

## **Importance of the Danube in the Development of the European inland transport. Inland and Port Infrastructure Development in Romania**

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**Abstract:** Europe currently has an extensive network of inland waterways components of the Pan European Transport Network. The Danube River with Sulina and Danube-Black Sea is part of pan European transport corridor VII. European policy in the transport sector, is subject to joint decisions in the Council of the European Union. A current priority is to balance the use of different types of transportation alternation and making connections between transport modes. Currently it acts to stimulate the development of a balance between rail sectors, maritime, river and waterways of Europe. Romania is implementing several European and national programs to upgrade its infrastructure on the Danube waterway

**Keywords:** Europe inland waterways, Danube River, Romania national programmes

**JEL Classification:** R42

### **1. The Danube - a Natural Link between Eastern and Western Europe**

Europe currently has an extensive network of inland waterways components of Pan European Transport Network, composed of several corridors. The Danube River with Sulina and Danube-Black Sea are part of pan European transport corridor VII. European policy in the transport sector is subject to joint decisions in the European Council, except for certain provisions which, by their direct application endanger or transport activity of a Member State or the social life of the citizens of this state.

A priority for the European Union is to balance the use of different types of transportation, alternation by making connections between transport modes. It is envisaged, in particular, combating excessive use of road, considered as the most polluting and often lead to the creation of congestion, energy and time consumption. It seeks a balance between fostering the development of rail, sea, river and waterways.

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Therefore, the intermodal transport is constantly promoted by implementing projects that ensure comfortable transportation of goods and people from one mode of transport to another, in terms of safety, comfort and reduced time. To achieve intermodal transport system, the creation of logistics centers is required in order to provide intermodal connections: road, rail, road, sea, road, river, road, air, rail, sea, rail, inland waterway, rail, air, rail-road.

Transport on European inland waterways is considered as the cheapest and safest, which is why we insist on the introduction of new technologies for building modern infrastructure and implementation of information communication networks.

ISTROS is the name given to Danube by the ancient Egyptians, the name that is later mentioned by Thracians and Greeks. Romans changed the name into Ister, specifically referring to the Lower Danube. For the upper Danube, they used the name given by the natives, which was DANUBIUS. The ancient Dacians named it Danara – the mudflow carrier.

The Danube flows from the western slope of the Black Forest, the Kandel peak, from the altitude of 668 m. Danube is the largest river in Central Europe with a length of 2857 km (2863 km, with the 6 km extension to large Sulina channel along), of which 2588 km are navigable. It is the second longest river in Europe (after the Volga) and the 17 - century world. The general orientation of the course the river is from west to east.

The Danube is the second largest European river with a hydrographical area of 817,000 km<sup>2</sup> (1/12 area of Europe) (Figure 1) has 120 tributaries, of which 34 are navigable. Danube wets the territory of 10 countries and three capitals: Germany, Austria (Vienna), Czech Republic, Slovakia, Serbia (Belgrade), Hungary (Budapest), Bulgaria, Romania, Moldova and Ukraine. In addition, the basin of the Danube, also includes Switzerland, Italy, Czech Republic, Poland, Albania, Macedonia, Slovenia, Bosnia and Turkey, a total of 19 states. The population of the states crossed by the Danube is 450 million, with an average density of 75-100 inhabitants/km<sup>2</sup>

The average water flow is 700 Passau m<sup>3</sup>/s; Vienna 1600 m<sup>3</sup>/s; 2300 Budapest m<sup>3</sup>/s; Iron Gate 5800 m<sup>3</sup>/s; Tulcea 7200 m<sup>3</sup>/s; 18 000-20 000 m<sup>3</sup>/s Danube is divided into sections: the upper Danube, with a length of 1072 km from the source (km 2863) to Gönyű (km 1791); Middle Danube, with a length of 869 km, from Gönyű (km 1791) to Drobeta-Turnu Severin (km 931); Lower Danube at Drobeta-Turnu Severin, with a length of 931 km (931 miles) from Sulina (mile 0). From the point of view of the Danube navigation conditions above, it consists of these areas: Ulm - Regensburg (209 km), Regensburg-Passau (153 km), Passau-Linz (91km) Linz - Vienna 206 km, Vienna - Devin ( 49 km), Devin - Gönyű (89 km), total 797 km and 275 km non navigable; the Middle Danube consists of Gönyű – Budapest areas

