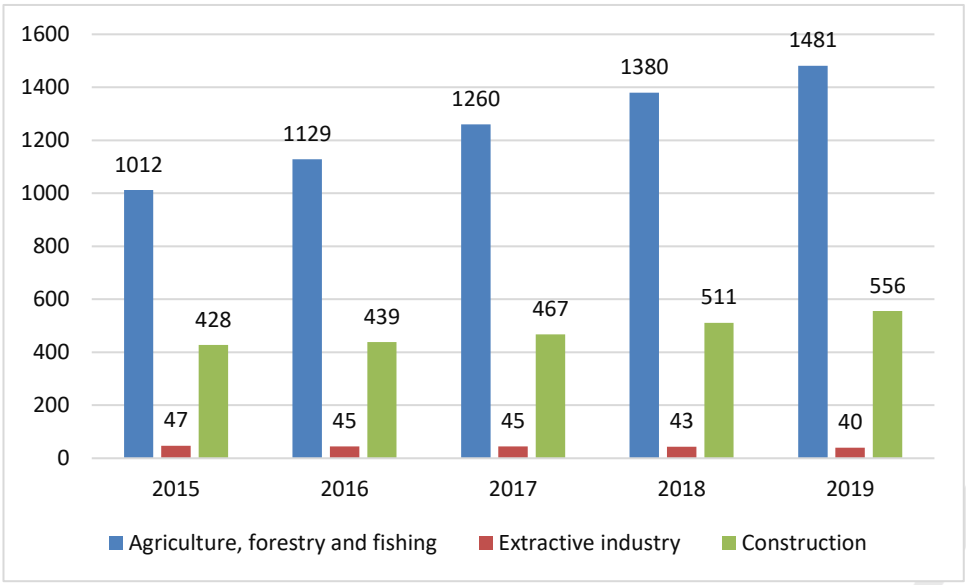
Thus, the comparative study by country and by region of the total number of economic agents becomes interesting (figure 41), after which we will indicate the data regarding the number of enterprises on economic activities related to Prut navigation activities and carrying out their activity either in the southern region, or in the center of the country (figure 42, figure 43).

The fields of activity of interest in the present study are: agriculture, constructions and extractive industry.



Source: adopted data from https://statbank.statistica.md/

Figure 42: Comparison of the total number of enterprises by fields of activity in southern region of the Republic of Moldova (2015-2019)



Source: adopted data from https://statbank.statistica.md/

Figure 43: Comparison of the total number of enterprises by fields of activity in center region of the Republic of Moldova (2015-2019)

As we can see from the information presented, the southern region has a small number of economic agents compared to the central region. So measures will be needed to attract not only businesses in the south, but also to work with those in the center. Also in Figure 6 we did not indicate the enterprises in the extractive industry, as their number varies from 1 to 3, which is irrelevant. We must also note that the local economic agents in the region have a modest purchasing power, which should also

lead us to foreign economic agents that have trade relations with the southern or central region of the country.

7.2.5.3. Characteristic of river transport service operators

The main carrier (and the only one nowadays) on the Prut River is the State Enterprise PORTUL FLUVIAL UNGHENI, which was founded in 1993. The founder of the company is the PUBLIC PROPERTY AGENCY. The company operates activities related to Ungheni River Port and Giurgiulesti Port. This undertaking provides freight transport services between the shippers and the consignees of the goods. The clients of the enterprise are the construction enterprises from the region, the enterprises dealing with the trade of construction materials, enterprises dealing with the cultivation and marketing of cereals from the southern part of the Republic of Moldova.

The company registers from 2018 losses in the balance sheets, in 2017 registering a profit of about 45 thousand lei (Financial Statements of the enterprise published on the website of the Public Property Agency http://www.app.gov.md/intreprinderi-de- stat-3-378). That is why it is necessary to implement strategies to attract and create a group of stable customers that would bring income to the company. The target group of customers to focus marketing policies could be those identified in the previous chapter.

If another river transport service operator appears on the Prut River, they have all the chances to occupy or attract a larger number of customers given the same marketing policy focused on creating a loyal customer base.

7.2.5.4. Projects for the development of navigation on the Prut River

Inland river transport is a ubiquitous component of economic development and environmental protection strategies developed and implemented by the ministries of resort of the Republic of Moldova. It is also present in strategies for integrating national policies into the European spectrum of environmental or socio-economic policies.

In the Second National Communication of the Republic of Moldova prepared by the Ministry of Ecology and Natural Resources under the United Nations Convention on Climate Change from 2009 one of the objectives is to identify and implement measures to attenuate greenhouse gas emissions. In this sense, inland river transport comes as a solution in the country's transport sector. Thus, this document proposes the rearrangement of internal waterways and the improvement of their operating parameters. One of the results of this communication was the elaboration of the Prut River Basin Management Plan which refers to the permanent monitoring works of the Prut River Basin, with emphasis on the water quality of the Prut River, the possibilities of navigation and their ecological impact.

We must mention that most of the European projects involving the Prut River and its basin, aimed at knowing the ecological impact of economic activities on the river water

and less the development of navigation on the Prut. It did not become a special priority until after 2008.

Previously, the efforts of the country's leading authorities regarding the renewal of navigation on the Prut were outlined in Decision no. 453 of 24.03.2008 regarding the approval of the Concept of the development of naval transport in the Republic of Moldova. This concept aims to develop river transport on the Prut from the south of the country to Ungheni.

7.2.6. Technical characteristics of the Prut River

Based on the performed study on the Prut River, can be formulated the following characteristics regarding the technical aspect in the table below.

Table 10: Prut River characteristics

Characteristics	Upper course	Middle course	Lower course
River channel	The river starts in the Carpathians mountains and has a narrow channel and a small depth.	It has a broad valley, which is between the upper and the middle course's shape.	The river has wide channel at the mouth of the Danube, which is also deep about 6-8 m.
Force/strength and speed of the water	The water is slow, as there is low force is it.	The current is fast, but the land is not as steep so it is slower and has less force downwards, but more horizontal.	The current goes slowly as the amount of water is greater and the force in it is greater too.
Amount of water	There is little water as it only comes from the source of the river.	There is more water than in the upper course as there tributaries which give water to the river.	There is a lot of water as more tributaries have joined, but some of the water might have been used for irrigation.
Amount of sediment in the water	There is little sediment as the river has not picked up much sediment in this area.	The river starts to get sediment from the banks, which makes erosion and deposition by and of these happen.	There is a certain amount of sediment, which is left behind forming dams, they were cleaned after drainage works.
Shape of the river	The shape of the river is approximately linear with some meanders near the middle course.	The river changes its course a lot because of the meanders on its way.	The river has many meanders as it has little force to erode its way downwards.

Characteristics of the Prut river would help us to choose technical parameters for the inland water transportation. Here we decide the dimension of the vessels and the structure of the fleet.

Before determining the dimensions of pushed and towed river trains we must delimit the possible cases of the realization of the internal water transport. There are two basic possibilities in the case of the Prut River - intermodal transport when the cargo unit is transshipped from one means of transport to another and multimodal or single transport with the actual transshipment of goods from one means of transport to another, or moving gods from quays to the ship.

The first way is most often done with the use of containers as loading units.

The second way is efficient in the case of transporting construction materials, grain, goods that are currently transported on the Prut, or generalized palletized or packaged goods.

In inland transport there are several different loading units whose dimensions and other typical characteristics differ in dependence to the kind of loading units for which they are constructed. This is why an integration of IWT is not a simple decision of just changing a mode within a transport chain. There have to be some prerequisites of changing a single transport into an intermodal transport.

Intermodal transport with IWT, which is the first way indicated below, competes with single road transport. Suitable loading units therefore have to be harmonized with road trailers, they should have the same dimensions to get the maximum of pallets in it, as this is the efficiency criterion in here. But they also must be stackable and need metal fittings for top lifting. According to experts, the 45 feet pallet-wide containers that are also used in short sea shipping are adequate to fulfil these prerequisites.

To involve IWT in logistic chains there are also concepts to carry trailers and swap bodies on barges. In some cases, for example in combination with container transport, this may be an added value to shippers if vessels do not have maximum load. But normally a carriage of those boxes would be far from cost-covering as trailers and swap bodies are neither stackable nor do they have the right dimensions with regard to the optimal use of vessel capacity. Also some questions arise of standardization and the implementation of a new generation of trailers and swap bodies in inland transport; such questions strongly depend on broad acceptance by shippers, forwarders and logistic providers.

To conclude, intermodal transport with IWT first of all needs intermodal loading units that are suitable to this mode. That means a choice of intermodal transport must precede a decision upon the relevant transport mode(s) on the part of the shipper or the forwarder.

Another question is how regular would be the transportation in future, whether or not it will have a transportation schedule. There are several examples of scheduled services

in IWT which show that this could be an efficient market sector if certain conditions are respected on the quantity of goods transported. Different load factors in upstream and downstream operations must not always be a precondition, as transport on the Rhine clearly demonstrates: Two thirds of tonnage moves upstream whereas only one third moves downstream.

7.2.7. Maximum dimensions and structures of pushed and towed river trains

The technical and organizational parameters of the ships in operation are decisive factors concerning the competitiveness of inland water transportation. They refer to both intermodal and single transport competition. Above all, competitiveness is determined by the costs, which are influenced by various parameters like those listed in the following:

- size and ship's capacity utilization ratio;
- draught or draught restrictions, respectively;
- ship technology, equipment, age and condition of the ship;
- flag, i.e. registration of the ship;
- operator structure (independent ship owner or shipping line);
- operation modus, e.g. operation time of 14-, 18- or 24 hours;
- crew structure (number, qualification and nationality of the crewmembers).

There exist a variety of classification methods for floating objects used in inland navigation.

Among others the most distinctive are:

1. According to the area of navigation:

- River (canal) ships;
- River-sea vessels (sea-going vessels properly equipped also for the operation in inland waterways);
- Lakers (vessels designed and built to cope with specific conditions on the lake where they operate).

2. According to the dedicated purpose:

- Commercial vessels including:

✓ Cargo ships;

✓ Passenger ships for daily excursions or for cruising (equipped with cabins);

- Technical floating objects (push boats, tugs, dredgers, floating cranes, floating docks, workboats etc.);

- Pleasure crafts (motor or sailing yachts and boats, water bikes, wind surfing-boards etc.);
- Special ships (police, customs, survey, fire-fighting ships, icebreakers, military vessels, supply ships etc.).

3. According to the installed machinery (self-propelled and non-self-propelled vessels);

4. According to the kind of propulsion;

5. According to the floating regime when running;

6. According to the hull configuration (conventional monohulls, twin-hulls, trimarans).

However, there exist plenty of other classifications based as for example on: material of the hull, structural and hydrodynamic particulars, type of the prime mover (engine), kind of commodity to be transported or type of service to be provided.

The classification used here is adopted on the base of the purposes assigned to the vessels, and thereby the most attention was paid to river cargo vessels and barges.

Self-propelled river ships

The majority of inland navigation ship types are standardized in their main dimensions (however within certain tolerances). The lists and basic considerations on most typical sizes for self-propelled cargo ships and pushed barges including approximate tonnage capacities are given beneath. These vessel types/sizes have had peculiar developments within the politically and on many spots also physically divided network. Since the end of the cold war and especially after the opening of the Main-Danube Canal and the Danube confluence (South-East Corridor) joining the integrated European waterway network a number of these vessels have free access to other corridors too.

The variety of vessel sizes is caused by both the market requirements and the area of navigation. Larger shipment sizes, stable markets and favorable nautical conditions along the route – in inland navigation that practically means wide and deep rivers and canals with high bridges – set up general prerequisites for the operation of larger ships. But on the other side, larger ships cannot operate on smaller waterways if draught, width or air draft restrictions are excelled. That leaves an opportunity and need for a reasonable share of also smaller vessels in the fleet (Source: Prospects of Inland Navigation within the Enlarged Europe).

In Europe, there are around 10,000 inland vessels in Rhine countries, and more than 3,000 vessels in Danube countries. In Rhine countries, 72% of all vessels are dry cargo vessels (self-propelled units or dumb barges). Tanker vessels account for 15% and push & tug boats for 13%. 75.4% of all 3,214 vessels in the Danube fleet are dry cargo vessels (self- & no propelled). 18.3% are push or tug boats and 6.3% are liquid cargo vessels (self- & non-propelled). The total loading capacity of the Danube fleet amounts to 3.4 million tons, of which 93% is dry cargo tonnage and only 7% liquid cargo tonnage.

Table 11: Standard sizes of self-propelled river ships in Europe

Vessel type	Dimensions (LxB)	Tonnage capacity at a draught of				
		1,50m	2,00m	2,50m	2,80m	3,50m
Large river motor ship	110,00m x 11,40m	600 t	1200 t	1800 t	2100 t	3000 t
Europe ship	85,00m x 9,50m	570 t	930 t	1350 t		
Johann Welker	80,00m x 8,20m	600 t	940 t	1280 t		
Gustav Koenig's (extended)	80,00m x 8,20m	500 t	800 t	1100 t		
Gustav Koenig's	67,00m x 8,20m	420 t	670 t	1000 t		
Kempner	50,00m x 6,60m	400 t	600 t	650 t		
Peniche	38,50m x 5,00m	250 t	300 t	400 t		
BM-500	56,50m x 7,60m	415 t	475 t			

Source: Prospects of Inland Navigation within the Enlarged Europe

There is another crucial aspect: the utilization of carrying capacity of the fleet. The shipment size might not always be equal to the maximal carrying capacity of the ship at her draught allowed on the given circumstances, for example under actual nautical conditions along the route.

Pushed barges

The different barge size standards were developed in particular navigation areas matching the usual nautical conditions. The most common European barge measures 251 by 37 feet (76.5 m × 11.4 m) and can carry up to about 2,450 tons (2,700 short tons). The most frequently used barge is the "Europe-barge-class type IIa". There are other longer and shorter barges available that have been adjusted in their dimensions, according to their designated navigation area and waterway requirements. An overview is provided in the following table:

Table 12: Standard sizes of pushed barges in Europe

Barge type	Dimensions (LxB), m	Tonnage capacity at a draught of				Area of use
		2,00 m	2,50 m	2,80 m	4,00 m	River or corridor
Europe Type I	70,00x9,50	940 t	1240 t			Rhine, MLK

Barge type	Dimensions (LxB), m	Tonnage capacity at a draught of				Area of use
		2,00 m	2,50 m	2,80 m	4,00 m	River or corridor
Europe Type II	76,50x11,40	1250 t	1660 t	1850 t		Rhine, MLK, Danube
Europe Type IIa	76,50x11,40	1140 t	1530 t	1800 t	2800 t	Rhine
Europe Type IIb	76,50x11,00	1100 t	1500 t			Danube
GSP-54	54,00x11,00	900 t				Elbe, Oder
SP-65	65,00x8,20	900 t				Elbe, Oder
SP-35	32,50x8,20	415 t				Elbe, Oder
LASH	18,70x9,50	250 t	335 t	385 t		Weser, Rhine
See-Bee	29,75x10,70	490 t	640 t	730 t		Weser, Rhine
Interlocutor	38,25x11,40	585 t	775 t	900 t		Danube
OBP-500	45,50x9,60	480 t				Oder

Source: Prospects of Inland Navigation within the Enlarged Europe

Pushed tow systems

The possibility to transport big capacities by interlinking barges is also used in combination with self propelled motor vessels of same or similar size. In this case the merits of the self-propelled motor vessel are combined with those of the pushed tow system.

The engine power of modern motor vessels (up to 1.99 kW) and their navigational and technical equipment allows for up to three additional Europe barges, which increases the loading capacity to as far as 10,000 t.

Here too the advantage lies in the possibility to individually control the capacity, depending on demand and relation, which would not be possible in that manner with single, self-propelled motor vessels:

- Mostly vessel and barge types for waterways of class IV and V are used in pushed tow systems;
- Self-propelled motor vessels used in pushed two systems usually have higher engine power and a specific bow form for the coupling of the barges;
- An interlinked coupling in a linear manner is just as possible, as parallel coupling (interconnected through simple rope connections). It is only subject to fairway conditions;

- It was mentioned repeatedly as a disadvantage of the pushed tow system that it is not possible to handle cargo of the self-propelled unit and the barge parallel, although desired due to the lack of time;
- Maintenance work can only be organized acceptably efficient.

Based on the information collected, it is possible to select those types of river vessels that fit the parameters of the Prut River.

7.3. Maintenance of the Prut fairway on the Giurgiulesti-Ungheni segment.

7.3.1. Requirements for navigation and handling

Waterways have always provided an avenue for transportation, communication, agricultural development and trade. This is the reason for what navigation of rivers to transport people and goods precedes historical record. However, within the last few centuries, navigation structures have significantly augmented the ability of industry to transport goods to and from inland ports. In many cases, improvements in river navigation have provided an economical method of transporting large quantities of grain, petroleum, coal, metals and ores, fertilizers and chemicals, forest products, and other cargo, but the improvements have not come without a cost. Or, this is the main purpose of our project – to increase and to assure the intensification of the navigation on Prut river up to Ungheni. For a continuous and efficient navigation on Prut river up to Ungheni it is necessary to increase river depths, eliminate meandering, and reduce water velocities in river bedside and on river problematic places. These structures are often expensive in monetary, societal and environmental costs, as we will describe in the 5th module of this paper.

In some cases, the necessary navigation structures require navigation dams or multipurpose dams. Navigation dams form a deep, low velocity reservoir in locations where passage was once impractical because the river was too shallow or currents were too swift or we have problematic places. Multipurpose dams are often used to provide a steady supply of water in times when flows would normally be low, what is happening on Prut river as well. The steady supply allows navigation downstream of the dam that would otherwise be impossible during low flow periods. If a multipurpose dam can be circumnavigated by barge tows, the reservoir behind the dam aids navigation in the same way as the reservoir behind a navigation dam. Although both types of dams assist inland navigation, the dams may be associated with a variety of problems. Sediment laden rivers may deposit large quantities of sand in reservoirs, and severe erosion may occur downstream of the dam. Reservoirs formed behind the dam offer recreational opportunities, this means we can use them for navigation when the river water level do not permit the normal navigation, or when there are some works for cleaning sediments from riverbed. Larger reservoirs sometimes inundate vast areas

of agricultural land and populated areas. Finally, the dams may cause habitat loss, or restrict passage of migratory fish.

While dams often help reduce the risk of flooding, other structures may increase flood risks. In some locations, dikes are installed to increase river depths. During floods, the dikes continue to restrict flow in the river, causing higher river stages. Navigation structures also influence where sediment is eroded and deposited. Sedimentation always occurs in areas of low water velocities and low turbulence such as in reservoirs, backwater areas, and behind dikes. Erosion occurs where water velocities are high such as in channel cut-offs, or where natural sediment loads have been altered such as downstream of dams.

There is almost always an environmental cost when the natural flow of a river is changed; the cost may come in the form of erosion, sedimentation, introduction and propagation of exotic species, or loss of habitat. With careful planning and wise decisions, environmental costs can often be reduced. Dam releases can simulate natural flows in times when excess water is available, the size and location of dams can be chosen to limit habitat loss, and measures can be taken to prevent the introduction and spread of exotic species. Furthermore, placement of navigation structures and vessel operation procedures can be modified to reduce unwanted sedimentation and erosion.

These structure can help to ensure a continuous navigation on Prut river up to Ungheni but we propose that they should be built only in the problematic places on the river, the ones indicated above in 2nd section, and in the places where the water level drops more often below the navigation level, so we will reduce the negative impact on the environment.

Also in order to minimize not only the impact on environment but financial costs too, using right capacity and dimension vessels on Prut river it would be an effective decision. This in turn requires the optimal selection of the fleet for navigation, so domestic shipping operators should also know the requirements for the fleet used before they begin the transportation process, also customers and freight forwarders could form optimal consignments of goods to be transported a well-established work plan.

7.3.2. The concept of organizing river transport on the Prut River

Before setting down on paper an efficient plan for increasing and improving the existent intern navigation of goods on Prut river, we must summarize the main issues to be taken into account:

- The share of cargo currently is very small as compared to whole Danube river trade.

- There are serious navigable constraints owing to sedimentation and river courses, namely where we have meanders.
- There are not enough vessels and operators for such routes from Republic of Moldova.
- There is serious lack of storage facility around the waterways.
- Environmental and social protections are the key factors that need to be addressed in the waterways.
- There are serious concerns of institutional set up along the waterways.
- Private sector participation in the developmental plans is still not forthcoming.
- Cargo operator transit arrangement has not yet been standardized.
- Investment loans are not forthcoming.
- Integrated development is not a visionary thrust area for private economical sector.

In order for the project to work, certain requirements and procedures need to be specified in detail. First of all, after setting down the scenario for the works that need to be done, it is necessary to inspect physically all problematic places and to reset the parameters of the work plan according to reality. We propose below a work plan to ensure continuous navigability on the Prut River from Giurgiulesti to Ungheni.

Table 13: Work steps for maintaining navigation on the Prut River

Activity	Responsible part	Terms
Inspection of all problematic places on the river, namely:		
Measuring the water level, the depth, thickness of the bedrock, the width of the river in problem areas;		
Periodic monitoring of the water level in the river before carrying out the excavation works;		
Identification of the narrowest meanders on the river for starting the construction of dams,		

Activity	Responsible part	Terms
barrages, doing excavations works in the riverbed. Contracting of economic agents to deal with excavation and dredging works; Identification and preparation of the land necessary for the storage of sediments excavated from the river; Dredging works Periodic inspection of the river, especially after torrential rains and floods in the area to detect problems, remove them, thus ensuring better navigation on the river.		

Source: designed by the author

Before starting the project with the works submitted above, we must identify the persons who will perform the observations, measurements, identify and establish contracts with economic agents. It is recommended that individuals have access to a common database during observations and measurements to facilitate the selection and processing of data. Excel tables can be used indicating the days on which the measurements were made, the persons responsible and the place where the appropriate measurements were taken. After the accumulation of data, it would be good to initially contract a structure, an economic agent in the field of geodesy to deal with the elaboration of the excavation project, later the construction of dams, or canals.

The arguments proving the necessity of increasing and improving the navigation on Prut river are as follows:

- It can be a supporting role for road and rail transport.
- It is far more cost effective per kilometer of travel.
- It is highly efficient in energy consumption per ton load carried.
- Load capacity can be doubled by small increase in depths by dredging.
- Considerable flexibility in ageing transportation and cost elasticity.
- Inherently low human cost.
- Reduce sediment problem along the Prut river.

- The deposition of material from dredging can be viewed simply as a relocation of material rather than an input of new pollutants.
- Sediment can be useful for soil amendment and landscaping.
- Managing pollution in the Aquatic system through the prevention of pollution and remediation techniques.

However, the remediation could be achieved in any of the following: Speciation/ separation, destroying the organisms by incineration, soil washing, solidification, Phytoremediation, Bioremediation.

Considering the above, it becomes quiet apparent that ensuring a green and consistent waterway would be most meaningful for the national level, not only for the Republic of Moldova, but for Romania too, as they are in the river aquifer.

7.3.3. Dredging plan

Dredging is an excavation activity or operation usually carried out at least partly underwater, in shallow seas or fresh water areas with the purpose of gathering up bottom sediments and disposing them at a different location. In actual sense, dredge is a device for scraping or sucking the riverbed / seabed, used for dredging and dredger is a ship or boat equipped with a dredge. In technical usage, any floating vessel equipped with dredging equipment is called a dredger.

There are several types of dredging which are carried out in waterways to ensure that the waterways are kept clear and navigable. The common types of dredgers are:

- Clearing and snagging dredgers which are used to track log jams, clear debris, sunken vessel, etc.
- Mechanical and hydraulic dredgers which are principally used to clear riverbeds, ponds, estuaries, interlinks between rivers.

Most waterways have soft ground, except for parts where there is a rock bed. There are other types of dredgers, namely: Dust dredger. Dear side costs that are used to remove loose, compacted granular material at a fast pace. Dragons can also be amphibians and are usually portable.

Without regular dredging operations, as is the case in most parts of the world, world trade would have been affected, as most of the goods travel by ship and have to access ports or seas via canals. In addition, the pleasure boat was also restricted to smaller vessels. Most marine dredging operations (and disposal of dredged material) will require appropriate licensing from relevant regulators, and dredging is usually performed by port companies or appropriate government agencies.

Main reasons for dredging include:

- Increasing / maintaining the depth of water in a navigation channel.

- Spot excavations preparatory to major waterfront construction like, bridges, piers, or dock foundations.
- Harvesting sand for usage in concrete production or for beach restoration.
- Waterways management and maintenance for flood and erosion control.

The dredging process creates debris that is transported to locations other than the dredged area; dredging can disrupt aquatic ecosystems, often with negative effects. On the other hand, dredging can produce land reclamation materials or other purposes (usually related to construction). Dredging has also historically played a significant role in socio-economic development and growth.

An assessment of the physical, chemical and biological characteristics of the sediment is required to determine: possible dredging methods; options for use, disposal or treatment; potential impacts; the extent of biological and / or chemical tests; and monitoring needs.

Sediments are natural elements in any river basin, as well as in the seabed. Although dredging interferes with the natural cycle of sedimentation and resuspension, nowadays the environmental focus has shifted to a "river basin approach", ie taking all activities into account in a total perspective. The scope is changing from the management of dredged material to the complete management of sediments in the river basin. It integrates the economic need for dredging, the beneficial use of the material and the reduction of the effects of dredging and disposal, as well as the control of the source.

The dredged material is no longer seen as a "scrap" or "waste", but as a resource. Beneficial use of dredged material can be defined as the placement or use of dredged material for a specific productive purpose. Mineralogy and geotechnical properties qualify it for use in the manufacture of high value products for beneficial use. The dredged material can be used in a variety of beneficial applications. A list of these includes remedying the oceans, restoring mountain areas, filling degraded ponds and pits, creating and restoring wetlands for water quality and habitat treatment, and creating / restoring other habitats such as oyster reefs and bird habitat. Beneficial end products include topsoil, building cement, lightweight aggregate, bricks and architectural tile. Often, these beneficial uses can save the public costs. All dredged materials proposed for beneficial use will be evaluated in a framework that protects human health and the environment. Most dredged materials can be a valuable resource and should be considered for beneficial uses.

Most dredged materials are clean sediments. It should be recognized as a resource, as part of the ecological system. The options for beneficial use are numerous: ranging from coastal food, the creation of land or wetlands and soil improvement to the construction of dams and use as a building material. The dredged material should be used, whenever possible, to maximize the benefits for both the project and the beneficial user.

Anticipated derivable benefits from the dredging of the Prut river system would among others, include the following:

- Improved transportation system through increased navigational channel for the movement of bulk cargoes. This would lead to the realization of the National Transport Strategy and mass transit objectives of the country.
- Economic viability resulting from reduction in the cost of transportation.
- Availability and affordability of transportation services. Presently the volume of cargo is expected to double as a result of the dredging.
- Improved communication link between the Ungheni and Giurgiulesti.
- Job opportunities along the riverine and inland areas arising from the dredging project.
- The dredging will provide auxiliary benefits to the host communities in the area through the development of fish ponds at designated locations, as a mitigating measure to disruptions in fishing activities that may be suffered by fishermen.
- Dredge spoils will be used to fill up marshy areas if requested by communities. This would result in increase in habitable and agriculturally productive land mass available to the host communities.
- Improved quality of life from the numerous economic activities that would be generated along the riverbanks.
- It would minimize problems of environmental pollution arising from emission of greenhouse gases and noise from people and vehicle.
- Diversion of traffic to waterways would in turn provide relief to roads and consequently improved lifespan of roads.
- It will lead to bulk transportation of goods thereby reducing the cost of these goods. (Not for ocean vessels carrying large cargoes).

