

## Strategy for the Transfer of River Freight Transport, From the Danube, on an Inland Canal in the South of Romania

Florin Iordanoaia

[floriniordanoaia@yahoo.com](mailto:floriniordanoaia@yahoo.com)

### Abstract

*Currently, the transport on the Danube River, on the sectors in Romania, depends a lot on the water level and the quotas in the navigation areas. The study, analysis and then construction of a navigable canal, parallel to the Danube and close to it, starting from Calarasi, to Drobeta Turnu-Severin, can be the technical and economic solution to solve the problem of lowering the water level on the Danube, water supply for irrigation and population consumption, pollution reduction and economic recovery of Romania. The paper follows the technical, economic aspects and strategies that must be established for the realization of a large-scale work, of this kind, the "South Canal".*

**Key words:** river, canal, development, strategy

**J.E.L. classification:** M 21, R 11, R 58

### 1. Introduction

The Danube issue currently involves several situations related to direct transport, freight and passengers, dams, flood protection, irrigation, protection of ecosystems specific to the Romanian area and especially the Danube Delta. Over time, transport on the Danube has been affected by many natural causes, from falling water levels due to drought, floods and exceeding warning levels, to freezing of the river or the detachment of ice floes and their floating. A major problem is the ecological protection of the river, protected areas and the Delta. For freight and passenger transport, the biggest problems concern:

**A. Lowering the water level.** This is a permanent, observed and recorded situation that helps state authorities and operators (NIHWM, 2021, pp. 1-2). Negative effects: safe navigation can no longer be carried out, it is impossible for ships to dock at port berths, so they can no longer be operated; long duration of time, of lowering the water level, which produces great disturbances in the normal development of the transport.

**B. Water freezing.** Interventions for this situation have been regulated and on this basis, activities are organized for raising the ice, (MTI, 2012, pg. 1-6). Problems: navigation can only be carried out with the help of vessels specialized in breaking ice, which increase operating costs, and after a passage of ships in the convoy, there is a risk that the water will freeze again; ships may be trapped in the harbor or in stationary areas, freeze water and ice and affect the resilience of ships.

**C. Rising water levels above flood levels.** This is considered the most dangerous situation, against which, over the last 50 years, several containment measures have been adopted for protection (Bularda, et al, 2014, pg. 5-6, 9-11). Negative effects: ships are affected by rising water levels, due to the fact that berths at port berths may be affected and ships can no longer berth; when ships are at the quay, during loading and unloading operations, they may be affected or stopped for a long time.

**D. Clogging of the waterway.** Considering the fact that on the Danube River, there are many places where the water depth is reduced, these being the most critical places for navigation, especially in the periods when the water level is low, the phenomenon of channel clogging also appear. This phenomenon is dangerous, permanent and involves great efforts for the River Administration, in the area of responsibility, to carry out extensive dredging works. These works are expensive, they must be carried out permanently, in accordance with the regulations of the

European Danube Convention, (MFA, 1948, pg.1-2). The problem is that a river ship or a convoy, when engaged in the riverbed with a difficult passage, it must sail in the middle of the channel, where the main current and the greatest depth, and in the case of meetings with other ships in these conditions, must adopt a series of measures imposed by the Danube Navigation Regulation, (MT-RND, 2013, pg.14, 18, 49-50). Hence another big problem, that of dredging the waterway on the Danube, in the area of responsibility of Romania. Dredging is also a problem for Serbia and Bulgaria, in the sectors they manage. From the data published by the Romanian river administrations, it results that they fulfilled their tasks regarding the dredging in the critical areas, (LRDA, 2019, pg.6-7). But what ship-owners and seafarers say is far from the situations presented in official reports. Over time, there have been situations and conflicts, related to the fact that the Bulgarian authorities have not fulfilled their tasks in the areas of responsibility, which has created major problems for ships (Toma, 2015, pg.1). All these situations have repercussions on the transport and operation costs, lead to very long delays in the delivery of goods, negatively influence the transport activity on the Danube. Therefore, the construction of a canal, between Călărași and Drobeta Turnu Severin, could solve many of the current problems of navigation on the Danube.