(144 km), Budapest - Moldova Veche (599 km), Moldova Veche-Turnu Severin (117 km), total 860 km navigable; the Lower Danube area consists of Drobeta Turnu Severin - Delhi (761 km), Delhi - Sulina (Danube shipping) total 931 km navigable.

Middle Danube hydrographic network is relatively less branched, situated in the plain, large variations in flow and water levels with large increases in the spring and early summer and large decreases in late summer until spring. From Moldova Veche to Drobeta Turnu Severin, it has a relatively sinuous channel and it is less branched; downstream of Moldova Veche, it splits into two main branches - Golubăț towards right, and Coronim towards left. At the Iron Gate dam, the river's width is 1000 m, the water level is 33 m above sea level and the lake is 150 km long.

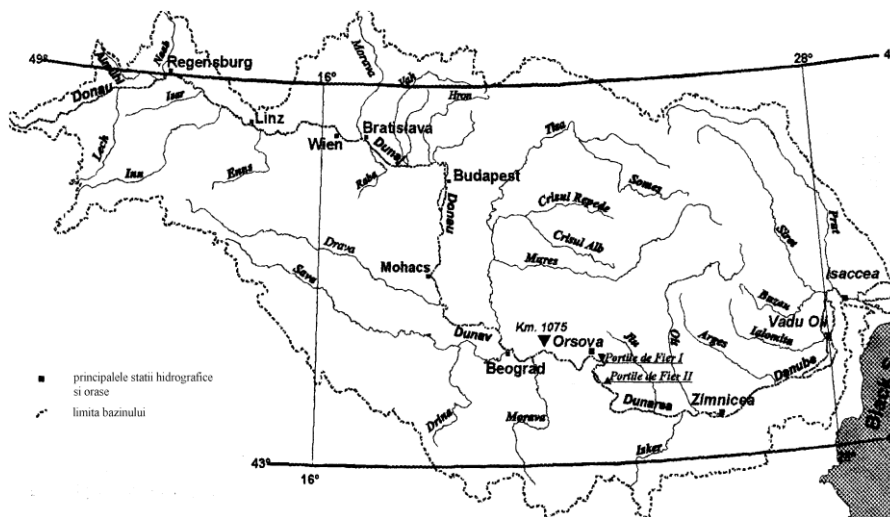


Figure 1. The Danube Basin (after Panin and Jipa 1998)

The main towns on the Danube are (table 1):

Table 1. The main towns on the Danube

| Nr.cr t. | City       | Position (km) | Nr.crt. | City     | Position (km) |
|----------|------------|---------------|---------|----------|---------------|
| 1        | Regensburg | 2381.32       | 35      | Svistov  | 554.3         |
| 2        | Passau     | 2228.36       | 36      | Zimnicea | 553.65        |
| 3        | Linz       | 2131.79       | 37      | Russe    | 495.85        |
| 3        | Mauthausen | 2112          | 38      | Giurgiu  | 493           |
| 4        | Viena      | 1929          | 39      | Tutrakan | 433           |