Strategies for Sustainable Management of Waterways for National Development

To ensure that the Prut river waterway get the proper thrust, certain measures need to be taken at the national level which would be in the following lines:

- Raise tax-free point and mobilize fees for infrastructure development.
- Encourage commercial/joint venture and provide for grants and subsidies.
- Encourage private sector participation.
- Introduce phased tax exemption.
- Enhance depreciation rate of vessels.
- Introduce vessel-building subsidy for Waterways.

- Minimize the custom duty.

Other strategies that could enhance sustainable management of the waterways therefore include:

7.3.3.1 Phased Development

To ensure that waterways are properly projected, development should be done in stages, and integrated waterway development should define human parameters for infrastructure requirements, dredging, navigation equipment, terminal, etc. and daily requirements, along with operational issues. Once this step is completed, then the next development step would be to define the Strategic Marketing Plan, project master plan, preliminary engineering for infrastructure, channels, navigation, terminals, storage, etc.

7.3.3.2 Organizational Management

This is cardinal to the realization of the goals of this scheme and the major components of this strategy are:

(a) Monitoring and advising on the Prut river corridors issues including both the man-made and natural aspects;

(b) Realizing the potential for understanding and enjoyment of all aspects of built and natural infrastructure along the waterways through education and promotion;

(c) The strong central control of all aspects of waterways management. In order to fulfil these functions adequate professional staff would be required in the following areas:

- Strategic planning;
- Navigation & Engineering;
- Planning & Development;
- Natural & Built Heritage;
- Education, Promotion, and Marketing.

7.3.3.3 Resource Management

The current situation of a multitude of government departments and other agencies involved in various aspects of waterway management has led to a lack of cohesion. Therefore, in order to improve the uniform coordination and efficient management of resources, the application and monitoring of water quality should continue to be carried out by local authorities and other agencies with a statutory obligation to do so.

7.3.3.4 Development Control and User Management

Where development, industrial or recreational projects could have a negative impact on waterway corridors, special control areas should be identified in consultation with local authorities and users included in their state development plans. The infrastructure of the inland waterway system needs to be improved in partnership with local authorities, local communities and the private sector.

Recognition of the wider socio-economic benefits of waterway projects must be taken into account in urban waterway development plans to ensure maximum benefit to the areas involved. Waterways can be used as a catalyst for development. All developments on waterway corridors, including tourism-related projects, should take into account potential negative effects on waterway heritage. Policies and guidelines are needed to ensure sustainable development on waterway corridors. The voluntary sector should be encouraged to continue its involvement in the development of waterways, and non-governmental organizations should be recognized as important.

The potential for inland waterway transport to encourage and support increased economic and social development in rural areas is enormous.

7.3.3.5 Balance Economy and Ecology

The overall goal of management should be to achieve a sustainable solution, subject to sound environmental, social and financial assessments, weighing and balancing all associated risks. Identifying and involving all potential stakeholders and stakeholders from the conceptual stage to the completion of the project is essential. Clear and competent communication on the physical, environmental, social and financial effects of a project should always be considered a key success factor. The dredging community is often able to repair contaminated sediments. Even when this is possible, high priority should always be given to source control. Successful implementation of prevention strategies will require collaboration between all actors from source to sinking.

7.3.3.6 The Need for Sustainable Relocation

Sea or river sediments normally contribute to the sustainability of natural ecosystems. Their role in the processes of the river, estuary and coastal areas should be respected whenever possible. Removing marginally contaminated sediment from an ecosystem can in fact, in specific cases, be more harmful than relocating it. Consequently, an environmental impact assessment is crucial, especially when considering the sustainable management of rivers and the coast. Environmental impact assessment is an important prerequisite for dredging initiatives. Such an assessment is used to establish and, where necessary, to explore options for mitigating the potential effects of dredging or disposal on the physical environment, wildlife, habitats, fisheries, archeology and many other interests.

7.3.3.7 Environmental Impacts

Dredging can disrupt aquatic ecosystems, often with negative effects. In addition, dredge residues may contain toxic chemicals that may adversely affect the disposal site; In addition, the dredging process often dislodges chemicals from benthic substrates and injects them into the water column. The dredging activity can create the following main effects on the environment: Release of toxic chemicals (including heavy metals and PCB) from bottom sediments into the water column;

- Short term increases in turbidity, which can affect aquatic species metabolism and interfere with spawning;
- Secondary effects from water column contamination of uptake of heavy metals, DDT and other persistent organic toxins, via food chain uptake and subsequent concentrations of these toxins in higher organisms including humans;
- Secondary impacts to marsh productivity from sedimentation;
- Tertiary impacts to avifauna which may prey upon contaminated aquatic organisms;
- Secondary impacts to aquatic and benthic organisms' metabolism and mortality; and
- Possible contamination of dredge spoils sites.

7.3.4. Technology and organization of dredging works

Definition: A dredger is a piece of equipment which can dig, transport and dump a certain amount of underwater laying soil in a certain time. The quantity of soil moved per unit of time is called Production. Dredgers can dig hydraulically or mechanically. Hydraulic digging make use of the erosive working of a water flow. For instance, a water flow generated by a dredge pump is lead via suction mouth over a sand bed. The flow will erode the sand bed and forms a sand-water mixture before it enters the suction pipe. Hydraulic digging is mostly done with special water jets. Hydraulic digging is mostly done in cohesion less soils such as silt, sand and gravel.

Mechanical digging by knives, teeth or cutting edges of dredging equipment is applying to cohesive soils. The transport of the dredged soil can be done hydraulically or mechanically too, ether continuously or discontinuously.

Table 14: Transport type used in different dredging technology

	Hydraulically	Mechanically
Continuously	Transport via pipeline	Transport via conveyor belts
Discontinuously		Transport via grab, ship, car

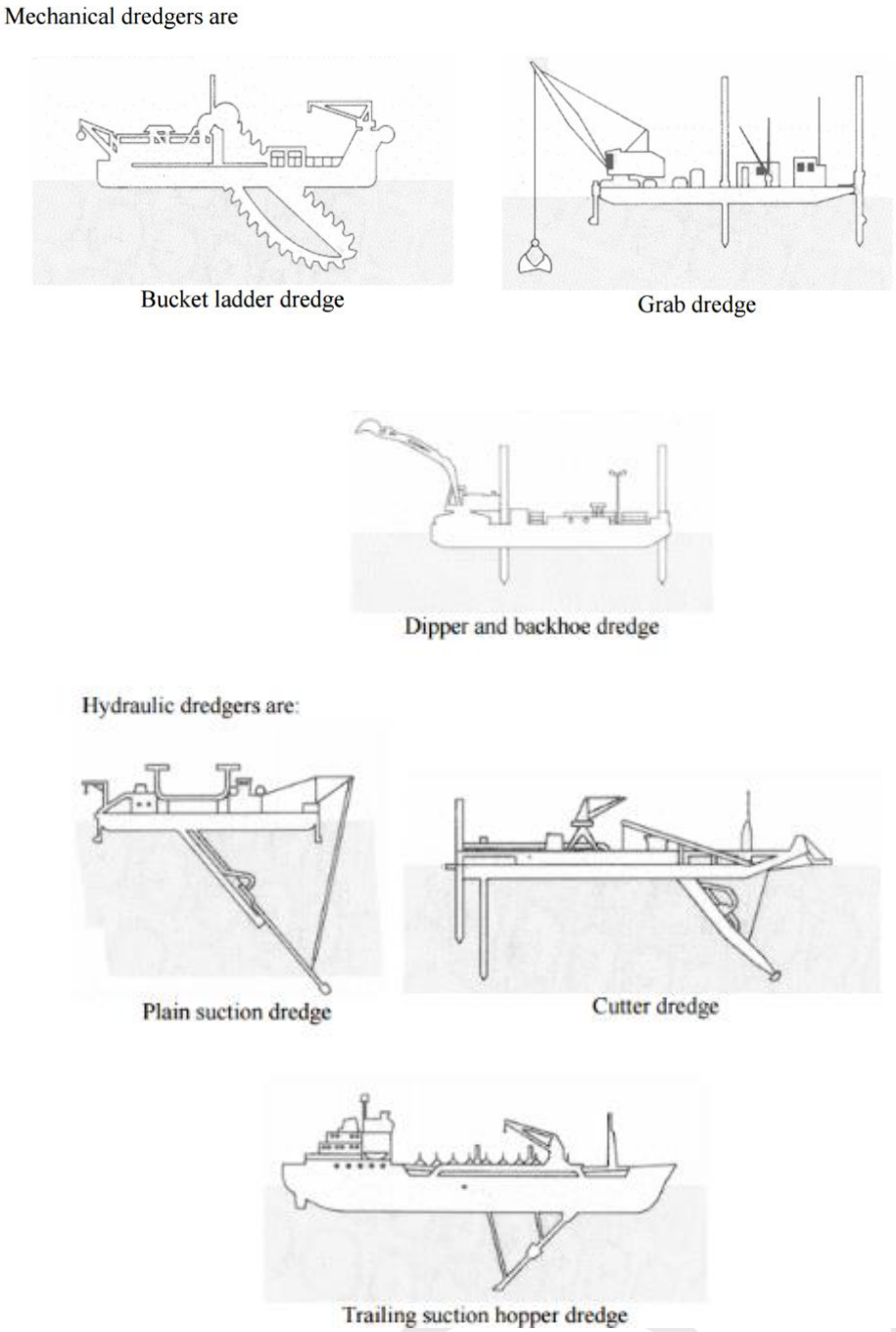
Source: Prof. Ir. W. J. Vlasblom, Designing Dredging Equipment

Deposition of soil can be done in simple ways fi by opening the grab, turning the bucket or opening the bottom doors in a ship. Hydraulic deposition happens when the mixture is flowing over the reclamation area. The sand will settle while the water flows back to sea or river.

Dredging equipment can have these three functions integrated or separated. The choice of the dredger for executing a dredging operation depends not only on the above mentioned functions but also from other conditions such as the accessibility to the site, weather and wave conditions, anchoring conditions, required accuracy and so on.

Types of dredging equipment

Dredging equipment can be divided in Mechanical Dredgers and Hydraulic Dredgers. The differences between these two types are the way that the soil is excavated; either mechanical or hydraulic.



Source: Prof. Ir. W. J. Vlasblom, Designing Dredging Equipment

Figure 44: Mechanical and Hydraulically Dredgers

For dredging works on the Prut river we can use mechanical dredgers, namely bucket ladder dredger. All dredgers except the trailing suction hopper dredgers are stationary dredgers, which means that they are anchored by wires or (spud) poles. Examples of bucket ladder dredgers we present below.

Source: http://sc04.alicdn.com/kf/HTB1eAUoX0jvK1RjSspiq6AEqXXaV.jpg

Figure 45: 2020 China Dredger Manufacturers 28inch 7000m3/h Sludge Pump Dredger/boat/sand and Gravel Dredges (ccs Certificate)

Source:
https://sc01.alicdn.com/kf/HTB1VCcRKeuSBuNjSsziq6zq8pXas/234459880/HTB1VCcRKeuSBuNjSsziq6zq8pXas.jpg

Figure 46: China HICL dredger shipyard 24inch 5500m3/h wheel bucket dredger/water master dredger sale (CCS certificate)

Of course the presented examples have a big excavation capacity and also a very high price. The Prut river and the required dredging works permits to look up at other equipment with a lower capacity and price. Also we can contract companies that own such equipment and pay for the work performed on problematic places.

As a more expensive method, more consistent in time, but not so invasive on the Prut river bio system, we can also review alternative dredging techniques for waste disposal. Alternative dredging follows a three-step process. First, the river's depth, bottom composition, and vegetation are evaluated. Second, a system of laminar-flow inversion and oxygenation is designed to create the aerobic conditions that are required for the rapid decomposition of organic sediment. Third, a bio augmentation program is designed to accelerate sediment digestion and re-establish a thriving food chain that begins to naturally process and remove the nutrients and organic matter that have accumulated over time.

If, however, we decide to use conventional methods of dredging and draining the riverbed, we must understand that dredging and desilting can have serious and long lasting negative impacts on the environment. For example, it can damage or destroy fish spawning grounds and make river banks unstable. Silt can become suspended in the water, lowering oxygen levels, potentially releasing harmful chemicals that may be present. This, in turn, impacts on wildlife, and water quality downstream. The silt that has been removed from rivers can be difficult to dispose of, particularly where it is contaminated due to the industrial activity along the river basin.

Before we undertake dredging and desilting activities we must be sure the work will not have any negative impacts on the environment, water quality or flood risk elsewhere in the riverbed. We also should take into account companies that design and undertake the work in a way that improves the river habitat or if that is not possible, minimize any impact as far as we can.

Taking action across entire river basin and riverbed is a much more effective and efficient way to protect communities and increase their resilience to flooding and the river navigability.

The most visible measures include flood walls, embankments, and demountable and temporary barriers, which help to contain water within river channels and tributaries.

Working with partners, we also must carry out activity alongside Prut river basin, restoring peatlands, planting trees, and building leaky dams, all of which contribute to slowing the flow of water into communities further downstream. In urban or rural areas, we must work with local authorities and other partners to promote sustainable drainage systems, which can include the creation of ponds and green spaces to help soak up rainwater, rather than it flowing quickly into drains and river.

Across the country we should work closely with Environmental Authorities to manage ecological risks related to increasing the level of navigability of the river and first related to dredging works.

7.4. Maintenance of the Prut fairway in the Giurgiulesti port area

7.4.1. General operating requirements for the port of Giurgiulesti located on the Prut River. General development scenario

Future constructions on the territory of Giurgiulesti port require to analyze the present constructions on the territory of the port, the current structure of the port and the services provided and the relief of the adjacent territory, which includes the possibilities of widening the port, possible dimensions of future hydro port constructions.

Port construction techniques and procedures are influenced by the topological and technical characteristics of the site, such as its situation and geology and the intended use of the plot. It occurs under greenfield or brownfield conditions.

Port development on a brownfield site involves reconverting an existing (mostly industrial) site for terminal use.

Brownfield port construction usually involves large-scale clean-up operations of contaminated soil and the renovation and deepening of the quay walls. It results in the rehabilitation and reuse of existing port real estate, thereby avoiding lengthy and difficult port extension procedures. Redevelopment of port brownfields produces numerous environmental, social, and economic benefits. By cleaning up and returning these lands to use, communities can remove dangerous structures and stop or stabilize contamination near waterways. Port redevelopment presents valuable opportunities for waterfront redevelopment, and it may catalyze revitalization in the broader community. Brownfield redevelopment frees space for various uses and creates a more available property for sale or lease, providing ports with additional sources of revenue. Besides, redevelopment of previously used sites can help alleviate pressure on undeveloped wetland and coastal areas, thus protecting important coastal habitats.

Construction of a port on a greenfield site mostly involves extending a port on a vacant site along a river, estuary, or coastline.

Historically, the majority of port development projects were labeled greenfield, which often goes hand in hand with port migration. The vacant site might be located in a green zone, wetland, or agricultural area. Getting permission for a greenfield development usually takes a long time given existing spatial planning and environmental rules and regulations, and the required extensive project evaluation. For example, the Bird and Habitat Directive and the Water Directive of the European Commission impose a complex regulatory condition on greenfield development for ports. Such developments can imply small or large-scale land reclamation works along the riverside or the digging of a dock on dry land connected to a river or existing dock system.

Land reclamation is based on hydraulic fill, a process whereby sediment or rock excavated by dredgers from the seabed or other borrow areas is transported and placed into the designated reclamation area.

Well-graded quartz sands are the preferred material for landfills. Before the hydraulic fill can commence, extensive preparatory engineering studies are conducted to collect bathymetrical (a measurement of the depth of bodies of water), topographical (physical features of the area), geological (soil and rock), and geotechnical data on the reclamation site and the borrow areas. This step also includes an examination of the hydraulic, meteorological, and environmental conditions. Based on these studies, a method and the right equipment are chosen to obtain the desired mix of soil/sand and water to facilitate the dredging, transport, and placement of fill material, and to meet the load-bearing and stability requirements of the reclaimed site. The quality of the landfill will be determined by its stiffness, strength, density (liquefaction resistance), and drainage capacity. The nature of the fill will influence the type of equipment, the means of transport, the reclamation method, and the possible need for ground improvement. Much used ground improvement techniques include vertical drains and vibratory, dynamic, or explosive compaction with or without admixtures.

On the territory of Giurgiulesti port we have to set up the scenario for both brownfield and greenfield port construction. This is because on the spot are located next to the actual engineering constructions of the port and some improvised constructions by the locals, which requires the adoption of the plan for brownfield port construction. At the same time, it is desired to explore the territory adjacent to the engineering constructions near the port, which has not yet been explored or used, which requires the adoption of the plan for greenfield port construction.

7.4.2. Port hydro technical constructions: berths, quays, ensuring the required water depth

At the moment it is required to plan the works regarding:

- On the territory of the Giurgiulesti Free International Port - cleaning the quays to maintain the necessary water depth in the port;
- On the territory of the State Enterprise Ungheni River Port – capital waterside facilities, that mainly includes construction of engineering objects that will ensure the transport of general goods and cereals; modernization of passenger docks, also cleaning the river bedside to ensure the necessary water depth for the access of river ships.

Waterside facilities include berthing facilities, such as harbor basins, approaches, access channels, locks, harbor dams, and breakwaters; cargo handling and ferry facilities, including goods transfer quays and piers, shoreline protection; and landing bridges, shipbuilding berths, fitting quays/wharfs, and dry docks. Offshore construction

activities specific to ports include preparing the waterside, including construction/capital dredging (and disposal of dredged material); excavation and blasting; and filling and other work related to the construction of quays, piers, harbor basins, access channels, dams, breakwaters, and dry docks.

To maintain the necessary water depth, it is indicated to construct berths and quays. A quay wall is a soil retaining structure that provides a mooring place for ships, bearing capacity for crane loads, goods and storage, and sometimes a water-retaining function.

The basic role of a berth structure is to accommodate a particular vessel or range of vessels as well as cargo handling operations. There is a wide variety of berth structures with different characteristics with a variety of engineering considerations. More specifically, the method and sequence of construction, the availability of construction materials, and the support of major construction plants such as cement making can determine the type of structure finally selected. This structure and the availability of construction equipment can significantly influence the construction schedule in view of factors such as weather downtime and the availability of contractors.

General parameters that are considered when choosing an appropriate quay wall type include:

- Dredging and filling in order to minimize the environmental impact of those operations.
- Access and safety during all the stages of the construction and operation of the structure.
- Berth orientation, berth geometry, and berth length.
- Required depth alongside the berth.
- Seabed conditions.
- Local construction materials, method of construction, and construction difficulties.

General site considerations such as drainage and filters, wave pressures on walls, scour protection, the risk of earthquakes, paving and surface water drainage, the chance of ice formation.

The possible failure or malfunction of a quay wall can be caused by the failure of the sheet pile wall, too much groundwater flow, not enough soil stability, or failure of the supporting points.

Quay walls are typically equipped with quay wall fenders, ship mooring bollards, crane rails, cable gutters, and other technical features. Typical Cross-Sections of Quay Walls are presented in the figure below.

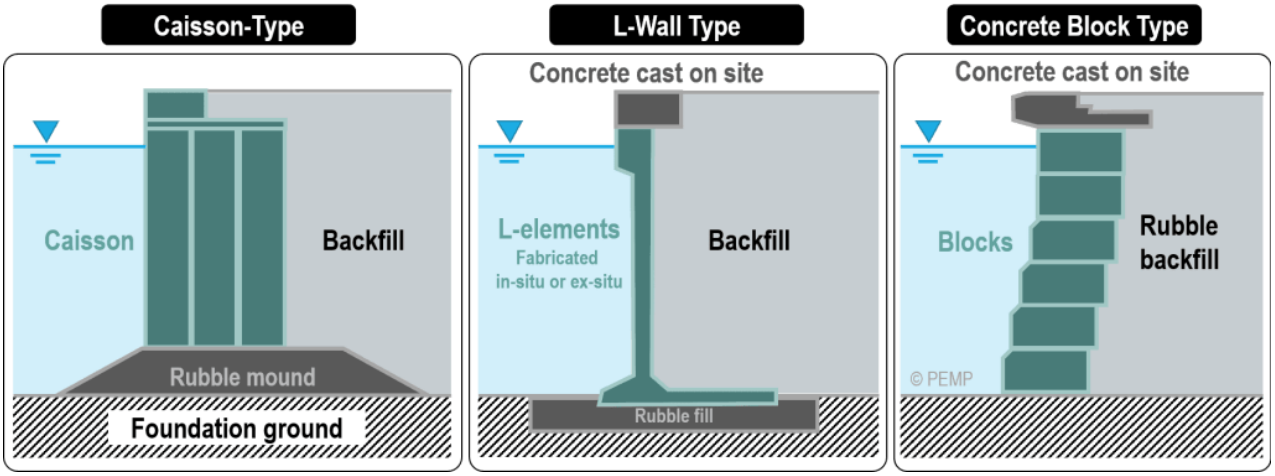


Figure 47: Typical Cross-Sections of Quay Walls

7.4.3. Navigation conditions: tonnage, access for ships, handling of ships in port

A harbor is a stretch of water where vessels can anchor or secure to buoys or alongside wharves to obtain protection (by natural or artificial features) from storms and rough water. A port is a commercial harbor or commercial part of a harbor with terminals, quays, wharves, enclosed docks, and facilities for transferring cargo from shore–to-vessel or vessel-to-shore. This includes onshore facilities and structures for receiving, handling, storing, consolidating, and loading or delivering waterborne shipments or passengers. Ports may include terminals, which generally serve a specific function, such as for containers, bulk shipments of cement, iron ore, grain, etc., and these terminals maybe be operated by a third party. Ports also may provide ship support facilities and services, including waste management and effluent discharge facilities, maintenance of vehicles and equipment, painting and other vessel maintenance.

The above definition requires us to provide all aspects related to commercial activity, transport and logistics to be held in the area of Giurgiulesti Port, both in the Free Economic Zone and in the Ungheni River Port. First of all, the spaces for the handling of inland waterway vessels selected in the previous chapters must be provided. Second, a water depth must be ensured as indicated. Both the first and the second point can be ensured by the periodic dredging of the Prut riverbed in the Giurgiulesti port area.

The access of the ships at this moment is possible in the Free Economic Zone Port Giurgiulesti, as well as it is possible to maneuver them, as well as the necessary depth is ensured. Capital works to ensure these conditions are needed in the Ungheni River Port.

Onshore construction typically includes site preparation and development, the removal of any existing vegetation, and the grading and excavation of soils for the

installation of structural foundations and site utilities that are typical of industrial development projects. Port development may include construction of new infrastructure and/or rehabilitation of existing infrastructure, such as piers and buildings. Onshore facilities typically include:

- Cargo storage and handling facilities, including crane tracks and bridges for loading/unloading cargo; pipelines, roads, railway lines and other areas for cargo distribution, storage and stacking areas; above-ground and underground storage tanks; warehouses; and silos;
- Facilities for embarking/disembarking passengers, such as parking areas and administration buildings;
- Vessel support facilities, such as those used to store and supply water, power, food and oil/used oil;
- Drainage networks (e.g., for storm water);
- Waste management and effluent treatment and discharge systems, such as for wastewater/sewage, oil contaminated wastewater, and ballast water;
- Port administration buildings;
- Equipment maintenance and repair facilities, such as vehicle maintenance bays; and
- Flood defenses such as gates and dikes in ports exposed to high water and flood risks.

All these constructions are necessary to be designed and realized on the territory adjacent to the Giurgiulesti Port Free Economic Zone, in the context of the development of the Ungheni River Port.

7.4.4. Dredging plan

Capital dredging for new ports includes the excavation of sediments to increase depth of berths and navigation channels for access by larger vessels. Sediments, even in new port developments, may contain contaminants. Much of this contamination originates from land-use practices in the adjacent watershed and is transported by rivers and surface runoff to lakes, bays, and the sea, where certain contaminants, such as polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), metals, and pesticides, tend to concentrate in the sediments. These must be taken into account when excavating and dredging works in the Port of Giurgiulesti.

In areas affected by sedimentation from rivers, estuaries, and land runoff, sediments are usually deposited over a period of time. Therefore, concentrations of contaminants can vary substantially over a vertical profile of the dredge cut. Typically, the upper layer is organic-rich and fine-grained, and is the most contaminated. The deeper materials

are typically coarse-grained or hard-pan materials that are less contaminated. However, historical contamination, such as from previous shipyards and spills, can result in contamination even in these materials. Material dredged from channels or outer harbor areas tend to be relatively coarse-grained and uncontaminated, although the nature of the materials is a function of the historical activities within the region. Sediment quality can be assessed by sampling and testing.

The re-suspension of sediment during dredging or excavation processes may be reduced by selecting an appropriate dredging method:

- Grab or clamshell dredgers collect sediments in a crane-mounted bucket, helping to keep material consolidated (e.g., lower water content);
- Bucket dredgers pick up sediment by mechanical means, often with many buckets attached to a wheel or chain;
- Backhoe dredgers are shore-based or "pontoon mounted" diggers used in shallow waters and confined spaces;
- Trailing suction hopper dredgers are typically used for maintenance dredging in coastal areas. Sediments from the seabed are pumped through trailing drag-heads into a reception tank (hopper); and/or
- Water injection dredgers are used for maintenance dredging in coastal areas and rivers, particularly in muddy areas and in areas with sandy ripples on the bottom. Water injection dredgers inject water in a small jet under low pressure into the seabed to bring up sediment in suspension as a turbidity current that flows downslope before being moved by a second burst of water from the dredger, or carried away by sea currents.

Non-contaminated, dredged materials can usually be disposed of in open waters or used to counter shoreline erosion, for beach nourishment, or as fill materials, although a license from national authorities is typically required to discharge dredged material. Contaminated sediments are generally placed in confined disposal sites located either on land or in the water.

7.4.5. Technology and organization of dredging works

Installation of pier columns, piles and other underwater foundations, and construction of harbor basins and access channels, may require excavation of sediment and underlying material. Soft material can be excavated using conventional means, however, excavation of hard materials often involves blasting. Foundations can penetrate natural low-permeability layers and facilitate vertical migration of saline water and contaminants. As with dredging, these construction activities also cause turbidity and generate crushed material and other debris requiring disposal. The use of explosives usually releases nitrogen and blasted material into the water. Other

contaminants, including metals and petroleum products, may also be released from sediments. Uncontaminated materials can be disposed of in open water, or used to construct breakwaters and other features, or for land reclamation. Contaminated material may need to be placed in a confined disposal facility.

Piers, wharves, and similar structures create the ship berths and provide the platforms for waterside cargo handling. These structures are typically constructed of concrete, steel, or lumber treated with chromated copper arsenate (CCA) or creosote as a preservative. Preservatives can leach from treated lumber, and the use of CCA-treated lumber is being phased out due to toxicity concerns. Filled structures, such as breakwaters, are crucial elements of port design and constitute sizable areas of artificial shoreline that are often projected into a bay, harbor, or estuary. Rubble mound breakwaters are commonly used and constructed by dumping rocks or debris of various size distributions from dump trucks, barges, or from fall pipes by barges.