## 2. Theoretical background. Study on the geographical area regarding the construction of the "South Canal"

There are a number of concerns regarding traffic on the Danube, the elimination of difficult situations and problems caused by the river, but also the lack of organization of the competent authorities. Considering the fact that for a very long time, none of these presented situations are solved, I carried out a series of theoretical studies and documentary visits, in order to understand if a canal can be built between Călărași and Drobeta Turnu Severin (South Canal). In Călărași, an industrial port was designed and started, in a basin that is connected to the "Borcea" river arm (part of Danube), by a 4.8 km navigable canal (IANATD, 2003, pp. 316-317). The problem is that the entrance on this canal is clogged and there is a risk that this canal will be closed by the alluvium brought by the "Borcea" river arm. This situation is known at the level of the leadership of the Ministry of Transport and Infrastructure. Following a parliamentary interpellation, the Minister of Transport replied: *„it was found that the phenomenon of natural clogging of this secondary arm of the Danube quickly led to deterioration of navigation conditions, the need for dredging being much increased compared to the initial situation”*, (Câju, 2021, pg.1). What does this mean? That additional costs are needed to maintain a canal, on which navigation is no longer carried out, because the "Siderca" Steel Plant, for which it was built, has closed. Thus, a generous project, with great prospects, became unusable. Figure 1 shows the canal and the industrial port. There was an idea to build another canal from this "Siderca" canal, which would be connected to the Bucharest-Danube canal, at north of the city of Oltenita. The Bucharest-Danube Canal has not been completed and there is currently no completion project. The project of the South Canal can be designed and realized starting from this canal, from the basin from the southwest of the city of Călărași or even from the exit point to the Borcea arm, as shown in figure 2. In this figure is presented the first segment between Călărași and Chiselet, 33 km long.

Figure no. 1. Călărași canal and industrial port



Source: google.maps

Figure no. 2. Calarasi-Chiselet segment



Source: author's study, google.maps

Table no. 1 shows the channel segments and their distances.

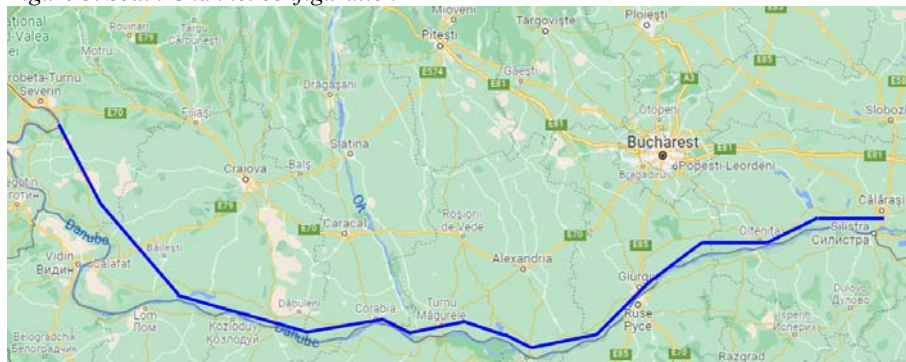
Table no. 1. South canal segments

CHANNEL SEGMENT	LENGTH	CHANNEL SEGMENT	LENGTH
Călărași – Chiselet	33 km	Pietroșani – Zimnicea South	24 km
Chiselet – Spațov	10 km	Zimnicea South – Suhaia	13 km
Spațov – Oltenița	13 km	Suhaia – Ciuperceeni	25 km
Connection Oltenița-Argeș	2,5 km	Ciuperceeni – Gura Oltului	11 km
Oltenița – Greaca	23 km	Gura Oltului – Corabia North	11 km
Greaca – Puieni	12 km	Corabia Nord – Dăbuleni	31 km
Puieni – Gostinu	11 km	Dăbuleni – Jiu	24 km
Gostinu – Giurgiu North-East	12 km	Jiu – Negoii	35 km
Segment Mocănașu Island – Plant Canal – Giurgiu South-West	10,5 km	Negoii – Gemeni	38 km
South-West Giurgiu – Vedea	15 km	Gemeni – Recea	23 km
Vedea – Pietroșani	14 km	Recea – Hinova	26 km
<b>Total</b>			<b>417 km</b>

Source: author's study, google.maps.

In total, the canal will have approx. 417 km, with an approximate configuration as in figure 3. If we compare with the distance between Călărași and Drobeta Turnu Severin, measured on the Danube, which is 561 km, there is a difference of 144 km. This difference can be appreciated as one that, under normal navigation conditions, a river tug with a speed of 10 km/h, upstream, travels in approx. 14-16 hours. So the use of the canal, in terms of travel time, will not lead to a substantial reduction, especially since it will depend on the number of locks through which ships and convoys will pass. But the benefits of this channel will be particularly important. The problem of locks and connections with the main rivers, which flows into the Danube, between Călărași and Negoii, in Dolj County, is a very important one, which will raise a series of challenges for designers and builders. The canal will intersect with the following rivers: Mostiștea, Argeș, Vedea, Călmățui, Olt and Jiu. The intersection with the small rivers is not a special problem, but the biggest challenges will be at the crossings of the rivers Argeș, Olt and Jiu.

Figure 3. South Channel configuration



Source: author's study, google.maps.