|    |                       |         |    |               |                  |
|----|-----------------------|---------|----|---------------|------------------|
| 5  | Devin                 | 1879.5  | 40 | Oltenița      | 430              |
| 6  | Bratislava            | 1868    | 41 | Silistra      | 375.5            |
| 7  | Gönyü                 | 1791    | 42 | Călărași      | 370.5            |
| 8  | Acs                   | 1781    | 43 | Oltina        | 337              |
| 9  | Comarno               | 1767.1  | 44 | Rasova        | 313.5            |
| 10 | Esztergom             | 1718.5  | 45 | Cernavodă     | 300              |
| 11 | Vișegrad              | 1695    | 46 | Seimenii Mari | 292              |
| 12 | Budapesta             | 1647    | 47 | Dunărea       | 285.7            |
| 13 | Csepel                | 1639.74 | 48 | Topalu        | 272              |
| 14 | Osiek                 | 1370    | 49 | Hârșova       | 253              |
| 15 | Vukovar               | 1334.9  | 50 | Vadu Oii      | 239              |
| 16 | Novisad               | 1257.7  | 51 | Giurgeni      | 239              |
| 17 | Belgrad               | 1170    | 52 | Brăila        | 170 (M 91.8)     |
| 18 | Orșova                | 955     | 53 | 23 August     | 153 (M 82.3)     |
| 19 | Kladovo               | 933     | 54 | Galați        | 150 (M 80)       |
| 20 | Kostol                | 931     | 55 | Grindu        | 139.82 (M 75.5)  |
| 21 | Drobeta-Turnu Severin | 931     | 56 | Giurgiulești  | 134.14 (M 72.43) |
| 22 | Maglavit              | 806     | 57 | Reni          | 127.23 (M 68.7)  |
| 23 | Calafat               | 795     | 58 | Orlovka       | 105.31 (M 56.86) |
| 24 | Vidin                 | 790.3   | 59 | Isaccea       | 103.8 (M 56.05)  |
| 25 | Lom                   | 743     | 60 | Tulcea        | 71.3 (M 38.5)    |
| 26 | Kozlodu               | 699     | 61 | Chilia Veche  |                  |
| 27 | Bechet                | 679     | 62 |               |                  |
| 28 | Oriahov               | 678     | 63 |               |                  |
| 29 | Corabia               | 630     | 64 |               |                  |
| 30 | Zagrajden             | 625     | 65 |               |                  |
| 31 | Islaz                 | 607     | 66 |               |                  |
| 32 | Nikopol               | 597.5   | 67 |               |                  |
| 33 | Turnu Măgurele        | 597     | 68 |               |                  |
| 34 | Belene                | 554.3   | 69 | Sulina        |                  |

On the navigable Danube there are 40 major ports and places to shelter in winter. The annual traffic is about 50 million tons and is made of more than 5,000 ships. It

is crossed by 114 road bridges, railway or pipeline (between km 2414 and km 0). Across the river, there are built or being built 30 dams and 22 operation locks (without those on the Danube - Black Sea). The regime of Navigation on the Danube was discussed in the conference at Belgrade in 1948. This convention proclaimed the freedom of navigation on the Danube citizens, merchant vessels and goods of all states on an equal footing in terms of port and navigation charges and conditions of general commercial navigation. This does not apply, however, to cabotage. The notion of cabotage is envisaged that performs navigation between ports of the same coastal state. The purpose of freedom of navigation is to ensure free communication between different states. Cabotage refers to the internal communication among ports of the same State. Cabotage reservation for national flag does not bother the transportation between ports of different riparian countries, shipments which remain free to be exercised by any other vessel.

Navigation on the Danube regime established by the Convention extends only to the portion of the Danube waterway, from Ulm to the Black Sea littoral in the Sulina. Navigation on the Danube for warships belonging of the nonriparian members is prohibited. Warships of the riparian countries can enter other countries bordering sectors only based on agreement between the States concerned.

Right to customs supervision and health of the river belongs to the riparian states, which are required to maintain their portions of the Danube river navigational status for ships, and where possible for maritime vessels as well, thus carrying the necessary work to maintain and improve navigation.