Ships may enter and leave the port under their own power or assisted by tugboats. While berthed in the harbor, vessels need an ongoing source of power for cargo handling, climate control, communications, and other daily operations. Power can be supplied by the ships' engines or by shore-based utilities. Most vessels are powered by diesel internal combustion engines, although some vessels may be powered by boilers and steam engines/turbines. Air emissions from vessels consist primarily of particulate matter, carbon monoxide, sulfur dioxide, and nitrogen oxides from propulsion and auxiliary boilers and engines. Coal-fired boilers generate a large quantity of particulate matter. Heavy particulate matter emissions are also generated when carbon deposits are blown from coal- and oil-fired boilers.

Maintenance dredging involves the routine removal of siltation material and sediment in harbor basins and access channels. This activity is important to maintain depths and widths and ensure safe access for the ships as well as efficient navigation depth in the neighborhoods and dock gates to ensure access to basins and dry docks. Maintenance dredging may take place continuously or once every few years, depending on the port.

7.4.6. Freight and passenger berth maintenance plan

Land-based operations at ports include cargo handling; fuel and chemical storage and handling; passenger embarking and disembarking; ship support services; waste and wastewater management; vehicle and equipment maintenance; and buildings and grounds maintenance.

Cargo handling includes unloading, storage/stacking, and loading dry and liquid cargo. Cargo typically includes containers, dry bulk, liquid bulk, and general cargo. Cargo handling includes use of vehicular traffic such as harbor vessels, trucks, buses, and trains and on-dock cranes, terminal trucks, and track cranes. Bulk cargo may be

transferred using cranes with grab buckets and front-end loaders, or pneumatic continuous ship loaders and unloaders, or belt conveyors.

Hazardous cargo, such as oil, liquefied gas, pesticides, and industrial chemicals, may require specific handling facilities or areas within the port, including separation from other cargo by cofferdam, void space, cargo pump room, or empty tanks. Pipe systems are required for handling bulk fuels and liquid chemicals. Hazardous cargo may be released through leaks and spill during transfer and storage, contaminating soil, surface water, or groundwater. Volatile organic chemicals may also evaporate and be released to the air.

Passenger terminals may be required within the Ungheni port area for embarking and disembarking passengers, including provision of parking facilities and temporary holding areas.

A port may offer ship support services such as solid waste and wastewater collection, electricity supply, fuels, and fresh water. The port or a separate company located within the port area may offer ship fuels, and fuel may be supplied by bunker boats. Fresh water may also be offered and pumped onboard ships.

7.5. Ecological aspects of navigation on the Prut River

Human activities related to river navigation and navigation itself affect the ecological status and biochemical levels of a river in different ways. From an ecological point of view, navigation is not the only ecological pressure, but also the activities related to hydropower plants also cause damage to river ecosystems.

The works of digging the riverbed and transforming it to facilitate navigation have a dramatic effect on river ecosystems. All engineering work that takes place at this stage affects the hydro-morphological structure of rivers, as well as natural structures and ecological communities - such as barriers or dams that prevent fish from migrating to spawning grounds; another way to affect ecosystems is to raise the turbulence of water during excavation and riverbed cleaning works that affect the development of microorganisms.

Changing the speed of water flow as an effect of navigation on the river, the retention of water by locks or hydropower plants can lead to the loss of fish species that cannot adapt to these changes.

Degradation or alteration of the riverbed can lead to environmental damage. The canals built to help navigation change the flora and fauna of the river.

Pollution of water with waste from ships also leads to ecological damage. The waves produced by the movement of ships disturb the habitat of some species of fish, invertebrates or other organisms. The reduced light due to navigation also affects the growth of algae and plants that serve as food for other species and have the role of cleaning the river water.

8. GIFP status quo assessment.

8.1 History.

After the declaration of independence in 1991 between Moldova and Ukraine, several questions arose regarding the ownership of the territory called "Ripa de la Mindresti" east of Giurgiulesti, which had an undetermined status. However, according to international law, "Ripa de la Mindresti" was already de jure Moldovan, given that from August 1940 until 1992, the border ran east of "Ripa de la Mindresti", which was part of the Giurgiulesti commune.

After difficult Moldovan-Ukrainian negotiations, a compromise was reached by signing an additional protocol in 1999, according to which the Republic of Moldova became the full owner with the relevant documents of a section of 450 meters of the Danube coast. The country, thanks to its access to the Danube, was able to build its first and only port, which allows it to receive the status of a Danube country bordering the Black Sea.

According to the current agreements, which were signed and ratified by Ukraine, the state border line between Ukraine and Moldova runs along the water surface of the Danube in the region of 71 miles, and the border between Romania and Moldova in the region of 72.3 miles. This means that the captain of the port of Giurgiulesti is responsible for the safety of navigation in the section from 71 to 72.3 miles.

In 1997, the construction of a port terminal for transshipment of oil products began in Giurgiulesti. In this regard, the Concession Agreement No. 397 of December 12, 1997 was signed and Terminal SA was established, in which 40% each belonged to the Government of the Republic of Moldova and Greek sponsors (Technovax A.O., Ellenikki Technodomiki Teb A.E., J&P Avax A.O, Intertask A.O.), and 20% - to the European Bank for Reconstruction and Development.

In December 2004, Danube Logistics signed an investment agreement with the government of the Republic of Moldova for the construction of Giurgiulesti International Free Port.

In 2006, the work was completed. The port received the status of a Free International Port, similar to a free economic zone until 2030. The territory of the port, including the free industrial zone, is a total area of 120 hectares. The main operator of the port "Danube Logistics" SRL invested 30 million euros in the construction at that time, including 3 million for environmental protection.

The investor undertook to create a multifunctional port on this territory, which, as a result of significant investments of tens of millions of US dollars in its construction with all infrastructure, began to fully function in 2011, having fulfilled investment obligations.

The Giurgiulesti Free International Port operates on the basis of Law No. 7 of 17.02.2005 for the approval of the Investment Agreement "Regarding the Giurgiulesti Free International Port" and Law No. 8 of 17.02.2005 regarding the International Free Port "Giurgiulesti".

In accordance with the Investment Agreement, the Government of the Republic of Moldova assumed obligations related to the rehabilitation and maintenance of roads, railways connecting to the port, the application of local tariffs to rail transport services, the adjustment of legislation regarding maritime-river transport.

In 2008, the construction of a 50-kilometer section of the railway from the city of Cahul to the port of Giurgiulest was completed. The new branch connected the port with the national railway network and transport arteries of Ukraine and Romania. Thus, for the first time in modern history, Moldova secured access to the sea.

In 2009, the river-sea liner "Princessa Elena" made its first voyage to Istanbul (Turkey) from the passenger terminal of the Giurgiulesti port complex. The ship holds 145 people, the trip lasts 5 days.

In 2012, the passenger terminal was commissioned. It is a 120-meter jetty at the mouth of the Prut River, a comfortable four-story building with a passenger hall, administrative offices, customs and border guards. State investments for the construction of the building amounted to 94 million Moldavian lei. The capacity of the gate is 300 passengers per day. Cruise liners started arriving at the port. The operator of the passenger terminal is "Freight and Passenger Port Giurgiulesti ", which is actually a branch of the state enterprise "Ungen River Port".

In 2012, the International Free Port of Giurgiulesti started working with container cargo. The port attracted cargo flows of imported containers arriving by sea through the port of Constanta. The main port operator "Danube Logistics" considers the container direction as one of the priorities, although we are developing as a universal cargo port, focused on transshipment of both dry and bulk cargoConnecting the railway to the transport of goods in containers will increase the competitiveness of railway transport.

In 2013, the narrow-gauge (1435 mm) European standard railway traffic was restored on the Giurgiulesti - Galati section.

In 2016, the "Trans-Oil" company commissioned the second terminal for the storage and handling of grain cargo in the port. The current capacity for loading and exporting grain through two terminals in Giurgiulesti is 1.6 million tons per year.

In 2018, the grand opening of the Grain Terminal "Prograin Organic" took place in the International Free Port of Giurgiulesti, intended for the storage and transshipment of organic products.

In 2019, Trans-Oil commissioned an independent pneumatic grain line with a capacity of 250 tons per hour, connecting both terminals of the group in the port. As a result of this project, the Trans-Oil terminals at the Giurgiulesti port can handle 1.6 million metric tons per year. The volume of investments in the construction of the pneumatic line amounted to about 1.6 million dollars. Also in 2019, Trans-Oil began construction of a new oil refinery at the Giurgiulesti International Port - the cost of the project is $24 million. Construction will be completed this year 2021, and the plant's capacity will be 700 tons per day.

In the period from 2011 to 2021, the amount of goods transported through the port of Giurgiulesti i has tripled from 428.5 thousand. tons to 1.4 million tons. Maritime transport is primarily used for the export of agricultural production and the import of oil and industrial goods. The development of the port is significantly facilitated by the location of the port in the free economic zone, which offers favorable tax regimes to its residents (48 companies).

In May 2021, the European Bank for Reconstruction and Development, headquartered in London, acquired 100% of the capital of Danube Logistics SRL, the operator of the Giurgiulesti International Free Port in Moldova, the country's only river port located on

the Danube River. Through its acquisition, the financial institution aims to contribute to the continued success and development of one of the most strategically important facilities in Moldova. The port annually provides international trade of Moldovan companies with more than 50 countries of the world. The Bank will also seek to attract international investors to further support and develop the port.

In 2022, the general operator of the port "Danube Logistics" prepared project documentation for the construction of a new wharf, allowing the handling of solid bulk and general cargo, in accordance with current environmental safety standards. Capacity expansion is connected with the expected increase in traffic volumes. Investments in the construction of the cargo terminal amount to 5 million euros. The terminal must be opened in the second half of 2023.

The total investment volume in the International Free Port of Giurgiulesti since its creation amounted to more than 100 million euros.

The operation of the port will help solve the country's river transport problems. Foreign specialists have calculated that investments in the development of shipping on the Prut River will pay off in 2.5 - 4 years. If the ships can reach Ungen, it can significantly revive the economy of the region. The Government needs to develop a plan of investment measures to develop the infrastructure of the port. An example can be the investment policy of other countries, in which the construction of new industrial sites are oriented towards water ports.

American experts have calculated that for 1 dollar of public funds invested in waterways, there are 25 dollars of private investment in the industry of riverside districts. As a result, the taxes received from these enterprises significantly exceed the initial sums of budget allocations.

The Republic of Moldova can increase the volumes shipped through the International Free Port of Giurgiulesti, for which the state authorities must consider the possibility of modernizing river and railway transport.

8.2 Ownership, administration and management

Legislation and applied Port Management Model

The economic activity in the Free International Port "Giurgiulesti" (hereinafter the International Port or GDP) is carried out in accordance with the provisions of the Investment Agreement "On the International Freeport" Giurgiulesti "between the Government of the Republic of Moldova and" Azpetrol "- SRL," Azertrans " - SRL, "Azpetrol Refinery" - SRL, approved by Law no. 7-XV of February 17, 2005, Law on the Free International Port "Giurgiulesti" no. 8-XV of February 17, 2005, the normative acts of and the Agreement between the Government of the Republic of Moldova and SCI "Danube Logistics" SRL of April 21, 2005.

Giurgiulesti port activity to be carried out in accordance with the following National Legal and Regulatory Framework:

LAW No. LP599 / 1999 of 30.09.1999 for the approval of the Code of commercial maritime navigation of the Republic of Moldova;

LAW No. LP176 / 2013 of 12.07.2013 regarding the internal naval transport of the Republic of Moldova;

DECISION No. HG546 / 2019 of 12.11.2019 for the approval of the Regulation on the arrangement and operation of temporary quays and related buildings on the inland waterways of the Republic of Moldova;

DECISION No. HG453 / 2008 of 24.03.2008 on the approval of the Concept for the development of naval transport in the Republic of Moldova;

Operational Directive No. 101-P of November 22, 2021 on the establishment of Requirements for the parking of non-self-propelled floating units in the Giurgiulesti Port Complex and in the undeveloped quay upstream of the Giurgiulesti Port Complex.

Port authority (port governance, port administration)

Danube Logistics SRL, general investor and operator of GIFP. De facto, the role of Danube Logistics is Port Authority and Port Operator in one.

The owner and operator of Giurgiulesti International Free Port (GIFP) is Danube Logistics SRL, a private entity. 100 % shareholder is the Dutch company Danube Logistics Holding BV. The ultimate owner is the European Bank for Restructuring and Development (EBRD).

As such GIFP is independently governing its port activities and has an own port agency that is responsible for coordination of vessel acceptance and port formalities as well as for support of ship owners. There is a state harbor master representing the state's interests in regard to navigation of vessels in the waters of Giurgiulesti.

Port land ownership

The territory at the shore of the Danube river and partially at the Prut river is leased to the general investor and operator of Giurgiulesti International Free Port (GIFP), Danube Logistics SRL, for a period of 99 years. Land plots of GIFP can be sub-leased to third parties on short- and long-term basis but cannot be sold.

GIFP has a special tax regime until 2030.

Port infrastructure ownership

The entire port infrastructure is authorities financed by Danube Logistics, no port or suprastructure is provided by state.

Third parties having residence status within GIFP (sub-leasing of land plot)

Port superstructure ownership

"Danube Logistics" limited liability company registered in the Republic of Moldova, is the general investor, owner and operator of the Giurgiulesti International Free Port.

The entire 120 ha area of the Giurgiulesti International Free Port has the status of a free economic zone.

Port operations

The total value of investments in the International Port, during its entire period of activity, according to the situation as of December 31, 2020, amounted to 74.9 million US dollars.

The preponderant part of the cumulative investments, since the establishment of the Port Internationally by the end of 2020, it is carried out by the General Investor, "Danube

Logistics" SRL, which has invested 51.6 million US dollars (about 68.89% of the total value of investments made in the International Port). "Trans Cargo Terminals" SRL, a subsidiary company of the Trans Oil Group of Companies, has built and manages the cereal terminal together with Danube Logistics. The cereal terminal, with a storage capacity of more than 50,000 metric tons, can receive up to 3000 metric tons of grain per day by means of car and rail transport.

SC "Trans Cargo Terminal" SRL, which carried out the construction and operation of the cereal terminal, made a cumulative investment of 14.2 million US dollars. "Trans Bulk Logistics" SRL, a subsidiary company of the Trans Oil Group of Companies, has built and managed the vegetable oil terminal with Danube Logistics. The terminal has a storage capacity of 6,000 metric tons and can receive vessels with a gross carrying capacity of up to 10,000 tons.

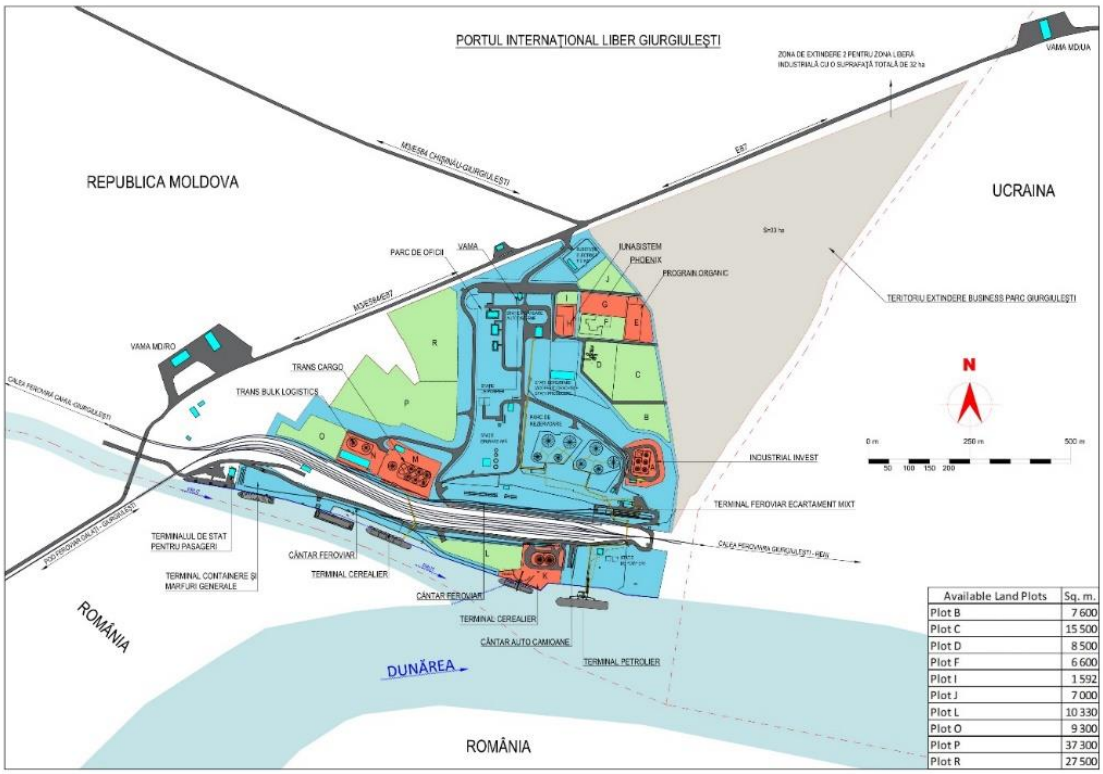
8.3 Port infrastructure.

In this context, GIFP (Figure 48) represents for its customers:

- the only direct river-maritime point of distribution and transhipment in/from the Republic of Moldova;

- a regional logistics centre at the border of the European Union with access to land, rail, river and sea communication routes;

- an excellent area for business development, due to its strategic positioning, trimodal transport infrastructure, cost-effective price environment and the single tax and customs regime.



Available Land Plots	Sq. m.
Plot B	7 600
Plot C	15 500
Plot D	8 500
Plot F	6 600
Plot I	1 592
Plot J	7 000
Plot L	10 330
Plot O	9 300
Plot P	37 300
Plot R	27 500

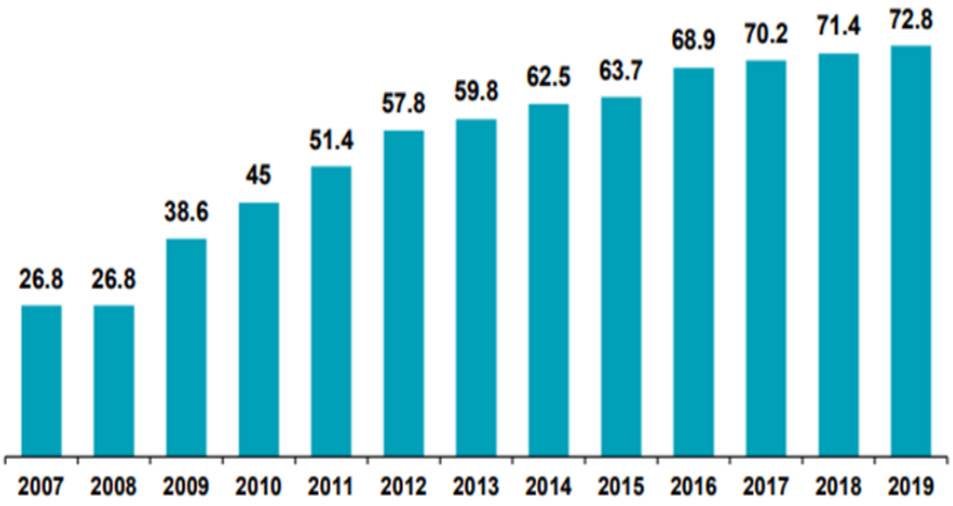
Figure 48. General plan of the Giurgiulesti port complex.

The total value of investments in the International Port, during its entire period of activity, according to the situation as of December 31, 2019, amounted to 72.8 million US dollars.

The preponderant part of the cumulative investments, from the moment of establishing the International Port until the end of 2019 (Figure 49), is made by the General Investor, "Danube Logistics" SRL, which invested 50.6 million US dollars (about 60% of the value total investment in the International Port). SC "Trans Cargo Terminal" SRL, which carried out the construction and operation of the cereal terminal, made investments of 13.8 million US dollars.

The territory of the port will be divided into 4 functional areas:

- Oil terminal;
- Transhipment terminal;
- Warehouse;
- Free economy zone;
-Administrative centre.



Source: Activity report of the International Free Port "Giurgiulesti" for 2019 prepared by the Ministry of Economy and Infrastructure

Figure 49: Cumulative value of investments made in PIL "Giurgiulesti" until 31.12.2019, mil. US dollars

The oil terminal - is owned and operated by Danube Logistics. The terminal (Figure 50) consists of a wharf on the Danube River, a tank farm consisting of eight tanks, truck loading facilities and, since mid-2012, loading/unloading facilities with mixed rail. The depth of the water at the hood of the oil terminal is at least 7 m and can therefore be accessed by both sea vessels and river barges. Up to three different types of petroleum products can be loaded or unloaded simultaneously from ships.

Source: www: gifp.md

Figure 50. Infrastructure elements of the petrolium terminal GIFP

Technical parameters:

- Trimodal transport infrastructure;

- Total storage capacity of 63,600 m3 provided by 8 tanks with a capacity ranging from 4,200 to 12,600 m3. Four of the eight tanks were equipped with floating roofs for the storage of gasoline and other easily flammable products;

- Maximum transhipment capacity of more than 2 million tonnes per year.

- Total loading/unloading capacity - maximum three different types of petroleum products simultaneously.

The cereal terminal (Figure 51) has been operating in the period of the Giurgiulesti International Free Port (GIFP) since July 2009. "Trans Cargo Terminals" SRL, a subsidiary company of the Trans Oil Group of Companies, has built and manages the cereal terminal together with Danube Logistics. The cereal terminal, with a storage capacity of more than 50,000 metric tons, can receive up to 3000 metric tons of grain per day by means of car and rail transport.

At the same time, vessels with a capacity of up to 7,000 metric tons can be loaded at a speed of up to 800 tonnes per hour through the two dans.

Source**:** www: gifp.md

Figure 51: Infrastructure elements of the cereal terminal GIFP

Source**:** www: gifp.md

Figure 52: Infrastructure elements of the cereal terminal GIFP

PILG's Vegetable Oil Terminal (Figure 52) has been operating since November 2011. "Trans Bulk Logistics" SRL, a subsidiary company of the Trans Oil Group of Companies, has built and managed the vegetable oil terminal with Danube Logistics. The terminal has a storage capacity of 6,000 metric tons and can receive vessels with a gross carrying capacity of up to 10,000 tons.

Source**:** www: gifp.md

Figure 53: Vegetable oil terminal

Figure 54: Bulk terminal

The bulk goods terminal (Figure 53) is located on the banks of the Prut River, on an area of 4 hectares, the Bulk Goods Terminal of GIFP is owned and managed by Danube Logistics. Through the terminal are transhipped mostly products of the type cox oil, crushed stone, coal and quarry aggregates. Transshipment shall be carried out, using the mobile port crane or floating crane, from ships directly into trucks, railway wagons or open warehouses.

Technical parameters:

• Trimodal transport infrastructure, consists of maximum 3 landings, with access to the road and railway systems of Russian and European standards;

• Open bulk cargo storage area: 160m x 35m = 5,600m2

General Goods and Containers Terminal has been in operation since January 2012 by Danube Logistics.

The terminal has (Figure 54; 55) an open storage space with an area of 2 hectares, direct connection to the railway and has 48 sockets for refrigerated containers. The terminal equipment consists of a Senebogen mobile port crane with a maximum lifting capacity of 70 tonnes, a forklift with an extensive Kalmar crane arm and two front forklifts. The minimum water depth at the terminal is 5 meters. Danube Logistics operates the weekly feeder service with the Container Terminal in the South Constanta Port of Romania.

Storage capacity: Open storage area of general cargo and containers: 60m x 45m = 2,700m2.

Table 15: Terminal infrastructure characteristics

Terminal infrastructure characteristics	Value	Unit/ Description	Notes
Multipurpose terminal	Yes	(Yes/No)	The terminal operates both containers and general cargo / bulk cargo
Specialized intermodal terminal	Yes	(Yes/No)	The terminal can conduct direct transhipment of cargo from ship, rail and trucks (in and out)
Total area	12650	(m^2)	
Storage area	8000	(m^2)	Both storage areas
Handling area	4650	(m^2)	
Interim (transit) storage capacity	300	TEU	
Depot (base) storage capacity	900	TEU	
Quay length at the terminal	160	(m)	
Rail length along the quay	100	(m)	
Capacity to handle block-trains	YES	(Yes/No)	
Maximum length of complete block-train	275	(m)	For direct transhipment 7 platforms, other in shunting line
Number of rail sidings for loading/unloading	1	(n)	For long-term storage area
Total length of rail sidings for loading/unloading	400	(m)	For long-term storage area
Number of road lanes for truck traffic	2	(n)	
Number of road lanes for truck loading/unloading	1	(n)	
Parking space for trucks / semitrailers	5	(n)	Inside the port area, more space outside
Number of fixed ramps (Ro-Ro)	1	(n)	90% finished Ro-Ro, finished at demand

Source: www: gifp.md

Figure 54: General Goods and Containers Terminal

Source**:** www: gifp.md

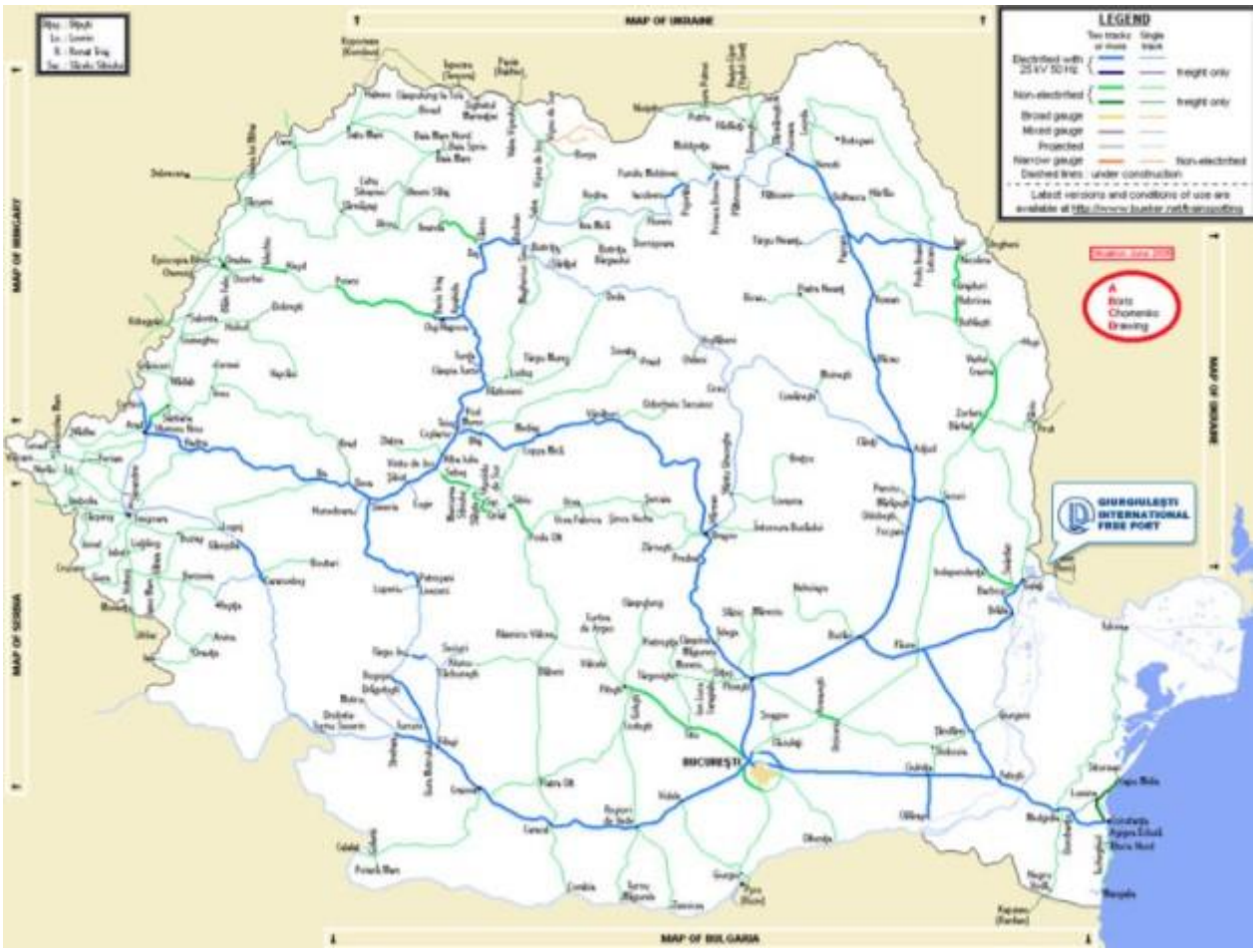
Figure 55. Infrastructure of General Goods and Containers Terminal

The Railway Terminal for the transfering of Liquid Products in Bulk is put into service by Danube Logistics in September 2014, being the first combined gauge railway terminal. The installation allows the transportation of liquid goods, dry and containerized goods on wide and narrow gauge railways (Figure 56).

Source**:** www: gifp.md

Figure 56: Wide and narrow gauge rail terminal

The fact gave the possibility to transport goods from/to Moldova, CIS countries and EU countries (Figure 57).



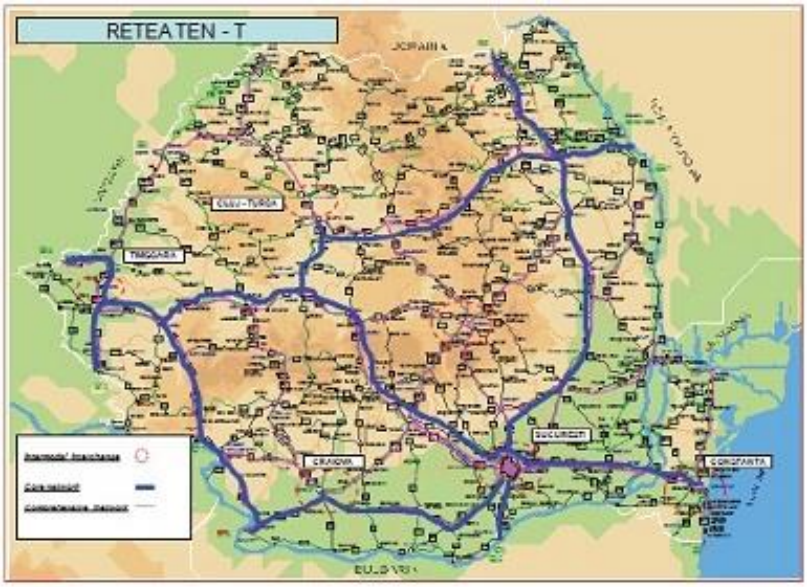
Source**:** www.gifp.md

Figure 57: Transport connection with narrow gauge Romanian rail network

The analysis of the strategic medium-term development plans of the transport infrastructure at national (Figure 58) and European (Figure 59) level, concludes that they are well thought out and coordinated.

Source: https://mei.gov.md/sites/default/files/roads_sector.pdf

Figure 58: Core and comprehensive national network transport as well as neighboring countries



Source:http://legislatie.just.ro/Public/FormaPrintabila/00000G3NJDV7FG7P3RC2GZ33ZMOWTI0U

Figure 59: The general and particular national context for promoting the TEN-T Network project on the Romanian territory

The basic national network is connected to the TEN-T network on the Romanian territory in three points:

- Trimodal (road-railway-river): Giurgiulesti - Galati;

- Bimodal (road-railway): Ungheni - Iasi;

- Monomodal (road): Leuseni - Albita.

The national network provides transport for the most important traffic flows that are registered on the routes: Chisinau - Balti - Mamaliga; Chisinau - Leuseni; Chisinau - Ungheni; Chisinau - Comrat - Cahul - Giurgiulesti. Implementation of road transport infrastructure rehabilitation plans will allow interconnection with major economic and urban centers and other intermodal transport nodes, such as ports and airports at a much more productive level, which will meet the requirements of the national economy.

The development of the road infrastructure in the direction of the connection points of the national network with the TEN-T network on the Romanian territory is in accordance with the stable increase of the import / export volumes between the Republic of Moldova and the EU (Figure 60).

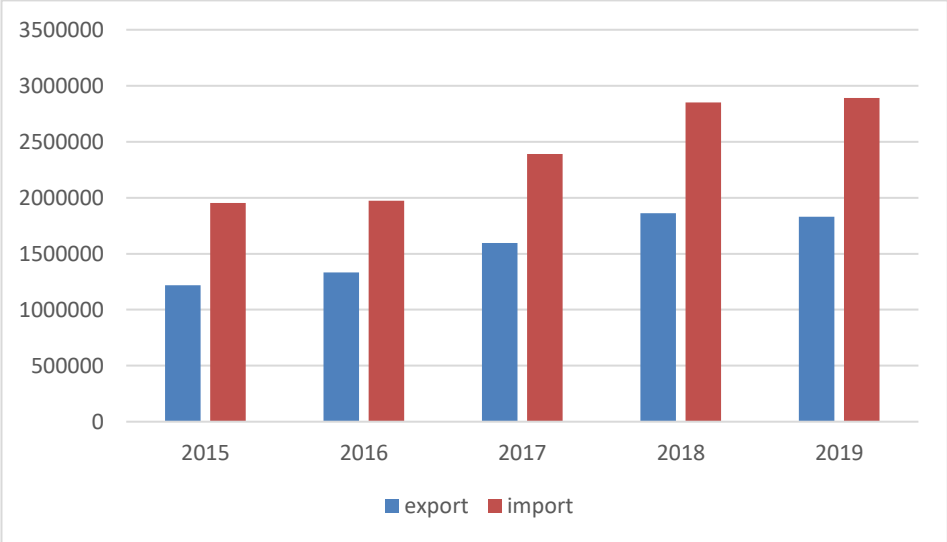


Figure 60: Dynamics of foreign trade between the Republic of Moldova and the EU, thousands of US dollars

The connection of the national transport infrastructure will open direct access to the main economic centers in Romania through road and railway routes to be modernized by 2030 (11), namely:
- Timisoara - Sebes - Turda - Tirgu Mures - Tirgu Neamt - Iasi - Ungheni;
- Calafat - Craiova - Alexandria - Bucharest - Constanta-Tulcea-Braila-Galati.

8.4 Superstructure port.

The container terminal consists of an open platform next to the quay, where the containers are being stored after discharge from vessel and for preparation of loading (2000m2). Most of the containers are stored of the secondary storage area in close proximity of about 600 m distance (6000m2). Next to the storage area is a container

stuffing zone with equipment for the grain exports in containers. There are further stuffing zones within the business park. The stripping area for containers is located inside the port, closer to customs office.

The building for field workers is located next to the berth, while the office building is located in the administrative area of the port.

In the port there are truck and rail weighbridges, that are used for containers and other cargo operated in the port.

Terminal handling equipment

- 1 mobile harbour crane with 80 to capacity
- 1 reach-stacker with 45 to capacity;
- 2 trucks with 40" platforms for port internal transport to storage area

Waterside handling equipment

In the Container Terminal there is a Mobile Harbour Crawler Crane, Sennebogen 6130R-HD. It is used for loading and unloading of containers, general cargo and dry bulk cargo. The crane with a crawler based undercarriage can move along the entire length of the berth and the platform in order to reach the target cargo. The harbour crane can be re-located to other terminals and to the second container storage area. Several attachments and grabs can be connected to the crane, for example various spreaders with different sizes in order to handle 20' /40' / 40' HC containers, as well as spreaders for handling big bags, electro-hydraulic bulk cargo grab, and other specialized attachments for heavy bulk cargo.

Table 16: Ship to shore cranes capable of handling containers

Ship to shore cranes capable of handling containers	Capacity (handlings/ hour)	Lifting capacity (t)	Manufacturer	Production year
Mobile Harbor Crane – Senneboghen 6130R-HD	18	80 T	**Sennebogen**	2011

Landside handling equipment

The Kalmar Reach Stacker is used in the port to handle the containers in the storage area, as well as load them on trucks or rail platforms. The Reach stacker is also equipped with special spreader to handle big bags.

Table 17: Reach stackers (RS)

Reach stackers (RS)	Capacity (handlings/ hour)	Lifting capacity (t)	Manufacturer	Production year
Kalmar DRF450 -60S5	n/a	45 T	**Kalmar**	2005

8.5 Port operations

Danube Logistics as operator of the port provides the following services:

- transshipment of liquid bulk, dry bulk, general cargo, container (currently suspended);

- port dues charged to ship owners;

- storage of oil products in tank farm, of dry bulk and general cargo in open and closed storage

areas;

- lease of land for short-term and long-term;

- documentation services e.g. for customs procedures;

- port internal logistics services, e.g. use of equipment, weighing;

- transportation services, internal and external.

In percentage terms, the services provided are distributed as follows:

- Transshipment and port services - 75%;

- Transport services - 10%;

- Rental services (mainly land lease) - 15%.

Services to cargo and containers

Besides operating the container terminal in Giurgiulesti International Free Port Danube Logistics acts as an international freight forwarder organizing for their clients the logistics services of delivering the containers from the requested loading point up to the final destination.

Also, in the port can be performed the following operations:

- Container stuffing
- Container Stripping
- Unloading of Vehicles from Containers
- Weighing of cargo / container
- Installation of flexitanks for liquid cargo
- Container cleaning and disinfection
- Container repair works (noncomplex jobs)
- Reefer container temperature management/ electricity supply

Table 18: Services offered

Services offered	Mark with X	Note
Container Stripping	x	If requested by client, the cargo is discharged from container / transshipped to other means of transportation

Services offered	Mark with X	Note
Container stuffing	x	Stuffing and lashing of the cargo inside the container using workers / forklift
Unloading of Vehicles from Containers	x	Unlashing of vehicles from containers, placing them on the ground back on wheels
Weighing of cargo / container	x	Weighing of the containers for VGM
Installation of flexitanks for liquid cargo	x	Services of container selection for flexitank, installation of the flexitank.
Container cleaning and disinfection	x	Cleaning the container solid particles / washing / disinfection
Container repair works	x	Repair of light damages, welding holes, changing handles / locks / bars
Storage	x	Short term storage of cargo, in covered warehouse of outside.
Inspection	x	If requested by customs

Maritime, inland waterway and rail liner and feeder services

Danube Logistics SRL, general investor and operator of Giurgiulesti International Free Port, is operating a container feeder transportation service between Giurgiulesti International Free Port and the Port of Constanta.

Volume: acc. to above table; all containers transshipped water-land via Danube Logistics feeder service;

Service: usually on weekly basis, adjustable to demand, up to max. 6 times per month;

Destinations: Constanta South Container Terminal DP World, SOCEP Terminal;

Containers: 20”, 40”, 40” HC, Reefer, Tank-containers

Fleet: is chartered depending on demand, two options:

(1) Short-sea maritime vessels taking the route via Sulina channel; or

(2) River barges, self-propelled or non-self-propelled, with one or two barges taking the route via Cernavoda channel;

The containers with POD Giurgiulesti are brought by liner vessels to port Constanta, from there are loaded onto the feeder vessel for delivery to Giurgiulesti International Free Port. The same applies the other way; containers with POL Giurgiulesti are loaded on feeder up to Constanta, from there loaded on big maritime vessels to be delivered to POD worldwide.

The container feeder service is currently suspended due to the poor harvest in the actual agricultural season 2020/21 and subsequent significant decrease of export volumes.

Table 19: Seagoing liner shipping services

Seagoing liner shipping services	Frequency	Traffic (TEU)				
		2016	2017	2018	2019	2020
Service 1 **Giurgiulesti-Constanta-Giurgiulesti**	1 voyage a week	9458	6273	6791	8047	1885

8.6 Port capacities.

Table20: Port capacities

Parameters	Explanation / Value
Port land owner (State, Region, Municipality, Private, Other)	State
Port authority name	Giurgiulesti International Free Port
Number of operators (concessionaires, lessors)	C.S. "Danube Logistics" SRL
Total port area (ha)	120
Maximum draught (m) - natural or dredged	7
Total number of terminals	4
Heavy lift and out-of-gauge handling capacity (Yes/No)	Yes
Ability to handle full block train along the quay (Yes/No)	No
Ability to handle full block train in the port area (Yes/No)	Yes
Transhipment equipment for intermodal transport (Yes/No)	Yes
Total quay length (vertical + sloped) (m)	780
Vertical quay length (m)	780
Sloped quay length (m)	0
Undeveloped quay length (m)	220
Max number of vessels handled at the same time	4
Max capacity of anchorage or waiting area for barges	2
Storage capacity (m2)	20000
Storage capacity for liquid cargos (m3)	63600 (petroleum products); 6000 (vegetable oils)

Parameters	Explanation / Value
Storage capacity (TEU)	210
Storage capacity (CEU - car equivalent unit, for Ro-Ro terminals)	-
Bunkering facilities within the port area (Yes/No)	Yes
Shore-side power supply for vessels (Yes/No)	Yes
Road conneection (Yes/No)	Yes
Rail connection (Yes/No)	Yes
Number of quay cranes of lifting capacity Q < 10 tons	0
Number of quay cranes of lifting capacity 10 < Q < 16 tons	1
Number of quay cranes of lifting capacity 16 < Q < 50 tons	0
Number of quay cranes of lifting capacity Q > 50 tons	1
Total number of quay cranes	2

8.7 Analysis of IWT development problems and proposed solutions

Overview of identified gaps and proposed solutions is given in the table below.

Table 21: Analysis of IWT development problems and proposed solutions

Type of gap or barrier	Gaps and barriers	Proposed solutions
Transport infrastructure	**railway transport infrastructure:** - low railway capacity; - Outdated infrastructure at the main railway terminals.	Rehabilitation of railway tracks in the direction of: - Central corridor: Chisinau-Ungheni; - southern corridor: Chisinau-Tighina-Basarabeaska-Etulia-Giurgiulesti, as well as Cahul-Giurgiulesti, Modernization of infrastructure at the railway stations of Chisinau and Bassarabeaska.

Type of gap or barrier	Gaps and barriers	Proposed solutions
	road transport infrastructure: - low capacity of some sections of the Chisinau-Giurgiulesti road; - low bearing capacity of the road on the section Slobozia Mare - Giurgiulesti. **river transport infrastructure;** - Shallowing on some sections of waterways on the Prut and Dniester rivers; - A high level of physical and moral deterioration of river vessels and floating equipment.	The construction of a bypass road around the city of Comrat will relieve the city of transit traffic and, as a result, solve the problem of traffic jams and air pollution. The necessary Comrat ring road will increase the capacity of the international highway M3. Construction of the M3 road bypassing the Slobozia Mare area, section km 0+ 000 - km 18 + 290 to remove the restrictions on the permissible mass on the axle of the car. Organization and implementation of channel hydraulic engineering works to maintain guaranteed depths in order to ensure the safety of navigation. Renewal of the fleet of river vessels for cargo and passenger transportation by attracting private investment. Organization of a modern repair base and technical control at the state enterprise River Port of Ungheni.
Logistic and transport gaps and barriers	**port infrastructure:** - short length of inland waterways with guaranteed depths for safe navigation, - no guaranteed depths in PPCG and GIFP ports;	Organization of work to maintain the waterway on the Prut River (E 80-07) on the Cahul - Semeni section (85-405 km). Organization and dredging of modern technical means in

Type of gap or barrier	Gaps and barriers	Proposed solutions
	- lack of a floating crane for complex dredging operations in PPCG and GIFP ports; - lack of modern equipment with high productivity for unloading and loading operations in the port of PPCG, - lack of a specialized cargo berth for loading grain agricultural products in the port of PPCG, - limited number of cargo berths in the port of PPCG, - unfinished construction and technical equipment of berths for bulk and general cargo in the port of GIFP, - lack of modern specialized warehouse infrastructure in the port of PPCG, **communication system:** - problems of functioning of a single electronic platform for the exchange of information,	accordance with the established work schedule. The State Enterprise River Port of Ungheni needs to purchase a floating crane to carry out drainage work in ports and waterways. It is necessary to purchase equipment of high capacity for unloading and loading of bulk cargo, The construction of a specialized cargo berth for loading grain agricultural products is an urgent task to increase the volume of traffic in the port of PPCG. It is necessary to build at least two cargo berths in accordance with the current technical requirements, as well as to equip them with modern equipment and infrastructure. It is necessary to complete the construction of cargo berths for bulk and general cargo in the port of GIFP. The official Operators of the PORT PPCG - the state enterprise "Ungheni River Port" should make efforts to attract public and private investment for the construction of

Type of gap or barrier	Gaps and barriers	Proposed solutions
	- problems in the functioning of the system for exchanging information with port agents, - low level of interaction with other modes of transport, low level of organization of mixed combinedtransportation; - problems of unification of transport documentation.	warehouse infrastructure in the port of PPCG. It is necessary to improve the system of information exchange between the ports of PPCG / GIFP and state institutions: Naval Agency of the Republic of Moldova; Customs Service of the Republic of Moldova; Border Police of the Republic of Moldova. It is necessary to improve the system of information exchange with port agents. Official Operators of the port GIFP – "Danube Logistics" SRL and PPCG - the state enterprise "Portul Fluvial Ungheni" should have long-term contracts with transport companies and the railway of the Republic of Moldova. Unification of transport documentation in accordance with international and European standards
Political and legal gaps and barriers	The lack of cooperation between the State Ecological Inspectorate and the technical sector of the "Ungheni River Port" in the organization of maintenance works of the internal navigable fairway of the Republic of Moldova.	An efficient mechanism for the application of the Regulation on the procedure for coordinating the performance and supervision of maintenance works of the internal fairway of the Republic of Moldova is to be created. The financing from the national budget for the maintenance

Type of gap or barrier	Gaps and barriers	Proposed solutions
	In the Republic of Moldova, works for the arrangement and maintenance of the fairway on the Prut and Dniester rivers in the necessary volumes are not carried out since 2015.	works of the internal fairway is to be carried out in the necessary volumes, but the execution of the budget is to be controlled.
	Harmonization of national regulations in accordance with European and international standards .	Periodic improvement of existing regulations and laws.
	Weak development of inland waterway transport.	Promotion of the policy of protectionism of inland water transport as one of the most economical, safe and environmentally friendly in the transportation of goods and passengers.
	Poorly developed inland water passenger transport.	Development of a policy for the development of the passenger transportation services market by providing preferential conditions for business development to water transport operators.
	Poorly developed market of tourist services in domestic transport.	
	The regime and laws of the neighboring states do not permanently coincide, which leads to problematization in the working procedures of the border services	Development of a tourism development strategy through the organization of tourist routes on inland waterways. Improving the quality of passenger and tourist service.
		In the case of recreational navigation, the itinerary and the rules for travel in the border waters shall be agreed with the Border Guard Service.
Trade gaps and barriers	A significant gap between the import and export of	It is necessary to develop new technologies for container transportation.

Type of gap or barrier	Gaps and barriers	Proposed solutions
	goods in international trade.	
Economic gaps and barriers	Lack of an effective system of attracting investors interested in the development of waterways and port infrastructure.	Creation of a mechanism for attracting and protecting investments. Development of a system of benefits in taxation of economic agents operating in the field of water transport.
	Lack of a system for protecting the economic interests of shipowners.	Creation of a functional system for the protection of the economic interests of ship owners of the Republic of Moldova.
	Outdated passenger and cargo fleet.	Creation of a mechanism for attracting private financial resources through preferential commercial loans.
	Insufficient level of economic development of the Southern region of the country.	Development of a strategy for strengthening the economic base for the socio-economic development of the regions in which inland waterway transport enterprises are located.
	Low level of cargo traffic on the Prut River.	It is necessary to equip a navigable fairway on the Prut River.
	Low profitability and competitiveness of economic activity of shipping companies.	Development of action plans to improve the profitability and competitiveness of the economic activities of shipping companies.

Type of gap or barrier	Gaps and barriers	Proposed solutions
Socio-economic and environmental gaps and barriers	Reduced availability of water for the deployment of navigation guaranteed on the Prut River. Increased water pollution. Lack of specialized vessels and technical means for the collection, processing and disposal of various types of waste. Poorly developed system of insurance of passengers and crew members of ships. Shortage of qualified personnel in the field of water transport.	Execution of maintenance work on the fairway in accordance with the stability schedule. Implementation of the periodical control system on behalf of the State Ecological Inspectorate. Shipping operators are to comply with measures to protect the environment. Acquisition of specialized vessels and technical means for the collection, processing and disposal of various types of waste from the operation of ships or in the elimination of the consequences of accidents with water transport, including sunken property. Creation of an effective mechanism for insuring passengers and crew members of ships. Creation of a system of sectoral training of qualified personnel in the field of water transport, expansion of scientific research.
Other gaps and barriers	Low demand for inland water transport services.	Creation of a stable portfolio of contracts for the transportation of goods in the mode of import and export.

8.8 Ecological aspects of GIFP activity.

The development of inland water transport in the country and the port complex of Giurgiulesti is carried out in accordance with the main provisions set out in the European Green Deal and the initiatives formulated by the European Federation of Inland Ports.

Inland ports can play a vital role not only as providers of alternative fuels, but also as clean energy hubs for industry, citizens and inland waterways.

An important direction in the decarbonization of transport processes is the reduction of fuel and energy costs per unit of transported cargo. To achieve this goal, it is necessary to accelerate the development of multimodal and rail transport, as well as the transport infrastructure necessary for this.

The direct potential danger of a negative impact on the environment in the area of Danube Logistics' production activities is primarily associated with the risk of oil products getting into the water in case of improper operation of the oil terminal, as well as railway and automobile rolling stock, loading equipment.

Given that the port is located in close proximity to the border with Ukraine and the water intake of the city of Reni is only three kilometers downstream, all possible risks were taken into account during the construction of the oil terminal and the latest technological equipment serviced by qualified personnel was used.

The equipment for transfusion of oil products (manufactured in Germany) ensures the tightness of the piping system and fittings (Figure 61).

The design of the platform ensures the collection of emergency leaks and storm drains from the platform and from the trays and directs them to a special well, from where they are transported by tankers to the treatment plant.

Figure 61: Oil transfer equipment

Since 2016, Danube Logistics SRL has been developing annual carbon footprint reports for its operations in Giurgiulesti International Free Port. To calculate the carbon footprint, Danube Logistics uses both a control-based approach and an activity-based approach.

The results of studies on greenhouse gas emissions show that most of the emissions in 2021 come from the category - diesel fuel and gas flaring. The increase in fuel consumption reflects the strong increase in transshipment volumes at the cargo terminal.

The main consumers of diesel fuel are cargo handling equipment, i.e. a mobile port crane and two loaders, accounting for 80% of the fuel consumption.Overall, the increase of transshipment volumes over the last five years together with the replacement of newer lighting technology are the major drivers for the reduction of CO2e emissions per ton of cargo transshipped.

As fossil fuel used for internal combustion engines is the major source of CO2 emissions, the control and optimization of diesel use for port equipment will remain important for both environmental and economic reasons. In the mid-term, it is recommended to procure electrical powered loading and unloading equipment in order to reduce the emissions.

Currently "Danube Logistics" SRL is carrying out the project of the construction of the universal quay on the banks of the Danube river in the area of the Giurgiulesti International Free Port, having the infrastructure already created for the import and export of general and bulk goods by sea.

Development of project documentation and construction of a cargo terminal is carried out in accordance with the environmental impact assessment.

Environmental impact assessment is a procedure carried out in accordance with the requirements of Directive 97/11/EC as amended by Directive 85/337/EEC on the assessment of the impact of certain public and private projects on the environment. Article 2 requires that “Member States take all measures necessary to ensure that, prior to the approval of projects that have the potential to have a significant environmental impact due to, inter alia, their nature, scale or location, developing and evaluating its consequences.”

9. GIFP development plan.

9.1 General aims and objectives of the plan.

Vision

Giurgiulesti International Free Port will become a regional logistics center integrated in international trade flows and a maritime gateway to and from the European Union.

Mission

The Giurgiulesti International Free Port will ensure the connection with the European Union and will attract goods from neighboring countries, as a strategic triple-modal port positioned on the Central Rhine-Danube TEN-T Corridor.

As part of its mission, GIFP aims to:

- To contribute to improving the connectivity of the Republic of Moldova with the Danube macroregion and the Black Sea economic space.
- To facilitate the optimal integration and interconnection of maritime transport with other modes of transport.
- To capitalize on its potential by positioning itself as the main point of connection between the TEN-T network and the national rail and road transport networks.
- To contribute to the expansion of the EU internal market and the development of trade with neighboring countries
- To support the reduction of economic and social development disparities of the South region compared to the other regions of the country.
- General objectives
- The Giurgiulesti Free International Port proposes the following general objectives with a horizon of achievement in the year 2035:
- Attracting a traffic of 2 million tons/year until 2035.
- Transforming the port community into an important employer in the region.
- Increasing the port community's contribution to sustainable economic development at the local and regional level.environmental solutions (clean fuel facilities, port handling equipment using alternative fuels, use of solar power, waste management).

· Transformation of GIFP into a highly competitive port with a developed capital infrastructure and modern high performance equipment.

· Attraction of investments from state and European funds to upgrade the transport infrastructure connecting the port with the hinterland of the Republic of Moldova and major logistics centers in Romania.

9.2 Major and potential port users.

Currently in port:

- Two operators offer transshipment services;

- Two companies offer equipment rental services;

- Three offices of customs brokers, offering customs documentation services;

- One operator offers indoor storage services;

- One operator offers an open warehouse and office rental.

The main potential users of the port include:

- large transport and logistics companies for the carriage of goods: Moldovan railway, Gamma Logistics LTD, Cargo-Master LTD, Moldcontainer LTD, Pro-Logistic LTD, Simplextrans LTD, Translogistic LTD;

- agro-industrial holdings.

Recently, activity in the port has intensified: the volume of exports of goods has increased 3 times, and the number of applications has increased by about 400%, which confirms the importance of Giurgiulesti as a trading platform for exporters and importers in the country.

9.3 Comparative analysis of GIFP activity.

In order to assess the place of GIFP at the regional level, a comparative analysis of its activities was carried out using the SWOT analysis method, which makes it possible to identify the strengths and weaknesses of the object of study.

The SWOT analysis is one of the key elements that form the basis of a well-founded strategy.

Based on this analysis, GIFP's objectives and strategic development directions were formulated.

In the following, the synthesis of strengths, weaknesses, opportunities and threats identified at the level of the GIFP community is presented.

Table 22: GIFP activity SWOT analysis

Strengths	Weaknesses
The port is an important strategic facility for the state transport sector.	Restrictions on the depth of the Sulina Canal.
The location on the sea section of the Danube opens communication channels in various directions.	Problems with navigation in the winter season.
Railways of the Russian and European gauge.	Inefficient dredging system to maintain depth in port.
Strategic position on the eastern border of the EU.	Limited number of port berths for loading/unloading ships.
The port complex of Giurgiulesti is one of the transport hubs of the trans-European transport network.	Incomplete capital construction of river berths.
The Free International Port of Giurgiulesti has a business park with the status of a free economic zone.	Limited offer of logistics services.
	A high level of wear and tear on the railway lines that provide communication with the hinterland.
	Inefficient transport links with major industrial and logistics centers.