## **2. The Romanian Danube Sector**

The lower Danube hydrographic network consists of its left tributaries: Nera, Cerna, Jiu, Olt, Arges County; Siret, Prut and right tributaries: Timoc, Lom, Ogasinul, Isker, Vid, Osna, Ianița, Lonul with lower springs in the Balkans. Level and water flow increases during spring and early summer due to melting snow. The slopes are small and the flow rates are high. The Danube flows into the sea through three branches forming the Danube Delta, namely Chilia, length 117 km; Sulina, length 63 km; Saint George, length 109 km. Delta covers a total area of approximately 3500 km<sup>2</sup>. Annually, the Danube discharges into the Black Sea 198 billion m<sup>3</sup> of water (62% of water intake), namely 198 km<sup>3</sup> (228 km<sup>3</sup> by other data). The average flow of silt at the mouth, is 2140 kg/s or 66.5 million tonnes annually (as other data, annual throughput amounts to 80 million tons). The average slope is 25 cm/km, the maximum width of the river at etiage 1,500 m and maximum speed - 5 m/s (18 km / h).

The Romanian inland goods transport is made by the Danube and the Danube-Black Sea/White Gate transit Midia-Năvodari and 28 river ports, including seaports

Galați, Braila, Tulcea, Sulina. A brief overview of the main Romanian ports, through which inland freight is (Table 2):

**Table 2. Main Romanian river ports<sup>1</sup>**

| <b>Port</b>   | <b>Thousand tons/2011</b> | <b>Position</b>   |
|---|---------------------------|---|
| Galați: Area /berth 865000 m <sup>2</sup> /56   | 7248                      | At sea mile 80<br>mile 80   |
| Brăila: Area/berth 390000 m <sup>2</sup> /25  | 498                       | km 170  |
| Tulcea<br>Area/berth 83000 m <sup>2</sup> /41   | 1501                      | km 73,05  |
| Giurgiu: It is divided into four port areas. Giurgiu Free Zone is divided into two areas: port "Cioroiu" and the Chemical Zone  | 267                       | km. 493 + 800,<br>km. 490.  |
| Cernavoda: The port is composed of the fluvial area, along the Danube, downstream basin with sloping quay. The commercial area and the harbor basin are operational berths with six vertical quay and a port with a platform area of 9 ha | 509                       | right bank of the Danube - km 300 and on the left bank of the Danube-Black Sea Canal, km 64 +400. |
| Calafat: Product berths, length 350 m of which 100 m of quay length is provided by two cranes 5 ft; inoperative front with a length of 150 m  | 129                       | left bank of the Danube   |
| Oltenița: The port is composed of sloping quay total length of approx. 750 m minimum depth at quay - 3 m  | 424                       |   |
| Calarăși: The total surface is 213,000 square platforms in the commercial port. Total area is 3000 square meters warehouses. Minimum depth - 2.80 m.  | 238                       | km 370  |
| Orșova: Receipt and storage of goods; goods stored; Download - gravity feed grains; Download - Load compressed air bulk cement powder or other substances; Bulk cargo handling (loading, unloading, transshipment).                       | 227                       | km 955  |
| Drobeta Turnu Severin: The port has berths for passengers (km 930) arranged on a sloping stone quay - 530 m   | 1813                      | km 930 - 934  |
| Bechet: Stone quay inclined (pitching) in total length of 600 m vertical quay 70 m long grain berth - 100 m length represented; general cargo berth - 200 m; oil terminal berth - 300 m   | 100                       | km 679  |
| Corabia: The port has a sloping stone quay - 1470 m of which: Grain berth - 150 m long, equipped with   | 29                        | 628+600 and<br>km 630   |

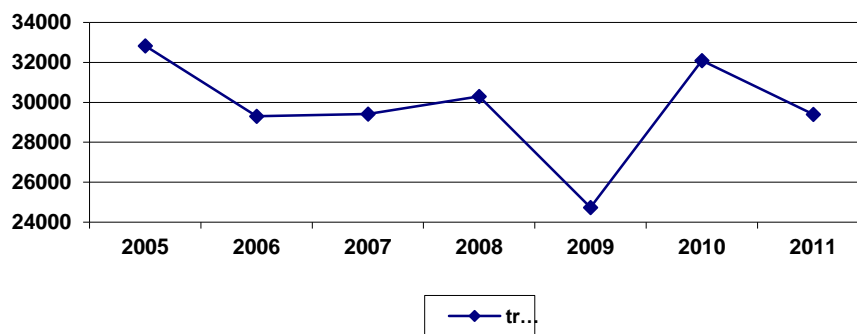
<sup>1</sup> [http://www.adrse.ro/Documente/Planificare/PDR/2014/2.5\\_Infrastructura.pdf](http://www.adrse.ro/Documente/Planificare/PDR/2014/2.5_Infrastructura.pdf)