Qualified personnel and available labor force in the region.

Efficient facilities for the collection of waste and residues from ships.

Availability of a customs office in the port.

Availability of territory for the expansion of logistics infrastructure.

Excessive bureaucracy and cumbersome procedures associated with customs clearance and border crossing activities.

Insufficient participation of the port community in scientific and innovative activities.

Opportunities

Availability of available European funds for

development of transport and port infrastructure.

Use of free capacities.

Creation of a logistics center on the territory of the Business Park with a developed infrastructure designed, among other things, for the storage of state reserves.

Development of navigation along the Prut River to the city of Ungheni.

European Union support for development

water transport.

Decarbonization strategy.

Regional European policy in the zone Danube and Black Sea

New markets for exports and imports.

Improvement of navigation conditions.

Using the Opportunity cooperation with the large seaport of Constanta.

Training of qualified port specialists in accordance with the current requirements of the industry.

Introduction of modern technologies for organizing transshipment operations in the port.

Availability of cargo flows with high potential to attract to the port.

Threats

Competition with ports from neighboring countries

The decline of industrial production in the region

The economic situation of port operators and

service providers.

Tightening environmental regulations for ports and high the cost of implementing environmental legislation.

The risk of delays in the implementation of major

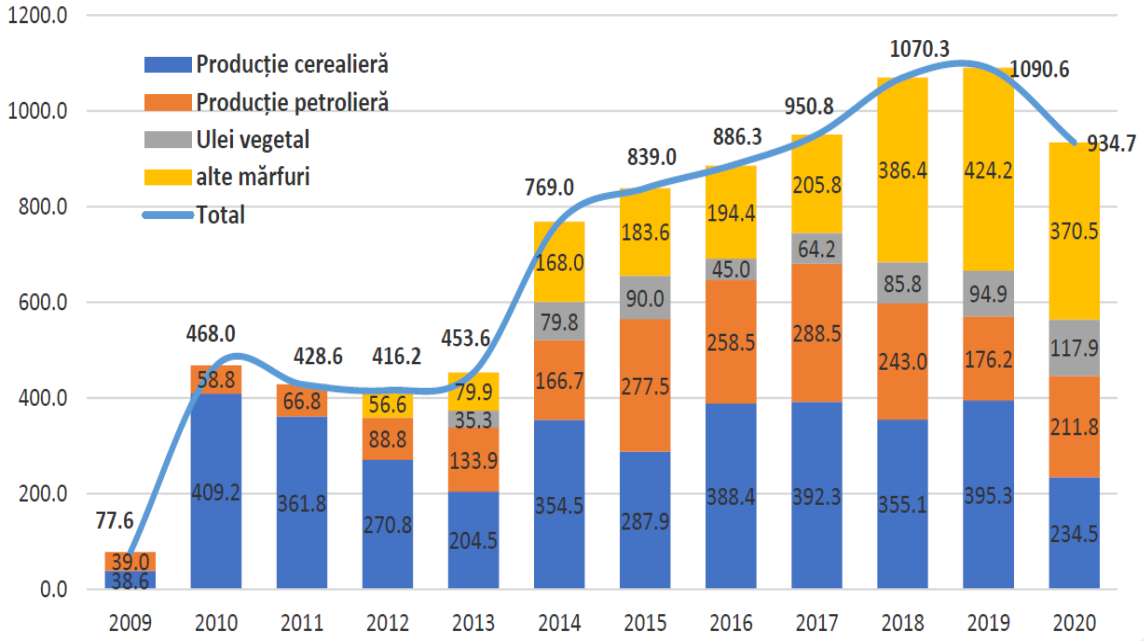
infrastructure projects.

Modernization and development of railways in the Republic of Moldova and Romania.

9.4 Cargo statistics.

The analysis of the goods transported through Giurgiulesti International Free Ports (GIFP) shows (Figure 62) that the port operators are specialized in transporting two groups of agricultural production: grain & seeds and vegetable oil. Over the last few years transport volumes of these agricultural production groups have practically stabilized at one level.

Source**:** Information Danube Logistics SRL

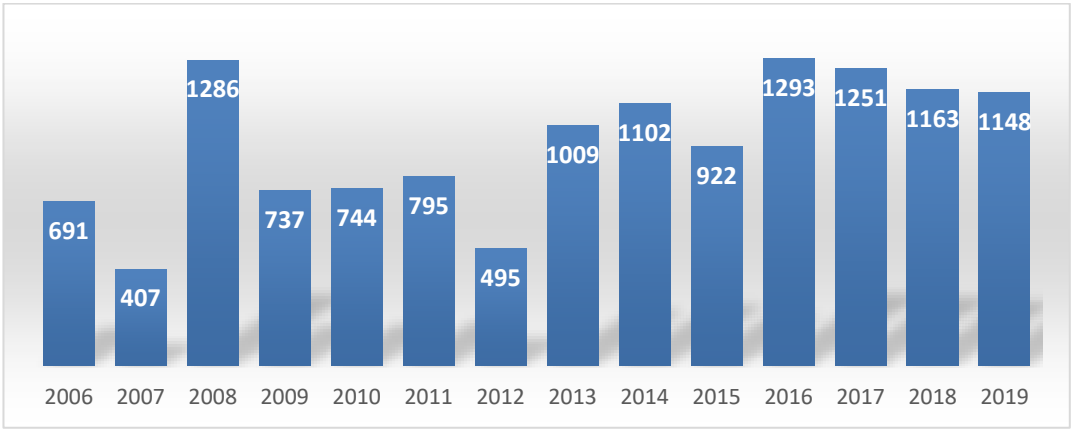


Source: Ministry of Economy

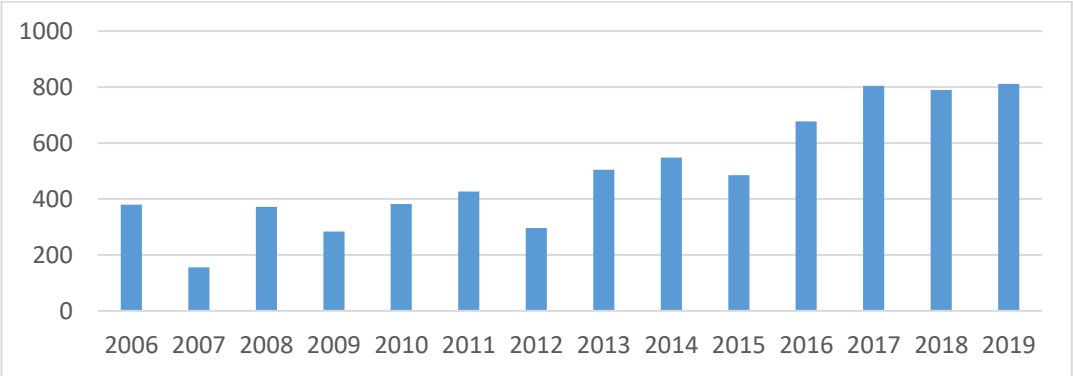
Figure 62: The volume of cargo transhipped through GIFP, by types of production, the situation on 31.12.2020, thousands of tons

Dynamics of annual production at national level of the main groups of agricultural products transported by GIFP (a) - wheat; b) - sunflower; c) - corn for grain) is shown in Figure 63.

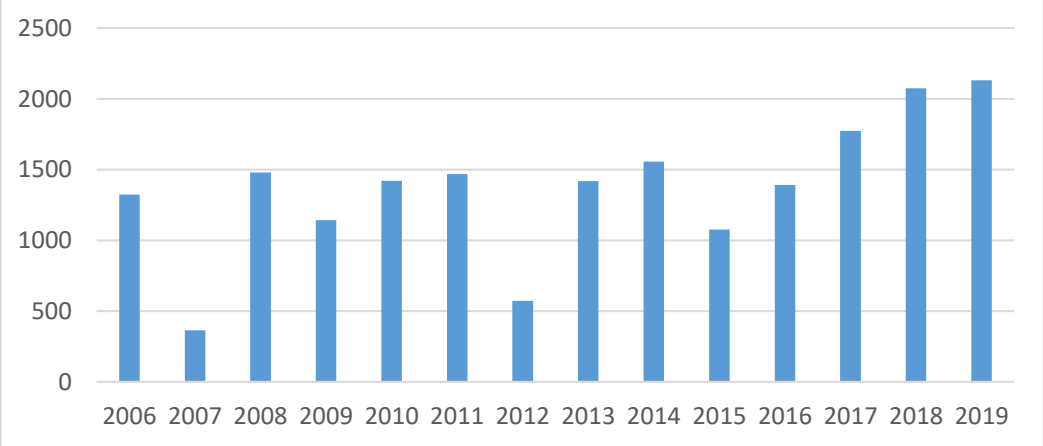
The data analysis concludes that over the last five years the national agricultural sector has come out at a stable level of production of these products.



a) Dynamics of annual wheat production, thousands of tons



b) Dynamics of annual sunflower production, thousands of tons



c) Dynamics of annual maize production for grains, thousands of tons

Figure 63 - a,b,c: Dynamics of production at national level of the main groups of agricultural products transported by GIFP

It can be argued that these volumes have the maximum national cereal production potential.

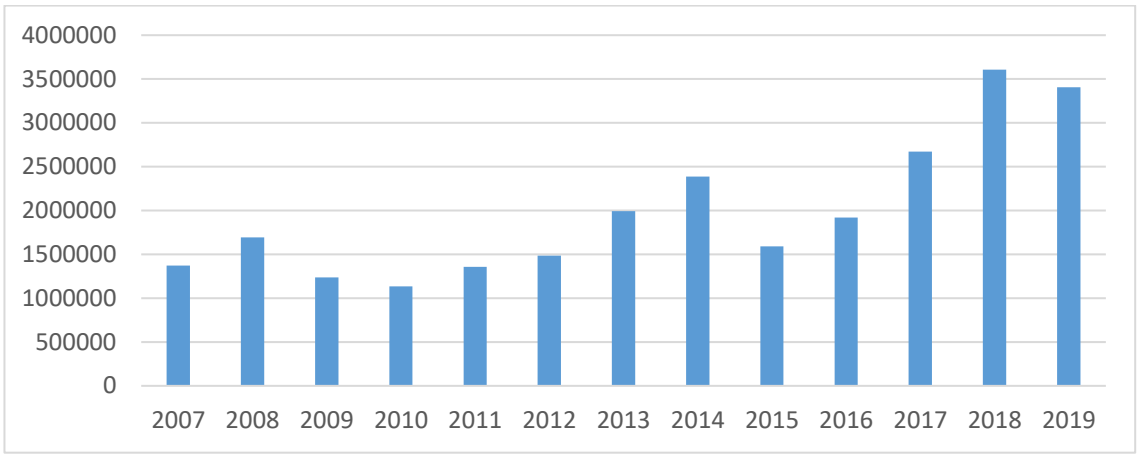
As a result, transport volumes of cereals and vegetable oils have also stabilized in recent years. The comparison of the data leads to the conclusion that about 25-33% of the annual volume of cereals produced nationally are exported through GIFP.

One of the priority directions for increasing the volume of transport of agricultural goods through GIFP is the expansion of logistics services associated primarily with warehousing and processing of primary products. SC „Trans Cargo Terminal" SRL works actively in this direction, which carried out the construction and operation of the cereal terminal with investments of 13.5 million US dollars until 2017.

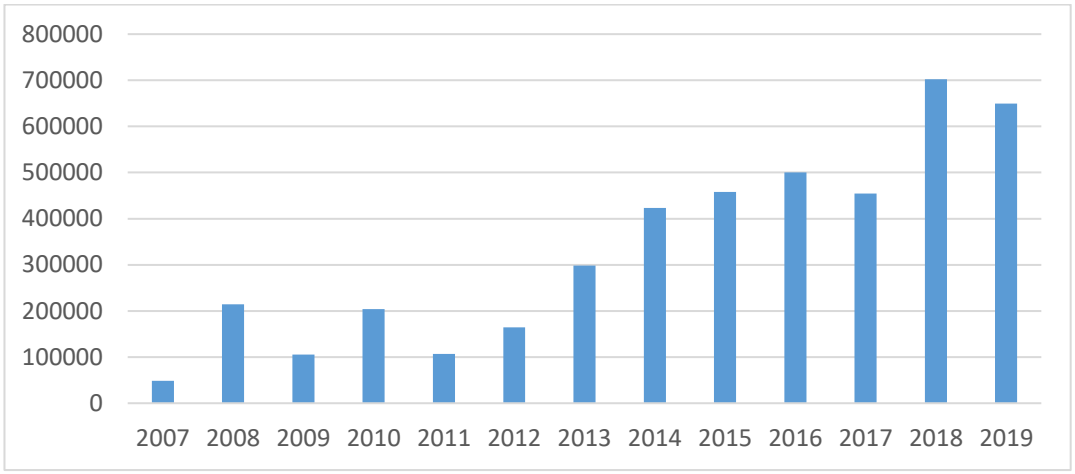
In recent years the TRANS-OIL GROUP of COMPANIES accelerator has set up its sunflower oil plant (Figure 64) within the GIFP Business Park.

Figure 64: Construction of the modern sunflower oil factory within the GIFP Business Park (2020).

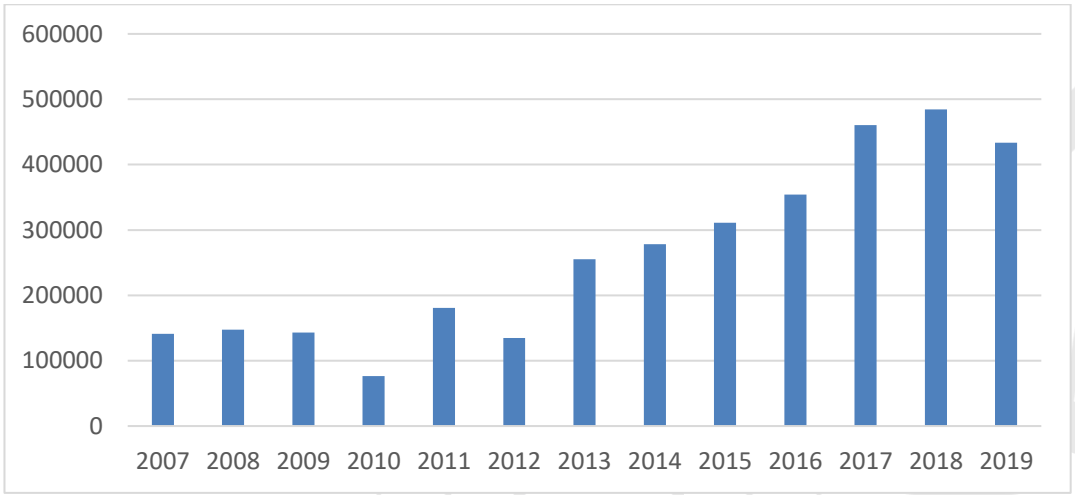
Another promising area is related to the organization of the transport of perishable products, namely fruit. Such transport is technologically more complicated and expensive, as well as seasonal. But all these problems can be solved. One of the reasons for solving them is the steady increase in fruit production volumes of the national agricultural sector (Figure 65).



a) Dynamics of annual production of apples, quintals



b) Dynamics of annual production of plums, quintals



c) Dynamics of annual production of live table varieties, quintals

Figure 65 a,b,c - Dynamics of national production of the main types of fruits.

Data analysis (Figure 65) shows that over the past five years there has been a growing interest in indigenous farmers in the production of fruit and live table varieties. Their production volume has practically doubled and is stable in production.

At the moment these products are transported by the fleet of car refrigerators. However, there are opportunities to transport fruit varieties with refrigerated containers, preferably over long distances.

Table 23: Bulk and general cargo volumes (by the product commodity groups, incl. autos), (2017-2019)

mt	2017	2018	2019
Petroleum oil products	268,300	219,700	162,500
Vegetable oil	67,000	88,100	97,700
Grain & seeds	409,400	373,900	416,100
Construction materials	33,100	163,700	151,400
Coal & petcoke	60,900	99,800	124,400
General cargo	10,800	18,300	20,800
Cargo containerized	83,000	83,600	104,000
Total	**932,500**	**1,047,100**	**1,076,900**

Cargo Handling Rates, mt/day, TEU/day (by stevedore operators):

Table 24: Giurgiulesti port (oil products, grain, bulks, TEU).

Cargo	mt/day
Petroleum oil products	5,500
Grain	4,000
Aggregates	2,500
Coal & petcoke	1,800
Container TEU/day	250

Note: Cargo handling rates are real average handling rates at berth including arrival and departure procedures and all interruptions such as waiting times, technical breaks etc.

Cargo flows in tons, TEU: total volume, import, export, domestic cabotage, transit (2017-2019)

Table 25: Cargo flows in tons, TEU

mt	2017	2018	2019
Imports	365,200	518,100	449,600
Exports	567,300	529,000	627,300
Total	**932,500**	**1,047,100**	**1,076,900**
TEU	6,273	6,791	8,042

9.5 Assessment of the prospects for increasing the volume of transportation of agricultural products

9.5.1 The potential for increasing volumes.

The Republic of Moldova is located in the south-eastern central part of Europe, to the west it is bordered by the Prut River, which borders Romania, and to the North, East and South it borders Ukraine. The area of the Republic of Moldova is 33,846 km2, and

the territory has a stretch from North to South of 339 km, from West to East – 155 km. Most of the territory is formed by the hilly plateau between Prut and Nistru. Although the northern part of the country is hilly, but the highest peaks do not exceed 430 m (the highest point being Balanesti Hill). The central and northern part of the country is located on the Codru Plateau, and the southern part - on the Bugeac Plain. Cultivable areas occupy 53% of the area of the Republic of Moldova, those for cereal cultivation - 14%, pastures - 13%, forests - 9%. Other areas, including non-productive land, make up 11% of the country's territory. Soils are generally of average quality.

The climate of the Republic of Moldova is temperate continental. The summers are long and warm with average temperatures above 20 °C, winters are poor in precipitation and in January the average temperature is around -4 °C. The amount of rainfall varies drastically, drought periods are often, but multiannual averages of precipitation fall between 400 mm in the south and 600 mm in the north. Most rainfalls occur in March and October, with most floods occurence.

The territory of the country is crossed by more than 3200 rivers which consist of rivers and permanent streams, 90% of which have a length of less than 10 km and only 9 of more than 100 km. The largest rivers and main water sources is the Dniester with a length of 1345 km and the Prut with a length of 967 km, which spring from the Carpathian mountains of Ukraine, and for the Republic of Moldova are border rivers. Within its current borders, the Republic of Moldova has 569 m from the left bank of the Danube at its confluence with the Prut. The most important internal watercourse is the river Raut.

Table 26: Main rivers on the territory of the Republic of Moldova

Name of the river	Length of the river, km	Area basin, km²
Dniester	657	19 070
Prut	695	7 990
Raut	286	7 760

In 2020, MARDE initiated the process of elaboration of the National Strategy for the Development of Agriculture and Rural Environment 2021-2030, which will contribute to the implementation of Pillar 1 and 4 of the National Development Strategy "Moldova 2030", respecting the commitments on the implementation of the 2030 Sustainable Development Agenda, and its adaptation to the development needs of the sector, the Moldova-European Union Association Agreement, while ensuring , the continuity of the activities planned for the National Agricultural and Rural Development Strategy for the years 2014-2020, approved by Government Decision No. 409 of 04.06.2014, such as:

- reducing the level of poverty in rural areas;

- increasing the competitiveness of the agricultural food sector;

- adaptation of agricultural producers to climate change;

- stimulating the growth of strategic agricultural and business activities in rural areas.

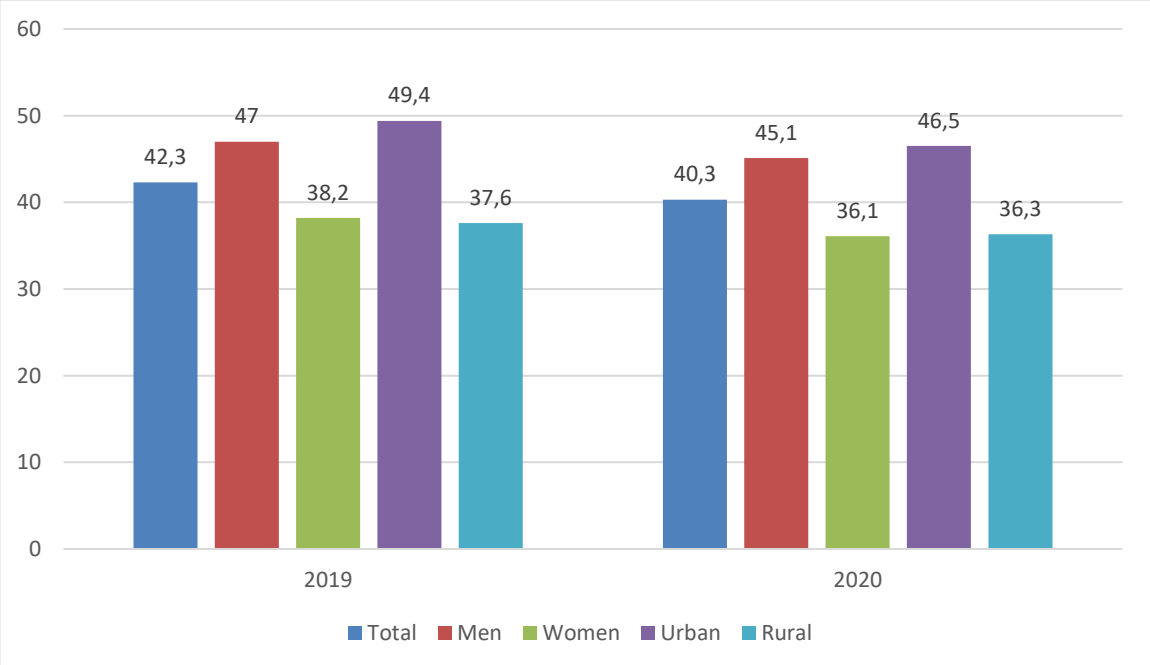
Within the Rural Programme of Inclusive Economic-Climate Resilience (RPIECR), funded by the Global Environment Facility (GEF) and implemented by the Consolidated Unit for the Implementation of the International Fund for Agricultural Development Programmes, particular attention is paid to the increase of the capacity of agricultural enterprises to adapt to climate change, which will enable them to overcome the critical environmental challenges , through investments in productive rural infrastructure.

In this context, according to the information placed on the official website, on 18.02.2021, MARDE finalised the scopes and structure of the National Strategy for Agricultural and Rural Development 2021-2030, with the support of the twinning project "Additional support for agriculture, rural development and food safety in the Republic of Moldova".

Note: The twinning project "Additional support for agriculture, rural development and food safety in the Republic of Moldova", started on 01.09.2020, is financed by the European Union with a budget of 2 million Euro. The project provides the necessary assistance to MARDE, the Agriculture Intervention and Payments Agency (AIPA) and the National Food Safety Agency (NFSA) with a view to strengthening institutional capacities in order to fulfil the commitments made according to the Association Agreement (AA).
Agriculture continues to be an important sector in the economy of the Republic of Moldova, but is currently in decline. According to NBS data, in 2020, the contribution of agriculture, forestry and fisheries to gross domestic product (GDP) amounted to 9,5.
The macroeconomic environment of the Republic of Moldova is similar to that of the countries, covered by the European Neighbourhood Policy (ENP) and other countries

in the region, but differs from that of the EU Member States. If we represent the share of the gross value added of agriculture in the region's GDP, we can see that agriculture plays a vital role in Eastern European economies, with its contribution accounting for around 10% of GDP over the past decade.
However, agricultural production shows slow and unstable growth due to external factors (climate conditions). Over the past two decades, agriculture has shown much slower and unstable growth trends compared to other sectors of the economy. One of the main causes is the dependence of agriculture on climatic conditions - drought has become a very common phenomenon in recent years. The high instability of agricultural production is a consequence of poorly developed instruments to mitigate risks related to climatic conditions, including insufficient access to irrigation, low application of modern agricultural technologies (drought-resistant varieties, anti-hail protection instruments) and the lack of innovative insurance schemes in agriculture, such as the climate index insurance programme. Another reason for slowing agricultural production is the economic crises leading to higher input prices (e.g. chemical fertilizers, fuel, machinery), causing difficulties for agricultural producers.
According to provisional data of the NBS, on 01.01.2020, the population of the Republic of Moldova constituted 2,640, 4 thousand people.

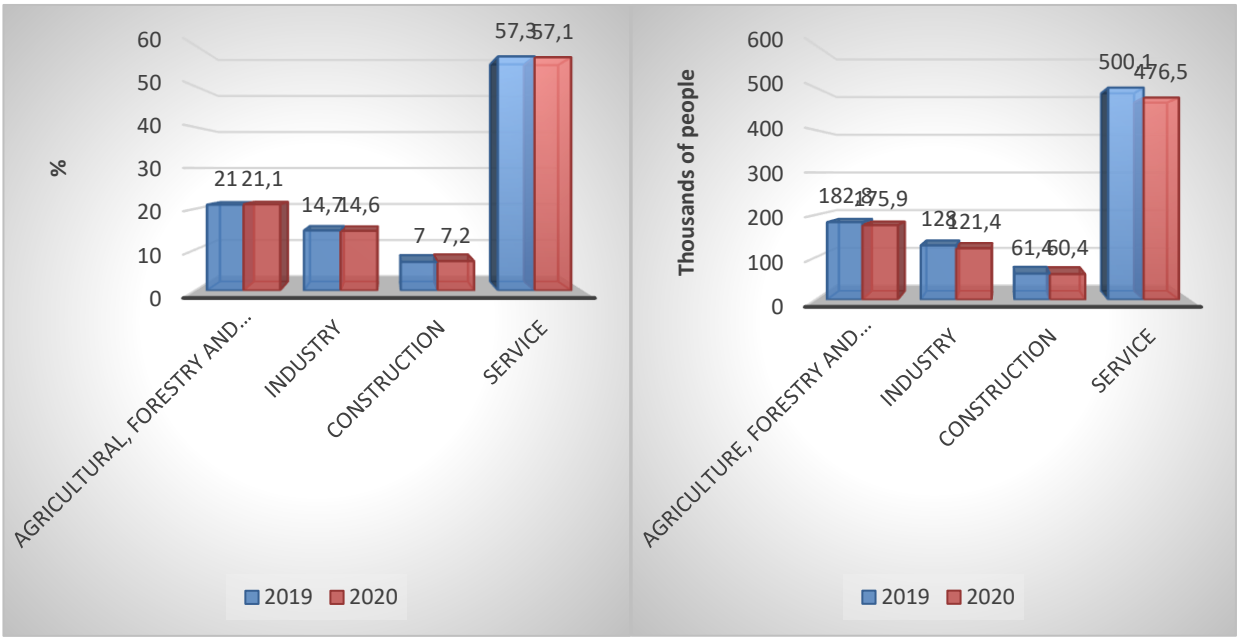
The employment rate in agriculture of the Republic of Moldova remains important, but is also in decline, both in absolute and relative terms. The analysis of the results of the Labour Force Survey (hereinafter - AFM) shows that in 2020 the workforce (active population) of the Republic of Moldova, which includes the employed population plus the unemployed, constituted 867.3 thousand people, decreasing by 5.7% compared to 2019 (919.3 thousand). In the labour force, the share of men (52.4%) was higher than that of women (47.6%), and the share of economically active people in rural areas was higher than the share in urban areas (54.4% and 45.6% respectively).



Source: NBS (2021)

Figure 66. Share of labour force, 2019-2020

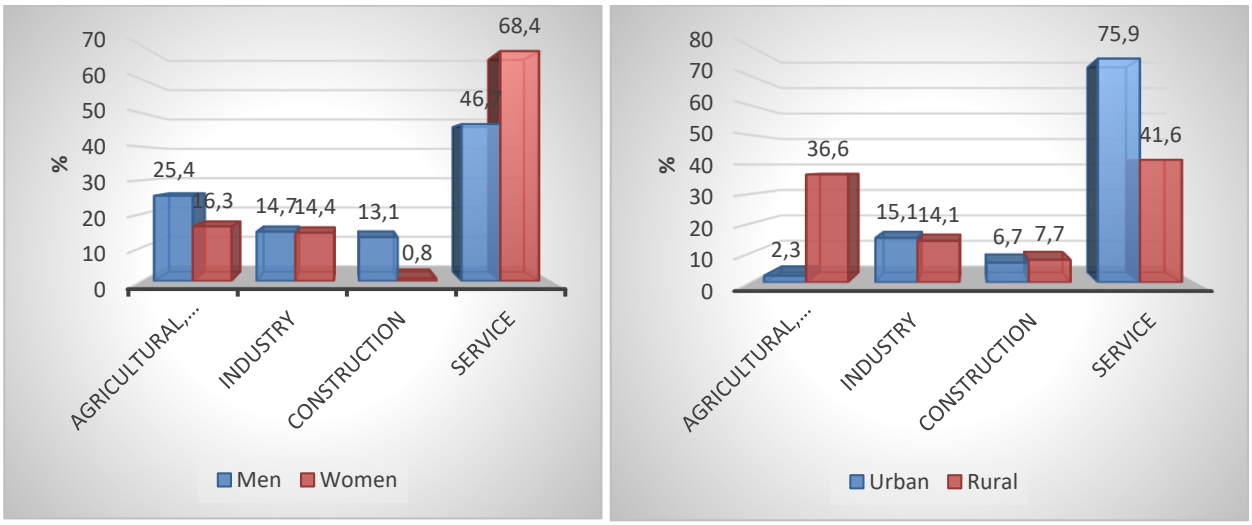
According to the survey, the distribution of people employed in economic activity shows that, in 2020, 175.9 thousand people or 21.1% of the total employed people (in 2019 - 182.8 thousand and 21.0% respectively)were empoyed in the agricultural sector. In non-agricultural activities, 658.3 thousand people were employed, decreasing by 4.5% compared to 2019 (689.5 thousand), the share of people employed in industry was 14.6% (in 2019 – 14.7%), including manufacturing with 11.7% (according to SDG indicator 9.2.2) (in 2019 – 12.1%), and in construction 7.2% (in 2019 – 7.0%). The number of people employed in the industry was 121.4 thousand, decreasing in comparison with the level of last year by 5.2%, and in construction it was 60.4 thousand, decreasing by 1.6% compared to 2019. In the services sector, 476.5 thousand or 57.1% of all employed people were active, the number decreasing by 4.7% compared to 2019 (500.1 thousand or 57.3% of the total people employed in 2019).



Source: NBS (2021)

Figure 67. Statistics of the employed population in economic activities, 2019-2020

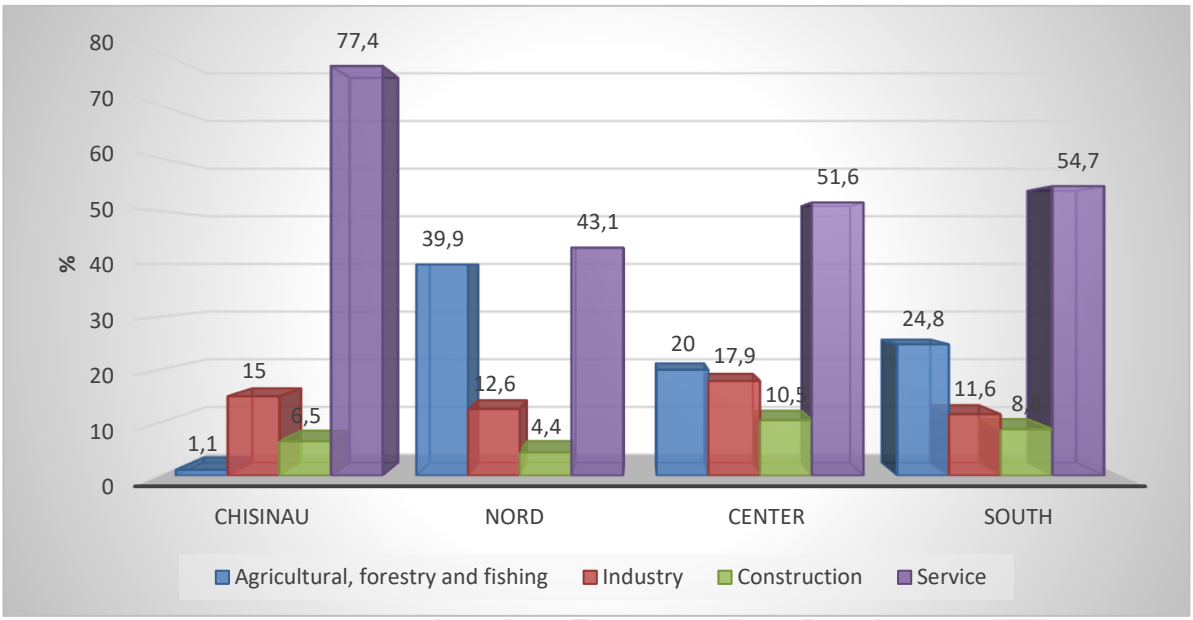
Of all non-agricultural activities, the services sector has the highest discrepancies in the population employed by sex (21.7 p.p. higher for employed women) and by average (34.4 p.p. higher for the urban employed population).



Source: NBS (2021)

Figure 68. Statistics of employed population in economic activities by sex and average, 2019-2020

Referring to territorial aspect, 29.6% of the employed population operates in Chisinau. At a relatively small difference of 30.1% of total occupancy , the Northern region is followed by the Central region with 25.8% and the South region, respectively, with 14.5%. The analysis of the distribution of employment in economic activities reveals that the services sector predominates in all statistical regions, showing values between 43% and 77%, industry and construction predominate in the Central region (17.9% industry and 10.5% construction respectively) and the agriculture sector – in the North region (39.9%).

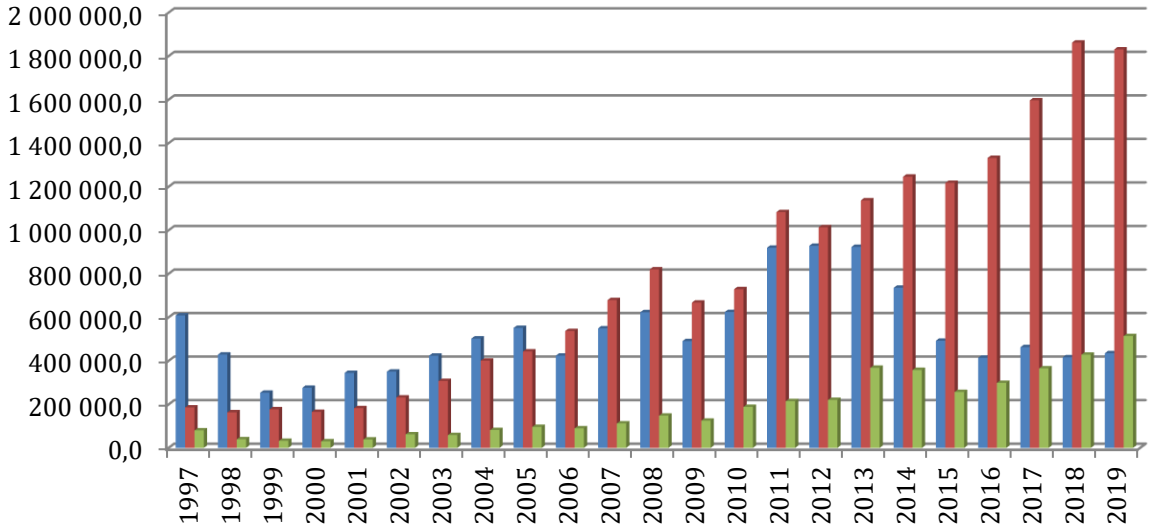


Source: NBS (2021)

Figure 69: Statistics of employed population by regions and by activities, 2020

Although the agricultural sector continued to play an important role as an occupational opportunity, representative rates and the number of employees in the sector have decreased. Agricultural workers have either found employment opportunities in the developing services sector or have been forced by the structural process to migrate. Rapid structural changes in the country's economy have led to new employment opportunities in non-agricultural sectors, thus making the migration of the population from rural areas conditional. Due to the increasing employment opportunities outside the agricultural sector, the migration process has evolved in two directions: internal migration, from rural to urban areas and external migration to foreign markets, in search of higher incomes. EU markets have particularly attracted women (as domestic staff and nurses), while men have migrated mainly to Russia, engaging in the construction sector. This phenomenon has had a strong negative impact on the availability of a young and mobile workforce in rural areas.
Although the employment rate in agriculture is declining, the agricultural sector continues to play an important socio-economic role. Clearly, agriculture remains one of the most important employers in the economy, being also an employer of last resort. The main cause that led people to remain in the agricultural sector could be rising agricultural prices and improving trade conditions in that sector in recent years. During the economic crisis, the agricultural sector served as a social buffer, with a large number of people returning to agriculture in the absence of better employment opportunities. The decrease in the employment rate in agriculture together with the increase in the production of the sector led to an increase in labour productivity in agriculture of the Republic of Moldova.
Domestic demand has largely increased because of money sent from abroad and has become more sophisticated, with consumers looking for bigger diversity of food and higher value-added tax. In analysing the structure of agri-food imports it is noted that the most popular imported products are those of relatively high value: tobacco, fresh fruit and vegetables in the off-season and alcoholic beverages. However, domestic supply is not prepared to cope with these demand changes for a number of reasons, such as: low processing capacity, primary production vulnerable to climatic factors, incomplete value chains, etc.

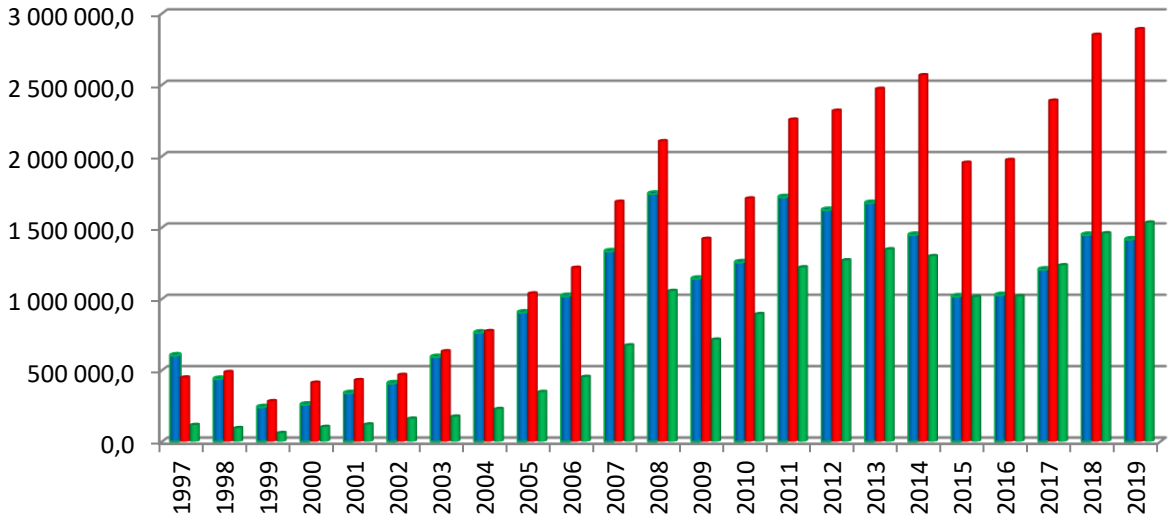
The main partners of the Republic of Moldova in agri-food trade are the EU and CIS countries, where 90% of agri-food products were exported. According to the products exported in the period 2006-2019, the main export destinations for agri-food products from the Republic of Moldova were Romania, Germany, Belarus and Ukraine, accounting for 60% of total agri-food exports for 2019. It is important to note that the share of agri-food exports from the Republic of Moldova to CIS countries decreased by 30% in the years 2000-2015, and in the last three years it has decreased to a quarter compared to the volume of exports to EU countries (see Figure 70). A study carried out by Expert-Grup in 2017 on trade flows between the Republic of Moldova and EU countries showed a positive development of all aspects. There has been an increase in export volume to 7 major EU trade destinations. Romania has become one of the main trading partners in the region, accounting for 25% of the volume of exports to EU countries.



Source: NBS (2021)

Figure 70: Structure of exports by groups of countries, $ USA

Regarding agri-food imports, the share of CIS countries in total agri-food imports over the past two years has remained at a constant level (see Figure 71). According to the products marketed in 2008-2019, imports of agri-food products to the Republic of Moldova were mainly done from Ukraine, Romania, Turkey, Poland and Germany, together accounting for 50% of the total agri-food imports made in 2019.

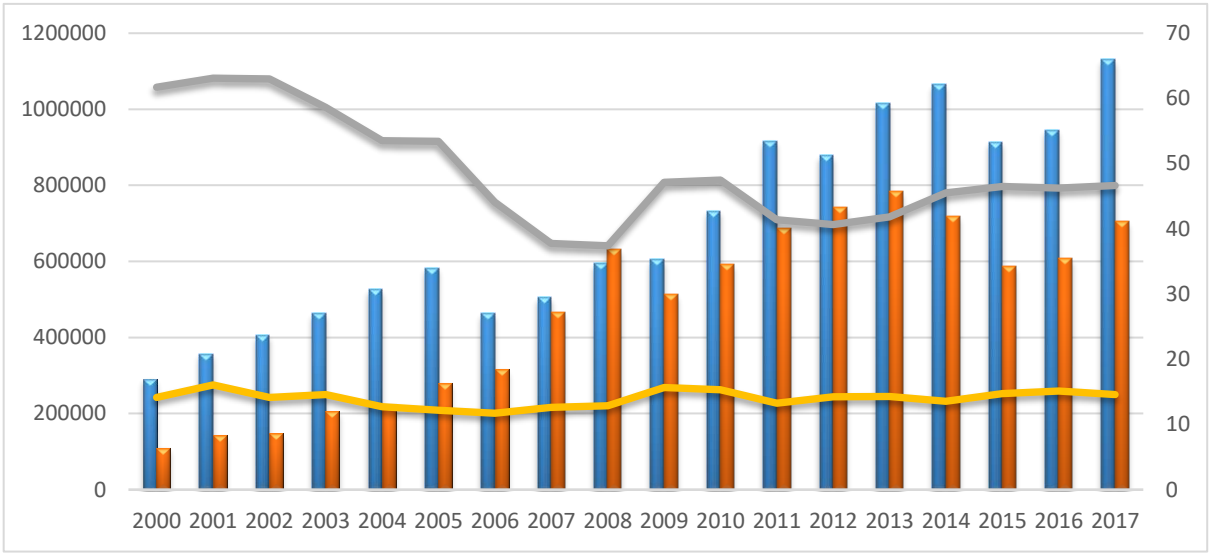


Source: NBS (2021)

Figure 71: Structure of imports by groups of countries, $ USA

The Republic of Moldova is a net exporting country of agri-food products, whose agriculture generates almost half of the country's export revenues, whereas its agri-

food trade balance is declining (see Figure 61). Thus, the export of agri-food products consists mainly of low-value products and unprocessed raw materials and the import of agri-food products consists mainly of processed products.



Source: NBM (2018)

Figura 72: Agri-food exports and imports, their shares in total export and import, $ USA

The Republic of Moldova has reduced barriers to agri-food imports. In 2001 the Republic of Moldova became a member of the WTO and as a member it does not apply quantitative trade bans or restrictions that do not comply with WTO provisions. Average customs duties on imports of agri-food products represent 12%, exceeding the average of 5% for all imported products. Since March 2008, the Republic of Moldova has benefited from Autonomous Trade Preferences (ATP) in trade with the EU, which provided for duty exemptions for most Moldovan products, with the exception of certain agricultural products. The Government has also signed the Central European Free Trade Agreement (CEFTA) and a multilateral free trade agreement with CIS countries. The Republic of Moldova is a member of the Black Sea Economic Cooperation Organization (BSECO), the GUAM Organization for Democracy and Economic Development (Georgia, Ukraine, Azerbaijan and Moldova), the Southeast European Cooperation Initiative (SECI) and other regional economic initiatives.

The export of agri-food products from the Republic of Moldova has been affected by changes in the trade regime of key partners. Currently, the export of agri-food products from the Republic of Moldova has had two main destinations: CIS and the EU. However, with the accession of the Russian Federation to the WTO in 2012, the position of the Republic of Moldova on the Russian market has changed, as all WTO members are subject to the same trading regime, leading, among other things, to increased competition on agri-food exports with other WTO members at lower prices. The situation of trade with the Russian Federation is even more complex, taking into account the high energy dependence of the Republic of Moldova on the Russian Federation and Ukraine. Moreover, the emergence of an alternative Post-Soviet trade

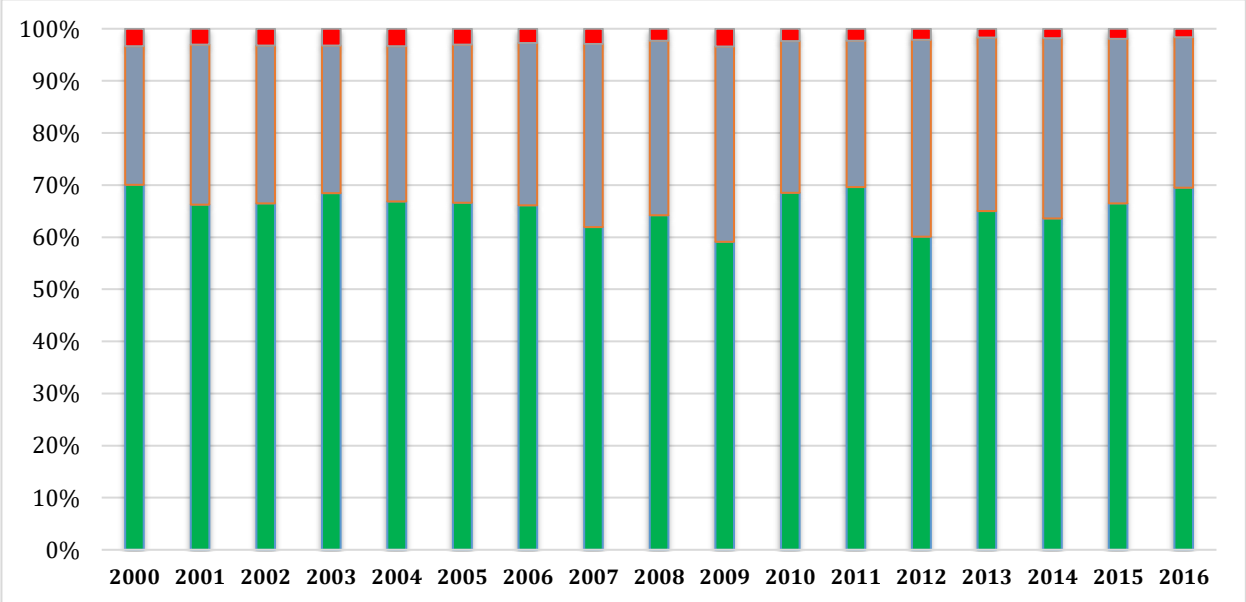
bloc that brings together the Russian Federation, Belarus and Kazakhstan in a customs union, generates certain difficulties for the Republic of Moldova. The development of trade relations takes place in the context of the conclusion of the Deep and Comprehensive Free Trade Agreement (DCFTA) with the EU and the rapid development of the Eurasian Economic Union (EEU), an highly influential regional union led by the Russian Federation.

At the same time, the evolution of agri-food exports to the EU was determined by both climatic conditions and trade restrictions imposed by the Russian Federation with the signing of the Association Agreement with the EU. Tensions in the region, which have led to the imposing of economic sanctions and trade restrictions by the EU and the Russian Federation, have also had an indirect impact on the evolution of food exports. Even in these circumstances, exports increased by around 25 % compared to the reference period, compensating to some extent for the loss of markets in the East.

The most dynamic increase in exports of agri-food products was observed in cereals and sugar. Exports of non-agricultural products were done in the context of the slowdown in the activity of certain sectors of EU industry, including direct beneficiaries of the main categories of products exported by the Republic of Moldova, as well as in the context of the reduction of import prices for these products.

Agri-food sector analysis

The agricultural sector of the Republic of Moldova is dominated by crop production (see Figure 73), while the livestock sector plays a less important but stable role in production, suggesting a potentially low level of competitiveness. In 2010-2019 crop production accounted for 60-70% of total agricultural production, largely represented by raw material exported in bulk to the EU and the CIS. The share of the livestock sector increased in the years of drought (especially in 2009 and 2012), following the mass slaughter of animals in times of crisis.

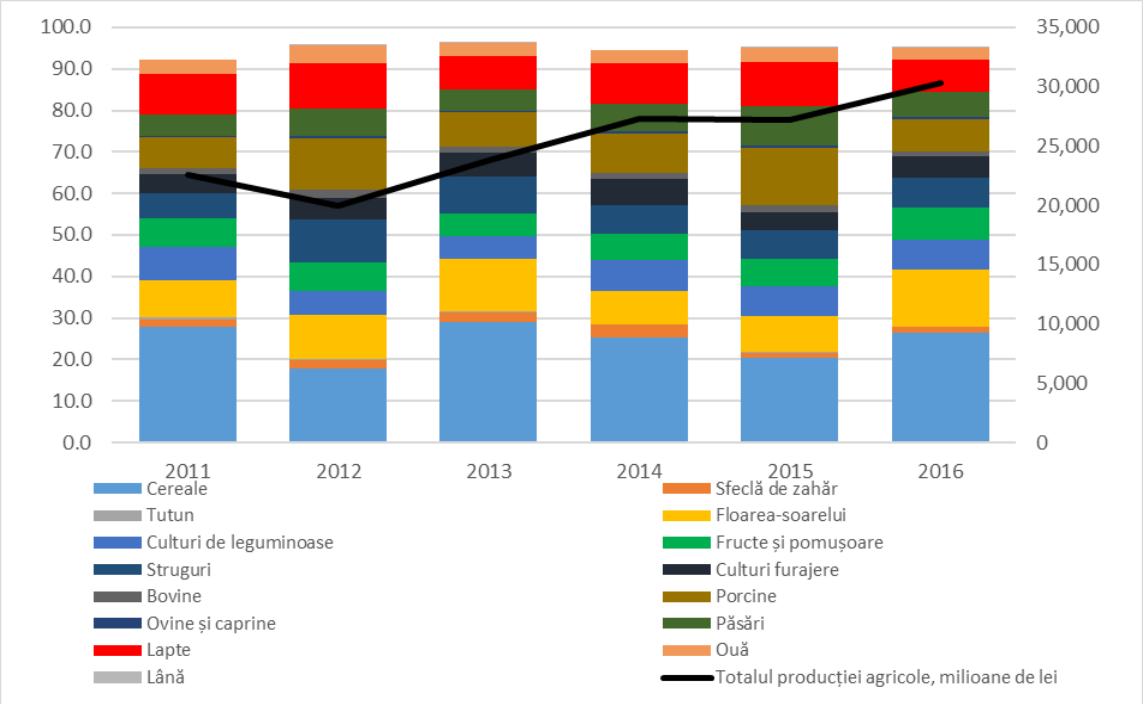


Source: NBS (2017)

Figure 73: Models of agricultural products of Republic of Moldova, %

The low profitability of the agricultural sector is determined by a number of factors, including soil degradation and the dominance of low-value crops in agricultural production at the expense of high-value crops. A significant part of agricultural production (90%) is represented by 7 products: cereals, grapes, vegetables, fruit, pigs, milk and poultry (see Figure 74). It is obvious that cereals (including wheat, barley, maize and sunflower) are first on the list, due to the large share of arable land – approx. 40% of the total area sown. The reasons why producers focus on cereals include large-scale mechanisation, relatively low capital requirements, low labour intensity, markets and reliable profit, and the limited need for irrigation – all of which show that large agricultural enterprises are the dominant form of organisation. The share of high value-added products in agriculture of the Republic of Moldova is modest, due to increased investment requirements, limited irrigation potential and availability, as well as strict food safety requirements.

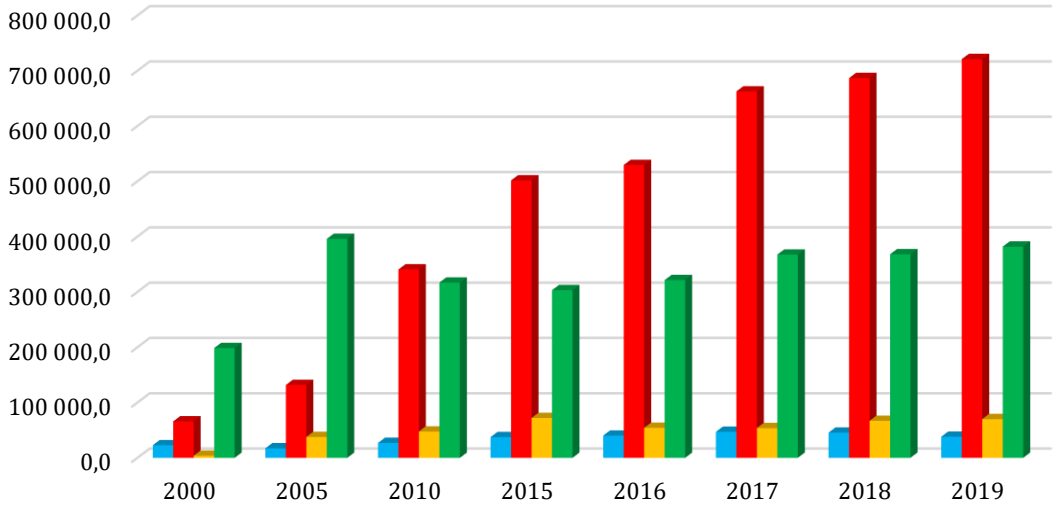
Over the past decade, nuts and honey have been successfully exported to the EU, as well as to other markets. In 2011-2016, nut plantations increased rapidly from 11 thousand ha to 27.2 thousand ha. The attractiveness of this sector is largely explained by the mild climate, pest resistance, disease and drought, as well as the limited resources needed for maintenance. Honey bee from the Republic of Moldova is among the top exports to the European Union. In recent years, exports have increased 10 times and reached US$14 million annually. Currently, there are almost eight thousand beekeepers, and the total volume of honey production is about 6500 tons annually.