|   |    |         |
|---|----|---------|
| silo with a capacity of 6000. Minimal depth ranges berths - 2.6 m - 6 m with areas of clogging                |    |         |
| Moldova Nouă: Quay - 550 m long berth for ore - 300 m long; commercial berth - 150 m, passengers berth- 100 m | 28 | km 1048 |

Romanian Danube freight traffic (thousand tons) in the period 2006 to 2011 was as follows (table 3 and figure 2):

**Table 3. Romanian Danube freight traffic**

| Year    | 2005  | 2006  | 2007  | 2008  | 2009  | 2010  | 2011  |
|---------|-------|-------|-------|-------|-------|-------|-------|
| Traffic | 32827 | 29305 | 29425 | 30295 | 24743 | 32088 | 29396 |



**Figure 2. Romanian Danube freight traffic**

From figure 2 it can be seen the influence of the economic crisis for the period 2009-2011, with a steep decline in 2009.

### 3. Inland and Port Infrastructure Modernization in Romania

#### 3.1. European Programs

Among the main European programs for the development of inland transport as: *PLATINA* programme (2008-2012 and *PLATINA 2* (2013-2016) pan-European multidisciplinary project which aims to develop and promote European inland transport. The latter is funded by the European framework Programme 7. Consortium project consists of 12 partners from 7 countries (Austria Viadonau, Voies navigables de France, Ministry of Infrastructure and Environment Netherlands, German Association of Inland Shipping Operators-BDB, Promotion Binnenvaart Vlaanderen Inland Navigation Europe, cereal, STC Group, CERONAV Romania, Maritieme Academy Hartingen, Pantareia-Nea, Development Centre for Ship Technology and Transport Systems-DST) and is led by the Austrian company Viadonau, which manages the inland waters.

### **3.2. Programs run in Romania<sup>1</sup>**

A. Improving the navigation conditions on the Danube, on the Calarasi-Braila (km 375 - km 175) to provide minimum navigation depths recommended by the Danube Commission 2.5 m works are underway in August 2011 and are monitored from its effects on the environment, as recommended by the EC and international environmental organizations; amount allocated in 2014 is 75.268 mil. lei;

B. Improving the navigation conditions on the joint Romanian - Bulgarian Danube (RA beneficiary River Administration of the Lower Danube Galati RA); on the joint Romanian - Bulgarian where there are about 30 critical points for navigation. 2014 will contract a consultant to review the proposed solutions in the feasibility study, cost benefit analysis, the study of environmental impact assessment and appropriate assessment; amount allocated in 2014: 1,325 mil. lei;

C. Establish a support system for topographic work on the Danube in order to ensure minimum depth of navigation, the project is in progress and is to provide a system of terminals along the Danube in 144 locations; amount allocated in 2014 is 2,561 mil. lei;

D. Rehabilitation and modernization of port infrastructure in Port Oltenita project consists in the following works: restoring piers in the cargo berths platform (about 200 ml); building in the area of trestles in length of 80 ml, with the possibility of further expansion; rehabilitation of the existing revetment entire passenger berths for general cargo berths (about 425 ml) and its extension in the downstream pipe (about 40 ml); Execution dock piling L = 170 ml; connection with the construction rehabilitated shore; accessories quay; amount allocated in 2014 is 17.4 mil. lei;