Source: NBS (2017)

Figure 74. Structure of agricultural production classified by branch (%, comparable prices)

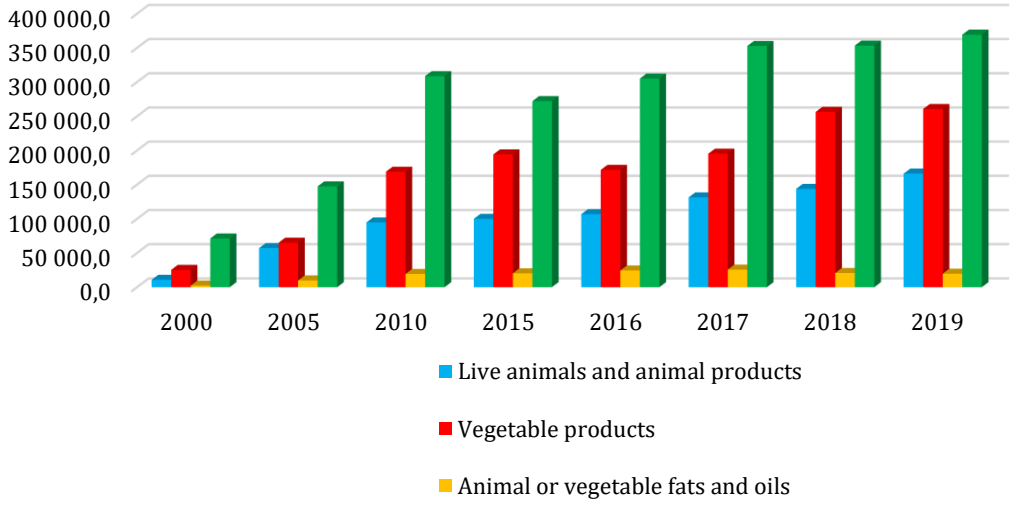
Exports of agri-food products of the Republic of Moldova are mainly represented by primary products, such as bulk wine, while the main imports of agri-food products are represented by processed products. The main agri-food products exported in 2019 were cereals, drinks, fruits and nuts, oilseeds, vegetable product, which accounted for 43.5% of all agri-food exports.



Source: NBS (2021)

Figure 75: Exports by sections and chapters, according Combined Nomenclature of Goods (CNG), thousand USD

Food, tobacco, plant products, cereal-based products and beverages were the main imported products, accounting for 45.3% of agri-food imports in 2019.



Source: NBS (2021)

Figura 76: Imports by sections and chapters, according Combined Nomenclature of Goods (CNG), thousand USD

According to NBS data, growth of cattle and poultry(live mass) in 2020 compared to 2019 in households of all categories decreased by 0.8%, due to a decrease in live stock production by 10.7% in households. At the same time, in agricultural enterprises the rearing of cattle and poultry increased by 10.9%. Milk and egg production in households of all categories decreased by 12.4% and 6.6% respectively as a result of the decrease in production in both agricultural enterprises and households.

On 01.01.2021 compared to the date of the same year 2020, there was a decrease in livestock in households of all categories, with the exception of the herd of cows in agricultural enterprises which increased by 13.1%.

Over the past decade, the development of the livestock sector has been problematic, hampered by bottlenecks in competitiveness and the market. The livestock sector faces domestic resource constraints (limited feed) as well as harsh pressures from cheaper animal imports. The supply of domestic feed is limited due to the low availability of good quality grassland, which is in turn driven by adverse weather conditions and insufficient irrigation capacity. On the other hand, relatively high local production costs, low productivity and low-yield breeds do not allow products of animal origin from the Republic of Moldova to compete with subsidised cheaper meat/dairy products coming from the EU and CIS markets. Currently, the Republic of Moldova is a net importer of most animal products.
The experience of the countries of Eastern Europe, especially Romania, shows that with the raising of living standards and in particular the ageing population of villages, the number of animals held in households decreases drastically. The effect of such a phenomenon can over time have harsh negative repercussions on the sector, ultimately influencing the country's food security - milk and meat being basic foodstuffs. An additional problem in this situation is also ensuring the safety of food of animal origin throughout the production chain. The massive decentralisation of livestock in the domestic sector makes it much more difficult to monitor animal welfare, as well as the process of ensuring product quality. Taking into account the situation created, special attention will be paid to stimulating the process of setting up/upgrading livestock farms specialising in cattle rearing for both meat and milk. The dual and fragmented structure of farms is a potentially considerable constraint underlying the low competitiveness of agriculture.

Table 27: Livestock by categories of producers, as of January 1, thousand heads

	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
All categories of producers										
Cattle	216	204	191	189	191	186	182	167	145	124
of which Cows	154	144	134	131	130	128	123	113	97	81
Pigs	478	439	410	420	473	453	439	406	397	397
Sheep and goats	905	832	824	849	875	869	870	843	770	677
Horses	52	50	46	45	43	39	37	34	30	26

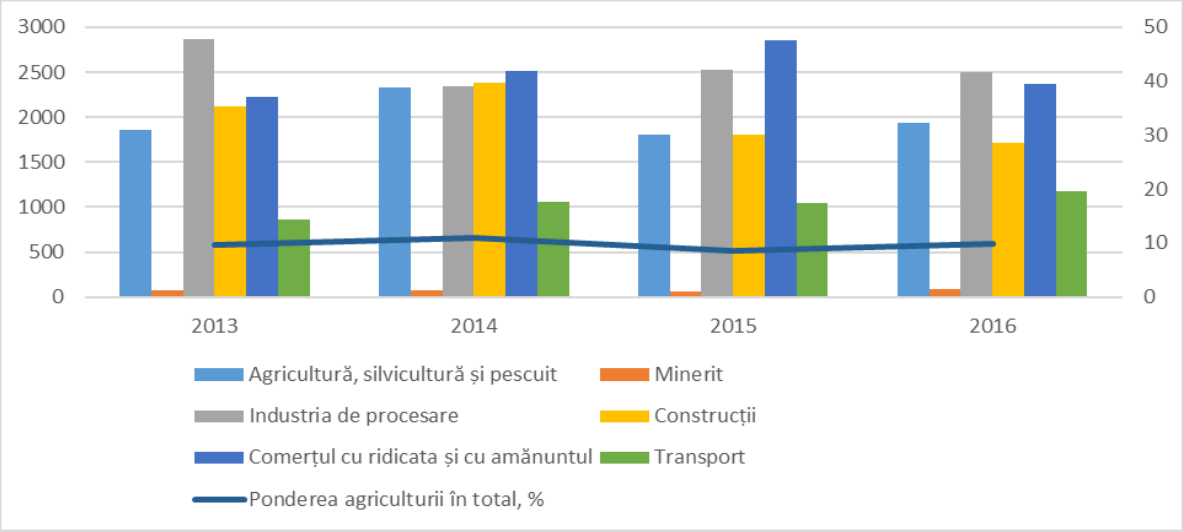
Source: NBS (2021)

The analysis of the livestock shows a decrease in 2020 compared to 2011, as follows: by 43% - of cattle, including 47% of cows, by 17% - of pigs, by 25% - of sheep and goats and by 50% - of horses. In 2018-2019 only pigs maintained their herds, for the other categories of animals it decreased.

Underdevelopment of the agricultural land market is one of the current constraints and a potential risk related to increased competitiveness and rural development. The majority of the agricultural sector in the Republic of Moldova consists of two large sub-sectors: the corporate sector comprising large enterprises and the individual sector which includes peasant households and land next to houses (private property).

Large enterprises have specialised in the production of low-value-added crops, for example: cereals, oil plants, sugar beet, use little labour due to the high level of mechanisation of the agricultural operations. This specialisation was determined by a number of factors, such as relatively low production costs for these crops, the availability of agricultural machinery allowing rapid cultivation on large areas, relatively simple and cheap post-harvest requirements, and insured markets for these goods. Land productivity has increased marginally over the past decade, indicating a decrease in competitive positions for moldovan crops.

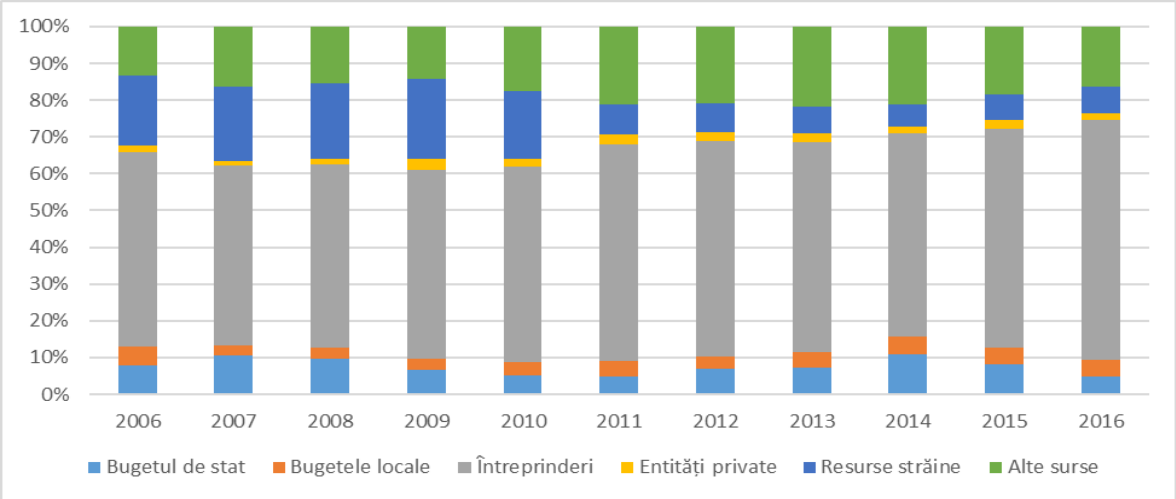
In 2013-2016 the share of agricultural investment in total investment increased from 8.5% to 11%, but these are not enough to stop the massive depreciation of agricultural assets (see Figure 77). One of the key investment measures – the import of agricultural machinery and equipment – has only intensified in the last 3 years, being stimulated by rising incomes as a result of rising prices for agricultural production, as well as by the reorientation of government subsidy programmes towards investment. Capital investments and maintenance of existing stock of agricultural assets are marginal and appear to be stagnant, indicating a continuous focus on low value-added crops requiring less capital.



Source: NBS (2017)

Figure 77: Share of investments in long-term assets, in economic activities, in mil. lei

The limited share of foreign capital in investments in long-term assets is another impediment for the competitive agricultural sector. Thus, during the period 2006-2016, the share of foreign capital in total investments halved, given that the majority of investments were financed by national resources. Public resources also played a limited role in investments and each second investment from the private sector.



Source: NBS (2017)

Figura 78. Structure of investments in long-term assets according to the source of financing, %

The agri-food sector in the Republic of Moldova still remains poorly financed, about one third of the demand for external financing for the agri-food sector is covered by bank loans, one-fourth - loans from suppliers and only 3% - of state subsidies. In the last three years the volume of loans granted to the agri-food sector has increased. The agri-food lending process revealed a number of systemic disadvantages, including insufficient provision of long-term loans (usually 3-year investment loans), high interest rates, poor collateral policies (excessive collateral requirements, undervaluation of collaterals/mortgaging by banks), combined with poorly developed market instruments to facilitate access to loans (loan guarantee funds , interest subsidies).

9.5.2 The prospect of expanding the list of agricultural products.

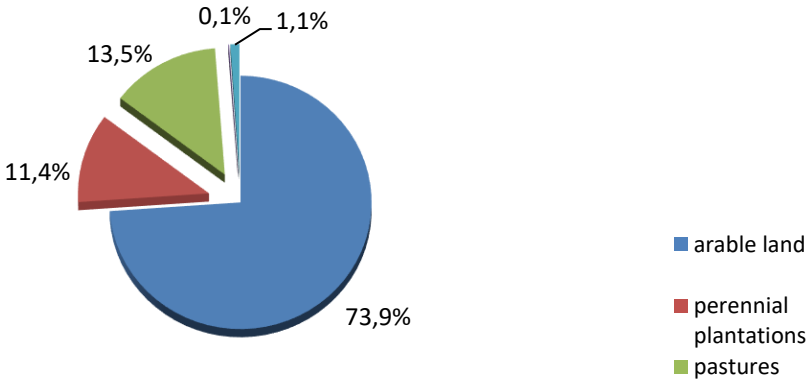
According to NBS data, on 01.01.2020, the land fund constituted 3384.7 thousand ha, including agricultural land, 2492.1 thousand ha, which represents approx. 73.6%, of which 1841.9 thousand ha arable land (73.9%), and 15.4% of these are covered by multiannual plantations (see Table 28). The typology of land ownership has three main classes of ownership: state property (22%), local public authority ownership (20%) and private property (58%). Currently, about 94% of agricultural land is privately owned.

Table 28: Aviable land by use, as of January 1*, thou. Ha, 2012-2020

	Area, thou. ha								
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Lands – total	**3384.6**	**3384.6**	**3384.6**	**3384.6**	**3384.6**	**3384.6**	**3384.7**	**3384.7**	**3384.7**
of which:									
Agricultural lands	2498.0	2497.8	2500.1	2499.7	2499.6	2499.8	2496.6	2496.4	2492.1
of them:									
arable land	1810.5	1814.1	1816.1	1817.4	1822.9	1827.3	1832.3	1838.5	1841.9
perennial plantations	298.7	295.3	295.3	291.7	288.9	288.8	290.1	286,6	283.5
of which:									
orchards	134.5	135.1	135.8	134.5	132.5	133.5	132.5	131.2	129.8
vineyards	147.3	142.6	141.2	137.5	136.2	135.3	135.8	133.1	130.6
pastures	350.3	348.9	348.0	346.4	345.0	342.8	340.2	339.1	337.8
hayfields	2.0	2.1	2.1	2.2	2.1	2.1	2.1	2.0	2.1
fallow lands	36.5	37.4	38.6	42.0	40.6	38.8	31.9	30.2	26.7
Forests and lands covered with forestry vegetation	462.7	464.2	465.2	464.5	465.2	465.3	466.3	467.2	467.5
Rivers, lakes, reservoirs and bogs	99.5	99.2	96.9	96.8	96.7	96.1	96.1	96.5	96.4
Other lands	324.4	323.4	322.4	323.6	323.1	323.4	325.7	324.7	328.7
Informational:									
Lands provided with Irrigation facilities	228.3	228.3	228.3	228.3	228.3	228.3	228.3	222.5	222.2
of which:									
arable land	213.3	213.3	213.3	213.3	213.3	213.3	213.3	207.8	207.8
perennial plantations	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.1

Source: NBS (2021)
* Data are presented in total for the country

The level of land fragmentation has not changed significantly since the privatisation process, which ended in 2000. Data from the general agricultural census, carried out in 2011, show that an agricultural holding, on average, is divided into 3 parcels. Currently, less than 1% of registered collective households manage more than 61% of agricultural land in production. The average land size is about 0.8 ha. Land consolidation continues to be a critical factor for the well-being of the rural population. Less than 6% of agricultural land has been estimated to be unworked.
The territory of the Republic of Moldova can be divided into three agro-ecological zones (see Figure 80). The areas included in each of these agro-ecological zones have the same characteristics in terms of terrain, climate, soil type and water availability. The North Agroecological Zone is a hilly area with forests, steppes and meadows, where the most fertile soil is found with high water retention capacity, being the most suitable for field crops. The Central agroecological area is hilly and has deep valleys, where the soil is less fertile and is best suited for perian crops such as orchards and vineyards. And the South agroecological area has steppe and meadow land with both, very fertile and less fertile soils. Due to high temperatures and low rainfall, this area has only marginal production in the absence of irrigation.



Source: NBS (2021)

Figura 79: Structure of agricultural area by use, as of January 1, 2020* %

*Data are presented in total for the country

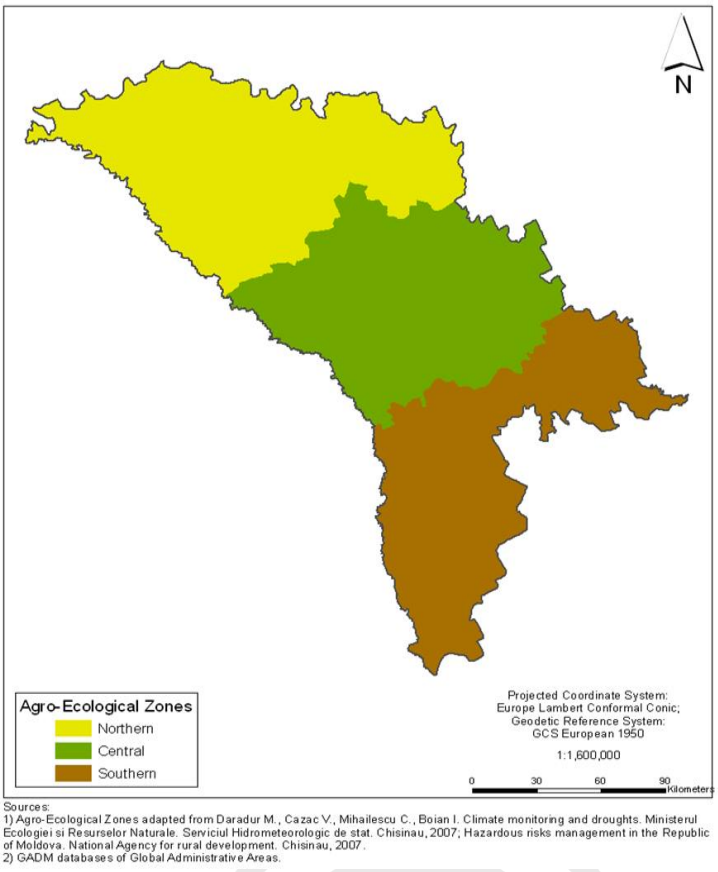


Figure 80: Agroecological zones in Republic of Moldova

The soil of the Republic of Moldova is characterized, first of all, by plains with fertile cernoziom and productive agricultural land. By its natural composition and fertility, the soil is characterized by a remarkable diversity. It is dominated by cernoziom, which has a different degree of degradation (70% of the total). A special interest is the alluvial soils intended for irrigation (arable soil - about 60 thousand ha) and grey soils (arable soil -

76 thousand ha), suitable for the cultivation of technical crops and pit fruit orchards. Almost every second hectare of land has a higher quality than average, of which 689 thousand ha (27% of agricultural land) is of superior quality.

Soil quality has decreased by 5 points over the past 30 years as a result of intensive exploitation in the absence of necessary pedological measures. The low level of crop rotations (reduction of fodder crops with legumes), 30-fold reduction in the use of organic fertilisers and 15-fold reduction in mineral fertilisers profoundly affected the amount of humus and bioelements in the soil, leading to its biological degradation. The phosphorus content in most soils is between 1,8 and 2,1mg/100g of soil and is at the boundary between low and moderate gradation. The general potassium content of the soils of the Republic of Moldova is favorable, offering the possibility to obtain high yields on 90% of agricultural land. The decrease in soil quality is becoming a critical problem for the Republic of Moldova and, in combination with the consequences of different types of erosion, leads to a decrease in the productivity of agricultural crops and the efficiency of agricultural production on large areas of land.

This table presents the information on areas sown with agricultural crops in households of all categories.

Table 29: Sown areas with agricultural crops, in all categories of producers, thousand hectares

	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Sown areas – total	**1527.3**	**1540.3**	**1460.3**	**1447.2**	**1468.4**	**1494.3**	**1502.8**	**1502.6**	**1519.5**	**1532.9**	**1544.3**	**1519.2**
Cereals and leguminous crops	**987.6**	**1034.7**	**919.6**	**894.0**	**930.0**	**964.7**	**940.4**	**949.6**	**950.8**	**936.6**	**974.1**	**950.4**
wheat (winter and spring)	373.0	406.6	328.2	301.8	316.1	366.6	348.6	345.5	371.3	335.6	373.1	352.7
barley (winter and spring)	105.7	118.8	132.6	103.4	92.7	103.9	96.8	84.5	83.2	80.7	65.0	53.1
grain maize	441.5	455.9	415.9	455.5	491.8	466.2	467.8	492.8	468.0	481.4	491.4	495.3
leguminous crops	50.5	41.5	34.9	27.9	24.3	22.7	21.9	23.7	23.8	34.6	41.2	39.8
Industrial crops	**330.4**	**358.0**	**388.3**	**412.4**	**403.6**	**399.5**	**437.7**	**434.9**	**447.4**	**478.3**	**462.8**	**458.3**
sugar beet (industrial)	62.7	34.2	26.5	25.4	31.2	28.6	28.1	21.9	20.9	23.6	19.8	15.3
sunflower	227.7	275.7	252.4	277.0	299.3	297.7	319.7	330.3	362.4	384.9	364.2	358.6
soy	11.6	36.2	59.0	58.9	59.7	41.6	54.9	67.8	39.9	34.0	28.0	37.7
rapeseed (winter and spring)	0.4	2.3	40.1	41.1	6.1	26.0	29.5	8.7	18.2	28.9	43.0	38.3
tobacco	23.5	4.7	4.4	3.8	2.4	1.5	0.9	0.8	0.6	0.5	0.4	0.3
Forage crops	**84.5**	**67.8**	**75.3**	**68.2**	**70.2**	**64.5**	**61.6**	**60.8**	**62.4**	**60.9**	**54.0**	**47.1**
maize for silage and green fodder	31.5	11.0	7.0	6.1	13.9	6.3	6.3	7.4	6.3	5.1	4.8	4.4

Source: NBS (2021)

The analysis of areas sown with agricultural crops, by categories of households in 2019, according to NBS data, shows the following:

- agricultural enterprises hold the highest share in the case of: cereal and leguminous crops 51 %, industrial crops 71,4 %;
- peasant (farmer) households hold the highest share in the case of: forage crops 42%, cereal and leguminous crops, grains approx. 28% and industrial crops 25.8%;
- households hold a share of 21% in the case of cereal and leguminous crops and 2.8% in the case of industrial crops.

Source: NBS (2021)

Figure 81: Structure of sown areas with agricultural crops, by categories of producers, in 2019

The agri-food sector of the Republic of Moldova may face the following uncertainties/risks:

- The agricultural production of the Republic of Moldova is completely dependent on agrochemicals, seeds and fuels, which are imported, which affects the competitiveness of its agri-food products. This dependence exposes the agriculture of the Republic of Moldova to the volatility of international prices. Prices for inputs (fuel, fertilizers and plant protection chemicals) have increased substantially over the past decade. Farmers are also facing instability in production prices. There are a number of factors between the producer and the consumer that affect competitiveness and that need to be addressed in order for producers' incomes to increase.
- Insufficient access to quality inputs remains a constraint on competitiveness in several sub-sectors. Agricultural producers rely largely on imported seeds and propagating material and are most affected by lengthy and costly varietal registration procedures. The testing and registration requirements governing the import of seed and propagating material could be the most important constraint, and are currently considered by interested parties to be an obstacle to the production of more

competitive varieties because of the associated costs and the deferral created by those requirements. The same factor is also an obstacle to access quality inputs for agri-food processing undertakings.
- Macroeconomic: fiscal policy, lack of sustainable financing, lack of a clear mechanism for price formation.
- Natural disasters (including droughts, floods, hail, frosts and severe storms) can contribute to a decrease in production in the agricultural sector, and annual losses are estimated at 3.5 to 7.0% of the country's GDP. As a result of climate change, temperatures and variability in rainfall are expected in the future, with even more significant reductions in crops and livestock. At the regional level, the uncertainty is even greater and annual rainfall could decrease by up to 118 mm per year, with considerable damage to all agro-ecological areas. The decrease in rainfall and the increase in demand for water for irrigation mean that unless adaptation measures are implemented, climate change will lead to conflicts over water resources and generate high unmet demand for irrigation. With climate change, especially in the River Raut basin, but also in the upper and lower basins of the Dniester, there may be a severe shortage of water for irrigation.
- The high volatility of agricultural production reflects the poor development of risk mitigation instruments caused by weather conditions, including limited access to irrigation, and a low adoption rate of modern agronomic practices and technologies. At the same time, innovative insurance systems are lacking in agriculture.
- Decrease in population numbers as a result of reduced birth rate, migration, ageing.
- Decrease in soil creditworthiness as a result of the failure to administer organic fertilisers on time and in full volume, failure to respect the rotation of agricultural crops, failure to comply with the technological process.
- Infrastructure: insufficient storage of agri-food products, processing of poorly developed agricultural products, transport.

Overview of measures to improve agricultural production and efficiency

UE supports the development and modernization of agriculture in the Republic of Moldova through various instruments aimed at implementing the association agreement.

The most successful programs include the „European Neighborhood Program for Agriculture and Rural Development" (ENPARD). Within the framework of the program, for the period 2016-2019, budgetary support to the agricultural sector was carried out in the amount of 53 million euros.

The overall objectives of the ENPARD are: 1) assist the Government of the Republic of Moldova in eradicating poverty, promoting sustainable and inclusive growth, and consolidating and improving democratic and economic governance; 2) to foster confidence building in the Republic of Moldova, by targeting - through a specific component–regions and territorial administrative units with a special status.

The program will contribute to:

- Developing the export capacities of the main products on the EU market and, consequently, increasing the impact on GDP;
- Restructuring and modernization of the agri-food sector;

- Ensuring the sustainable management of natural resources;
- Improving living and working conditions in rural areas;
- Transposition of the standards and requirements of quality, safety and control of the European Union;
- Increasing the competitiveness of agri-food production, by investing in the modernization of the agri-food and feed chain;
- Development of education, research and extension services in the agri-food sector, including facilitating the development of information systems;
- Reducing agricultural regions affected by natural disasters and reducing the effects of climate change;
- Facilitating investments in physical infrastructure and rural services.

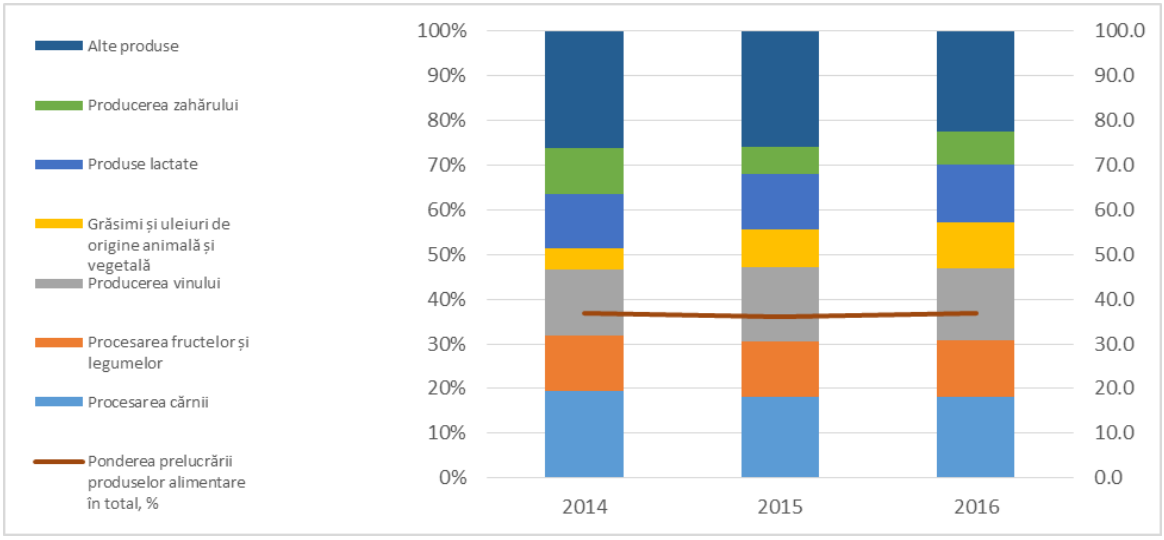
At the moment, the European Union remains the main important donor for the Republic of Moldova.

At the national level, the mission to manage the resources of the National Fund for Agriculture and Rural Development and the resources of development partners allocated for administration and to implement intervention measures for agriculture is assigned after the Agency for Intervention and Payments for Agriculture.

The accomplishment of the Mission focuses on the following fields of activity: ensuring the correct and legal development of the operations of management of the funds allocated for the support of the agricultural producers; control of the use of funds allocated to the beneficiaries; participation in the elaboration of the subsidized directions; continuous monitoring of compliance with eligibility criteria and contractual conditions for granting of non-reimbursable financial assistance by grant beneficiaries; information, communication, presentation of innovations that take place in the activity process.

Overview of measures taken to increase agricultural trade and required infrastructure

A key factor underlying the low competitiveness of the agri-food sector is the decline of the food processing industry. The processing industry contributes to the increase in the added value of agricultural products. This increase, in the case of the Republic of Moldova, is also hindered by the lack of investment in the agri-food processing sector. Agricultural product processing companies face serious constraints in many areas, including technologies, equipment, finance, management, marketing, logistics, the burden of regulation.
Currently, the storage capacity of grain silos is a modest one.



Source: NBS (2017)

Figure 82: Share of agricultural products of total value processed agri-food products, %

The analysis of NBS data on the number of enterprises and production units, concerning economic activity, 2014-2019, shows a negative tendency. Thus, in 2019, 4,706 enterprises were registered in the industrial sector of the Republic of Moldova, representing a decrease of 49 enterprises compared to 2018 (4755), including 58 enterprises – in the manufacturing industry, of which 32 enterprises – in the food industry.

In 2019, 900 enterprises were active in the food industry, including 153 in the manufacture of milling products, starch and starch products (17%), 282 - the manufacture of bakery products and flour products (approximately 31%), 229 - in the manufacture of bread; the manufacture of bakery and fresh pastry products (25.4%) and 43 – in the manufacture of animal feed preparations.

Table 30: Number of enterprises and production units, by economic activities

	2014	2015	2016	2017	2018	2019
Industry – total	**4,850**	**4,834**	**4,775**	**4,775**	**4,755**	**4,706**
Manufacturing industry	**4,223**	**4,232**	**4,139**	**4,098**	**4,050**	**3,992**
of which:						
Manufacture of food products	**1,056**	**1,041**	**987**	**966**	**932**	**900**
Production, processing and preserving of meat and meat products	148	146	135	130	131	129
Processing and preserving of fish, crustaceans and molluscs	17	16	17	15	15	15
Processing and preserving of fruits and vegetables	82	90	85	90	93	99
Manufacture of vegetable and animal oils and fats	116	115	107	103	98	88
Manufacture of dairy products	31	29	30	31	35	36
Manufacture of grain mill products, starches and starch products	231	221	204	190	167	153
Manufacture of bakery and farinaceous products	323	325	309	306	292	282
Manufacture of bread; manufacture of fresh pastry goods and cakes	273	271	258	254	236	229
Manufacture of other food products	49	44	49	51	54	55
Manufacture of sugar	4	4	4	3	3	4
Manufacture of cocoa, chocolate and sugar confectionery	10	9	12	16	15	16
Manufacture of prepared animal feeds	59	55	51	50	47	43

Source: NBS (2021)

Analysis of the structure of the manufacturing industry during the referred period shows that the evolution of the food industry has had a decreasing tendency, decreased on average by 0.5%, as follows: 25% - in 2014, 24.6% - in 2015, 23.8% - in 2016, 23.6% - in 2017, 23% - in 2018 and 22.5% respectively - in 2019.

Analysis of manufacturing production in the period 2010-2019 shows steady growth according to NBS data. The information on the production of the processing industry is given in the table below.

Table 31: Production of main industrial products

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
MANUFACTURING INDUSTRY										
Meat, thou. tonnes	23.7	27.8	31.0	34.5	43.1	44.6	44.2	54.3	60.1	60.5
of which:										
Poultrymeat, thou. tonnes	12.5	14.0	16.7	21.3	26.6	28.5	29.6	36.2	40.5	40.8
Sausages, thou. tonnes	13.2	14.5	15.9	17.2	16.3	17.2	16.4	18.4	19.7	21.2
Canned meat, thou. tonnes	1.5	1.3	1.5	0.9	0.7	0.5	0.5	0.5	0.6	0.5
Fruits and vegetables juices, thou. liters	27,115.0	29,715.3	46,055.2	49,059.1	49,074.9	39,242.5	49,687.1	55,689.1	63,210.8	81,812.1
non-concentrated juice	17,460.6	16,828.3	21,098.9	22,825.5	21,482.7	21,534.7	18,755.3	20,080.0	19,000.3	22,320.6
concentrated juice	9,654.4	12,887.0	24,956.3	26,233.6	27,592.2	17,707.8	30,931.8	35,609.1	44,210.5	59,491.5

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
MANUFACTURING INDUSTRY										
Canned vegetables and fruits, thou. tonnes	29.9	26.3	24.3	25.1	30.4	15.7	16.7	19.6	25.6	17.9
Processed and canned fruits, thou. tonnes	8.0	6.8	4.7	10.7	7.6	7.9	9.4	8.2	12.5	9.4
Crude oils, not modified chemically, thou. tonnes	80.7	89.7	93.5	53.9	109.6	109.5	79.9	86.8	106.2	124.6
Milk and cream with fat content < 6%, thou. tonnes	65.1	62.9	62.4	65.3	78.7	80.0	86.0	80.0	69.1	61.3
Solid milk and cream, tonnes	1,217	625	536	439	1,042	1,357	1,675	2,474	2,276	865
Butter, tonnes	4,199	3,878	3,764	4,159	4,673	4,787	5,869	4,772	3,938	3,922
Fat cheese and brynza, tonnes	1,779	2,087	2,113	2,435	2,427	2,469	2,402	2,869	2,822	2,582
Curdled milk, cream, yogurt and other fermented products, tonnes	25,615	27,314	29,144	30,216	31,542	32,659	32,744	31,107	29,527	29,500
Ice cream and other edible ice, whether or not containing cocoa, thou. liters	12,491	12,375	14,064	15,160	15,633	15,969	16,473	16,963	17,580	16,926
Flour, thou. tonnes	108.0	118.2	101.9	117.9	118.4	113.2	103.8	112.0	105.8	120.9
Cereal groats, meal and pallets, thou. tonnes	5.6	4.8	3.6	4.4	4.7	5.7	5.3	6.7	6.2	6.6
Ready-made forage for animals, thou. tonnes	71.6	73.3	94.9	96.3	97.3	79.0	95.4	87.5	85.6	70.8
Bread and bakery foods, thou. tonnes	129.0	130.0	129.3	132.5	128.4	131.5	129.2	130.1	128.2	130.9
Bread	124.3	125.9	124.8	126.8	122.3	124.4	121.2	122.2	120.8	122.8
Other bakery foods	4.8	4.2	4.5	5.7	6.1	7.1	7.5	7.8	7.5	8.1
Flour confectionery, thou. tonnes	26.9	28.3	30.6	33.9	34.0	33.6	34.4	35.4	36.8	39.1
Sugar granulated, thou. tonnes	103.2	88.4	83.4	140.3	177.7	84.5	100.0	129.0	73.9	86.9
Molasses, thou. tonnes	36.2	35.8	31.7	53.1	61.1	30.6	39.1	45.1	64.5	34.9
Sugar confectionery, thou. tonnes	12.9	13.0	12.3	13.4	13.7	14.0	14.2	13.8	13.3	12.9
Macaroni, thou. tonnes	6.3	6.5	5.6	6.3	5.6	5.7	5.0	4.2	3.8	3.8
Mayonnaises and other emulsified sauses, tonnes	540	466	476	486	549	509	607	703	621	634

Source: NBS (2021)

Thus, in 2019, 124.6 thousand tonnes were produced - unchemically modified crude oils, 120.9 thousand tonnes - flour, 130.9 thousand tonnes - bread and bakery products, including 122.8 thousand tonnes of fresh bread.

Table 32: Volume indices of industrial production, in economic activities

								2010 = 100
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Industry – total	**110.7**	**120.2**	**129.0**	**129.9**	**131.1**	**135.6**	**140.7**	**143.7**
Manufacturing industry	**113.2**	**125.2**	**135.9**	**139.0**	**141.5**	**148.1**	**152.2**	**157.1**
of which:								
Manufacture of food products	114.1	124.3	139.7	133.9	134.1	143.9	139.8	147.7
Production, processing and preserving of meat and meat products	100.8	103.8	126.3	118.6	122.7	137.4	151.6	158.0
Processing and preserving of fish, crustaceans and molluscs	95.8	104.2	100.9	97.5	143.2	106.4	158.0	155.9
Processing and preserving of fruits and vegetables	170.1	193.4	204.8	247.7	206.5	294.1	259.0	308.0
Manufacture of vegetable and animal oils and fats	119.2	32.7	67.6	73.5	61.8	56.6	56.9	64.2
Manufacture of dairy products	99.1	107.9	114.2	117.5	124.5	121.6	109.8	103.4
Manufacture of grain mill products, starches and starch products	150.7	183.6	173.7	171.6	173.4	162.8	157.6	186.9
Manufacture of bakery and farinaceous products	103.0	110.0	108.1	114.4	116.7	119.4	126.1	135.8
Manufacture of other food products	99.1	141.3	162.6	121.6	115.6	136.0	106.1	112.4
Manufacture of prepared animal feeds	161.0	227.3	223.9	208.3	248.2	266.7	241.3	189.2

Source: BNS (2021)

The analysis of the information on the volume of industrial food production indicates that in 2019 they decreased compared to 2018 for the following economic activities, as follows: by 5.8% in the case of the manufacture of dairy products and by 21.6% respectively - in the case of the manufacture of feed preparations. This decrease is the result of the reduction of the animal herds.

Currently, there is a drastic problem with strategic policy documents, including development programmes in the Republic of Moldova, given that the National Development Strategy "Moldova 2030" has not been approved yet, which is in the process of public consultations, on the one hand, and the National Strategy for Agricultural and Rural Development 2021-2030, which is being developed. In this situation, the information cannot be provided for the analysis of long-term development programmes.

The only action targeting the Giurgiulesti Port Complex provided for the Transport and Logistics Strategy for the years 2013 - 2022, approved by Government Decision No. 827/2013, it should be provided with port facilities to receive waste from its operation on board ships.

9.6 Investment strategies in port, railway and IWT infrastructure.

The dynamics of stable growth in the volume of cargo transshipment through the International Free Port of Giurgiulesti confirms the importance of the port as an important trading platform for importers and exporters of goods from the Republic of Moldova. Currently, the port is one of the most successfully developed in the Danube region. The volumes of cargo transshipment through the port in 2021 reached a new

record and amounted to 1.4 million tons. This figure is 30% higher than the previous maximum level recorded in 2019.

The volume of liquid cargo, which includes oil products and vegetable oil, transshipped through the port in 2021 increased by 61% compared to the previous year, this increase was due to a doubling of the volume of transshipment of oil products compared to 2020. Bulk cargo handling, including grain, seeds, coal, gravel and bauxite increased by 49%. The 70% increase in general cargo transshipment is largely due to the first full year of serving scrap metal exports.

The general port operator "Danube Logistics" SRL aims to double the capacity for transshipment of dry cargo through the construction of an additional berth, allowing to receive sea vessels with a draft of up to 7 m.

It should be noted that, in accordance with the “Investment Agreement”, the Government of the Republic of Moldova committed itself not only to create a legislative framework to ensure the promotion of investments in the development of the GIFP, but also to transfer land for the development of the port and the free economic zone, as well as to invest in the development of the road network, railroad, power lines and communications. At the moment, the General Investor and Port Operator Danube Logistics SRL not only fulfilled its obligations stipulated in the Investment Agreement, but also exceeded them.

The total value of investments in the Giurgiulesti International Free Port for the entire period of its operation, as of December 31, 2020, amounted to 74.9 million US dollars. The main part of the total investments from the moment the port was established until the end of 2020 is carried out by the General Investor "Danube Logistics" SRL, who invested 51.6 million US dollars (about 68.89% of the total investment).

For the growth of traffic volumes through the port, the implementation of investment projects of residents of the free economic zone is of great importance.

SC "Trans Cargo Terminal" SRL, which carried out the construction of a terminal for the processing and storage of agricultural products, realized a total investment of 14.2 million US dollars.

An analysis of the dynamics of income and profits of "Danube Logistic" SRL (Figure 83) allows us to conclude that with the current tariffs and traffic volumes implemented in 2021, the port can operate with a profit. These indicators of economic activity testify to the effective management of the General Port Operator and the high organization of transshipment operations in the port.

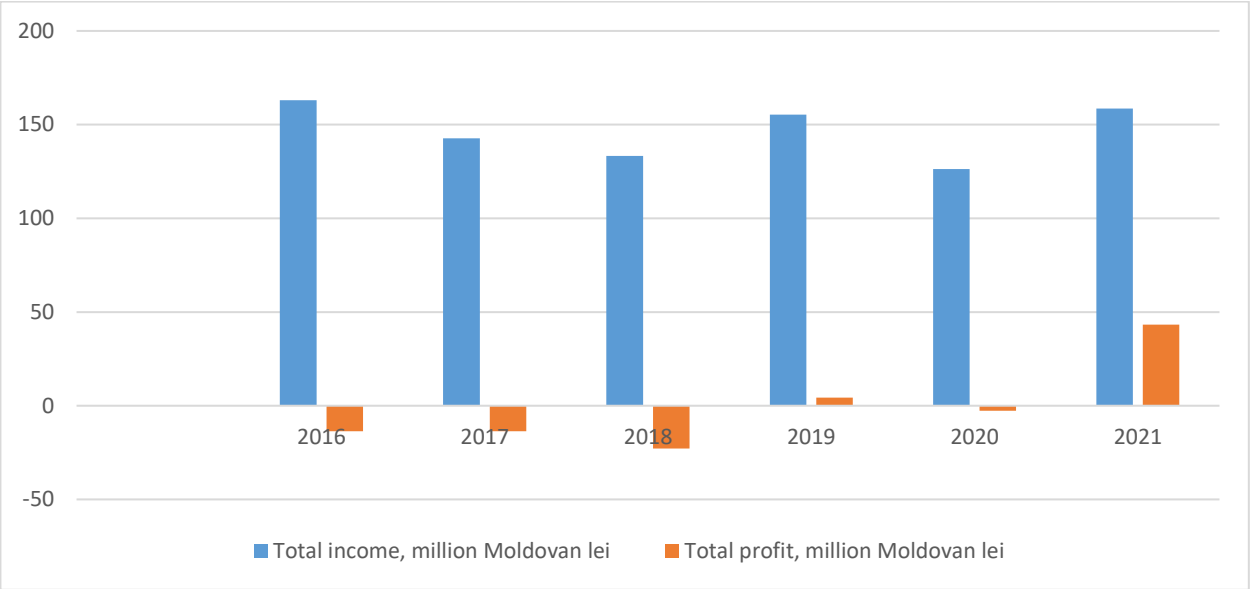


Figure 83: Danube Logistic" SRL revenue and profit dynamics

An increase in profits with a steady growth in the volume of cargo transshipment in the port allows you to make investments not only in the further development of port infrastructure, but also create more jobs (Figure 84).

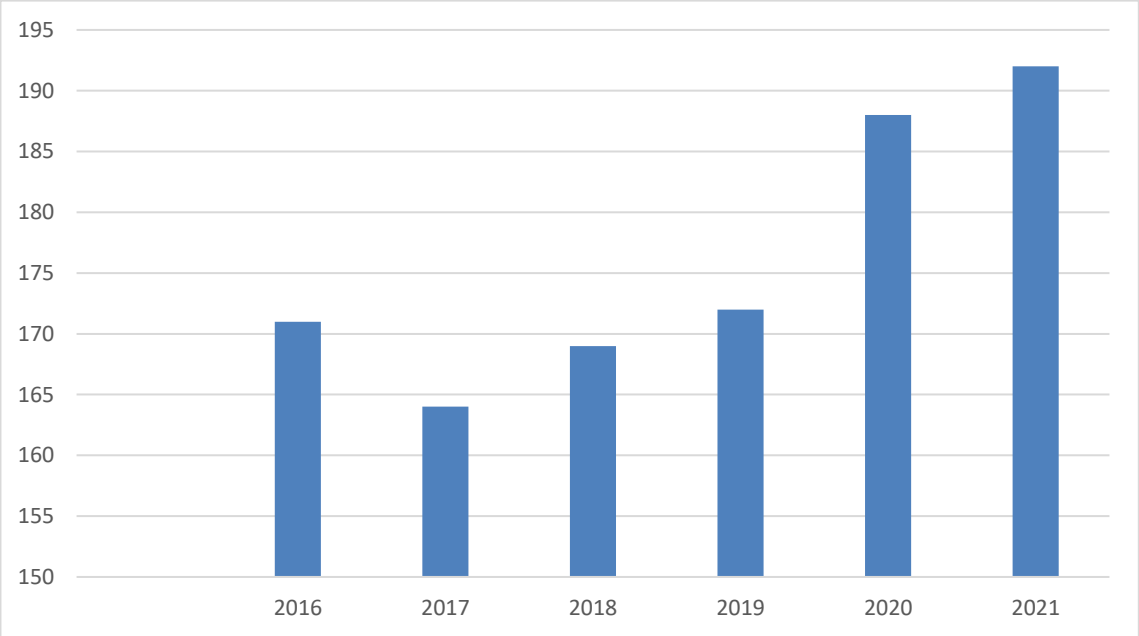


Figure 84: Dynamics of the number of employees at "Danube Logistic" SRL

To maintain high rates, it is necessary to further increase port capacities and ensure the effective development of port infrastructure. In this regard, one of the most important tasks in the development of port infrastructure is to increase the capacity of berths, berthing depths, improve the mechanization and automation of loading and unloading equipment, develop the port network of rail transport, roads, conveyor and

pipeline transport, ensuring the most rational interaction of modes of transport in transport hubs, direct cargo operations.

It is extremely important to increase the utilization factor of existing berths by rational distribution of cargo flows and reconstruction of capacities for certain types of cargo.

To increase the level of competitiveness of the port complex, it is necessary to equip it with the latest technical means, advanced technologies, modern electronic systems for managing technological and information processes, and updating the auxiliary fleet.

One of the most effective areas in the field of innovation is the active introduction of logistics transport and technological systems that allow for the transportation of goods in enlarged units according to the “door-to-door” scheme.

The absence (limitation) of the possibility of transporting import and export products through the major seaports of Ukraine due to the military conflict provoked a sharp increase in the volume of cargo transshipment through the International Free Port of Giurgiulesti. Obviously, at the moment and for the long-term prospects for the development of the port, the most relevant project is the construction of a berth and the development of a terminal for bulk and general cargo.

The current extreme situation not only actualized the existing problems of the development of transport infrastructure, but also revealed new problems, contributed to the development of a correct vision for solving existing problems.

Among the most relevant transport infrastructure projects that contribute both to the development of the Giurgiulesti port complex and the integration of the Republic of Moldova into the European Union, one should include the reconstruction of the main railway lines that are part of the trans-European transport corridors.

Considering that the railway infrastructure is a strategically important object from both an economic and a military point of view, the railway rehabilitation program should be implemented regardless of changes in demand for transportation due to the war in Ukraine.

The presence of a well-developed railway network will make it possible to redistribute the volume of traffic from road transport to rail and inland water transport. This redistribution will help improve the environmental situation.

Unfortunately, both in the Republic of Moldova and in the European Union, the bulk of cargo transportation is carried out by road. This leads to an increase in transport costs per unit of transported goods, an increase in fuel consumption per unit of transport work (t * km) and increased environmental pollution.

Analysis of statistical data shows that significant structural changes in the European market of transport services have not been observed for many years. Road transport has traditionally been the leader in the transport of goods in many countries.

The enlargement of the European Union, the increase in distances and volumes of traffic positively contribute to a faster transition from road to rail transport. However, the following remain problematic: inertia of thinking in the organization of transportation; the absence in many regions of large logistics centers that contribute to the consolidation of goods for transportation by rail; insufficient modernization of the trans-European railway network.

It is known that both rail and inland water transport require large capital investments in infrastructure development. The European Union has a sufficiently powerful investment potential for the implementation of large infrastructure projects. However, investments will only be effective if rail and inland water transport have stable and long-term traffic volumes.

To ensure these conditions, as well as to improve the environmental situation, it is proposed to introduce restrictions on the transportation of goods at the level of the transport market of the European Union according to the following criterion: the lowest fuel consumption per unit of transport work (t*km). The introduction of this restriction requires a preliminary assessment of the specific values of the criterion and the development of a mechanism for introducing the restriction.

The positive effect of this restriction will be structural changes in the freight market between different modes of transport, as well as an improvement in the environmental situation.

The previous analysis of the transport networks of the European Union and the Republic of Moldova allows us to conclude that for the effective development of the economy as a whole and successful cooperation between the Moldovan Railways and GIFP, the most relevant investment projects are: modernization of the main railway lines; increase in the number of modern locomotives and wagons; improvement of the logistics infrastructure at the main railway stations.

The implementation of these projects will increase the volume of traffic in the direction of the port of Giurgiulesti, including transit exports from Ukraine.

Currently, a project worth 113 million euros is already being implemented for the rehabilitation of the „Tighina-Bassarabeasca-Giurgiulesti" railway section. After the completion of the rehabilitation of the railway tracks, it will be possible to increase the total load of trains and their speed up to 90 km/h.

Another task, vital for the normal functioning of the port complex, is to find investments and carry out rehabilitation works on the Cahul-Giurgiulesti railway section.

Among the medium-term projects for the development of the railway should include the construction of the railway bridge across the Prut River "Cantemir - Faliu", which, together with the bridges "Giurgiulesti - Galati" and "Ungheni - Iasi", will ensure the integration of the Moldovan railway into the European transport corridors.

In the long term, projects related to the construction of railways with a European gauge of 1435 millimeters will be relevant.

The main goal of these projects is the economic and social development of the lower Danube region. Modern railway lines will ensure proper connections between the major industrial and logistics centers of the Republic of Moldova with the corresponding centers from Romania, and above all in the direction of "Galati - Braila - Constanta - Bucharest".

It should be noted that the development of railways in these directions will significantly reduce the volume of traffic carried out by road transport and unload roads.

According to our estimates, the development of railway links will not compete with the Giurgiulesti port complex. The port of Giurgiulesti mainly provides transshipment of cargoes transported by sea vessels. Almost all ports of the lower Danube have their own

specialization and clientele. The activities of these ports to a large extent cover the list of services and traffic volumes that the seaport of Constanta cannot provide.

Competition between the river and sea ports of the lower Danube is topical. And in this competition, a well-developed transport infrastructure is of great importance for the port, providing a link between the port and the interior of the country.

The implementation of current, medium-term and long-term projects should comply with the European policy of decarbonization and the reduction of harmful emissions from transport by 55% by 2023.

A well-known philosophical law says that movement is life and, as a result, everything changes over time. This is true for nature as well. Preserving nature in its original form, as some idealist ecologists want, is practically impossible. It is only possible to comply with certain conditions for its development and, above all, temperature. This fact is especially relevant when it comes to vital river arteries. Constant sedimentation leads to a decrease in the depth of the river and, as a result, to higher water temperatures. In turn, temperature changes in water largely determine the development of flora and fauna. Thus, for the normal development of life in the river, it is necessary to maintain constant conditions and, above all, the purity and depth of the water, the range of variation in its temperature. It can be confidently stated that the correct implementation of rehabilitation work to maintain waterways contributes not only to the development of navigation, but also to the preservation of flora and fauna.

The development of navigation on the Prut River is another important project, the implementation of which can contribute to a stable increase in the volume of cargo transshipment in the Giurgiulesti port complex. To implement this project, it is necessary first of all to invest in cleaning up the Prut riverbed. Definitely, such work should be carried out under the control of state institutions.

These works are authorized to be carried out by the state enterprise "River Port of Ungen". To carry out these works, the enterprise has the necessary material and technical base and competent specialists. However, the implementation of these works in recent years has been problematic due to restrictions and prohibitions imposed by the State Ecological Inspectorate. As a result, in recent years, the Ungen River Port enterprise has not received financial subsidies from the state budget.

The last successful project was implemented in 2012 and 2013. After cleaning the river bed between the villages of Giurgiulesti and Cahul, it became possible to navigate ships with a carrying capacity of up to 600 tons at a distance of up to 86 kilometers. More than 550 tons of gravel, necessary for the rehabilitation of highways, was transported. Provided that the fairway of the Prut River is cleared, it is possible to organize the movement of ships to the city of Leovo and further to the city of Ungen. Navigation can be carried out from spring to autumn, from April to October.

The organization of the work of river transport in the section from Giurgiulesti to Ungheni can be implemented through public and private partnerships. Cooperation must be mutually beneficial. For the state, investments in the cleaning of the Prut river bed will allow: creating jobs; reduce emissions of exhaust gases through the implementation of transportation by water, and not by road; increase taxes to the state budget. For private entrepreneurs, investment in the development of river transport

can bring benefits due to the large difference in transport costs between road and water transport.

Separately, it should be noted that the development of transport infrastructure and the port complex will help attract new private investment in the free economic zone and more dynamic social development of the Giurgiulesti settlement. It is proposed to create a territorial cluster in this zone with a powerful logistics structure.

10. Impact on target groups

The results obtained during the DIONYSUS project can be used by:

- Ministry of Economy and Infrastructure - for making political decisions and developing a strategy for the development of the transport and logistics industry;
- The Naval Agency of the Republic of Moldova - for making decisions regarding the organization, planning and management of the IWT, as well as in the development of regulatory documents;
- The National Road Transport Agency - for improving the regulations regarding the organization of freight transport;
- The State Administration of Roads - for evaluating the development of the road infrastructure;
- The Moldovan Railways - for the improvement of railway infrastructure development plans;
- The Giurgiulesti Free International Port - for the improvement and development of the logistics and transport activity in a sustainable and efficient way;
- The Giurgiulesti Passenger and Cargo Port - for the emprovement of the services provided;
- The academic university environment in the field of transport - to improve the teaching process in the river transport discipline;
- Local public administration in the southern region of the Republic of Moldova;
- Shipping companies.

The development of transport infrastructure in accordance with the proposals proposed in this project will positively contribute to the growth of cargo transshipment in the Giurgiulesti port complex and the integration of the Republic of Moldova into the European Community.

The main operator of the Giurgiulesti International Free Port and the administration of the Ungheni River Port should continue to develop the port infrastructure and increase the capacity of cargo handling equipment.

Cooperation with national and local authorities should be continued, primarily in order to jointly implement the developed development strategies for the future.

Port authorities should make more efforts to develop medium-term plans and implement current plans for the development of inland waterways in order to ensure the achievement of strategic goals.

The implementation of the tasks outlined in this project requires synergy between the activities of state structures and port administrations, not only at the stage of finding financial investments, but also in the implementation of infrastructure projects.

In addition to cooperating with the Ministry on a strategic and financial level, it is necessary to jointly encourage private investment by concessionaires through public-private partnerships and through the use of loans and financial instruments.

Port authorities, port operators and other stakeholders should work together to create new routes for the movement of goods and develop river transport.

It can be concluded that the implementation of projects for the development of transport infrastructure and the port complex will contribute to the social and economic development of the southern region of the country.

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