E. Expanding port and systematization Calafat's device port rail beneficiary River Danube Ports Administration SA Giurgiu). The project consists in the following works: restoration of vertical quay 4 berth length of 100 m; 4 berth jetty extending vertically along the length of 30 m; construction of berth 5 in length of 130 m; electrical works and water supply; amount allocated in 2014: 4.5 mil. lei;

F. Collection and processing system of waste from ships and response to pollution in the Danube ports; project objective is to increase the quality of ship waste collection through the acquisition of ships, installations and equipment specialized in cleaning / collecting waste from ships transiting / operating in Danube ports; period of realization: 2011 - 2014; amount allocated in 2014 is 15.75 mil. lei;

G. Modernising water quality management of waterways by installing water quality monitoring stations; project consists of the installation of 12 water quality monitoring stations at the following locations: Confluence of Danube-Black Sea

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<sup>1</sup> <http://www.mt.ro/web14/domenii-gestionate/naval>.



Canal (CDMN) - Danube (km 64, left bank), Cernavoda hydro node (km 60), SPA 1 Saligny (left bank CDMN), canton km. 46 Mircea Voda 500 (left bank CDMN) Medgidia downstream (right bank CDMN) bifurcation CDMN with CPAMN building Basarabi radar port (right bank CDMN) downstream city Basarabi (left bank CDMN, outlet Black Valley, km. 23) Galesul pumping station outlet (right bank CPAMN) Ovidiu lock, Năvodari Agigea lock shield; amount allocated in 2014: 1.00 billion lei;

#### 4. Conclusions

The Danube is part of European priority axis 18 Rhine/Meuse-Main-Danube Canal, which links the North Sea port of Rotterdam to the Black Sea port of Constanta. The European inland goods transport has undeniable advantages to be manifested in the near future on the Romanian Danube sector as well, namely: high safety, high reliability, lower cost than road and rail transport, pollutant more reduced, compared to other modes of transport, lower investment costs, transportation and maintenance, efficient tracking of goods, reduced traffic restrictions.

The Danube is a good example to create a balance between fostering the development of rail, sea, river and waterways. Improving the navigation conditions on the Danube, rehabilitation and modernization of port infrastructure, collection and processing system of waste from ships and response to pollution in the Danube ports, and modernizing water quality management of waterways are the main directions of European policy in modernization of the Danube waterway in the next years.

#### 5. References

Boşneagu, R., Preda, I. & Iordache, T. (2003). *Maritime and Inland Military Geography*. Constanța: Naval Academy Publishing House.

Boşneagu, R. (2004). *Geographic Conditions Influence on the Maritime Trade Routes in the Black Sea Basin (West sector)*. University Book Bucharest: Editura Universitara.

##### **Online Sources**

[http://ec.europa.eu/transport/modes/inland/index\\_en.htm](http://ec.europa.eu/transport/modes/inland/index_en.htm).

<http://www.european-waterways.eu/e/index.php>.

<http://www.inlandports.eu/>.

<http://ria.org.ro/ria/images/platina/danube/porturi%20dunarene.pdf>.

<http://www.danube-ports.ro/porturi.html>.

[http://www.mdrap.ro/userfiles/espon/dimensiune\\_teritoriala/reuniune2/materiale05.pdf](http://www.mdrap.ro/userfiles/espon/dimensiune_teritoriala/reuniune2/materiale05.pdf).

[http://www.unece.org/fileadmin/DAM/trans/main/sc3/European\\_inland\\_waterways\\_-\\_2012.pdf](http://www.unece.org/fileadmin/DAM/trans/main/sc3/European_inland_waterways_-_2012.pdf).

<http://www.naiades.info/news-and-events/markets/platina-2-has-started/>.

<http://www.mt.ro/web14/domenii-gestionate/naval>.

<http://naiades.info/what-we-do/about-platina-ii/>.

[http://www.adrse.ro/Documente/Planificare/PDR/2014/2.5\\_Infrastructura.pdf](http://www.adrse.ro/Documente/Planificare/PDR/2014/2.5_Infrastructura.pdf).