Also, substantial arrangements will be needed in the ports of Calarasi, Oltenita and Giurgiu. The canal will pass at a certain distance from the localities near the Danube, then from the western part of the Romanian plain and in the southern part of the "Getic" plateau, from Mehedinți county. When passing by the ports of Zimnicea, Turnu Măgurele, Corabia and Bechet, due to the configuration of these ports, it is not possible to make the direct connection with the Danube in these ports. This will be possible only on the nearby rivers, which will make them arranged on the portion from the intersection with the canal, until the discharge into the Danube. In the case of the 4 localities, it will be necessary to arrange some ports on the canal, in order to connect the roads and the railway, which are close to these localities-ports.

### 3. Research methodology

For the elaboration of this work, I studied several works in this field, checked and studied the navigation maps called “Danube Road” (LDRA, 2021, maps, km 297-1045), but also the terrestrial maps of the area in the south of the country. I traveled along the Danube, from Călărași, through Oltenița, Giurgiu, Zimnicea, Turnu Măgurele, Corabia, Calafat, to Dorbeta Turnu Severin and I noticed the characteristics of the area near the river, the intersections with localities, ports, rivers and adjacent areas. In the works I studied and found few concrete solutions to solve the issues related to the Danube road, navigation conditions, Danube quotas in ports and waterways, dredging and problems related to water freezing, but also constraints that arise each season. I systematized the information, centralized it and introduced it in this study. The literature makes no reference to such a project.

The methodology used consisted of the systematic, oriented and coherent study, in accordance with the principles used in a scientific investigation in the field of economic development strategies, of making large-scale investments, with a special impact on the entire national economy. I used the method of “transfer of concepts”, which consists in taking from scientific papers and legislation, some ideas, concepts and methods important for this type of study. Added my own studies and ideas to find the best solutions for carrying out such a project.

### 4. Findings

The transfer of river transport from the Danube, on the South Channel, is the first strategic point of the project. From a technical point of view, the realization of the channel means the following:

- The construction of the canal itself, of the locks, of the monitoring stations, of the road and railway bridges over the canal, the modernization and arrangement of the main ports, their endowment with operating installations and the realization of the logistic spaces.
- Connecting the current irrigation systems with the canal to ensure the water needed in agriculture, given that many irrigation systems have been built and most of them are now derelict. Realization of dam systems, for the protection of the areas adjacent to the rivers that intersect the canal.
- Construction of a system of photovoltaic panels on the banks of the canal, to provide electricity and a power supply system, electric river vessels, according to the system used for electric trolleybuses.
- Creation of a “green line”, consisting of trees planted on the edges of the canal.

**1. The projection and construction of the canal itself, locks and traffic monitoring and control stations.** Considering the previous experiences regarding the construction of the Danube-Black Sea canal, the “Poarta Albă-Midia Năvodari” canal, the “Călărași-Siderca” canal and the “Bucharest-Danube” canal (unfinished), which represent large-scale and very expensive works, from the point of view of the implementation strategy, the following steps are required:

**A). Study and understanding of the location of the South Canal.** These must be preceded by field geodetic measurements along the entire length. Only on the basis of measurements, it will be possible to choose the exact routes, to establish the areas where the locks will be located, the areas of connection with rivers and ports, where the canal will pass. It can be appreciated that such a canal can be built in any area of the plain in the south of the country, but I think it is best for this canal to be built near the Danube, in the area where the river was flooded, closer to the river. The reasons why I think this area is the best are the following:

- *Danube meadow.* This is an area recovered from the flooded areas of the river. In many such areas there were lands arranged for rice paddies, and now there are agricultural lands. Between Călărași and Negoi, the canal is not too far from the Danube.

- *Ecological impact.* I think the negative effect is small, because the ponds and swamps have been drained for a long time, then protective dams have been made over a very long distance, especially where the ground level was close to the water surface and was periodically flooded. A problem will be given by the passage through the forested areas, but I consider that on the edge of this canal, later, it will be possible to plant a very large number of trees, which will compensate for

any deforested parts of the forest. Due to the fact that there will be drainage channels for “overflow” and bringing water into the canal, with each opening of the locks, fish populations and other aquatic animals will not be affected. An environmental impact study is needed, but solutions will be found to all the problems that will be discovered.

- *The final area.* A problem will be on the segments between Gemeni-Recea and Recea-Hinova, where the relief forms change and the area of the sub-Carpathian hills appears. In this area, there will probably be some route changes, to avoid areas with hills.

- *The cost of land.* Where they have been used for restitution, it is much lower than in normal plain areas, but near localities, land prices will be higher.

**B). The technical aspects of the channel.** The largest work in Romania, the Danube Canal - Black Sea, has the following technical characteristics (ANC, 2021, pg.1-2): length = 64.4 km; navigable channel width = 90 m; channel depth = 7 m; maximum weighing of ships = 5.5 m; height at bridges = 16.5 m. The shape of the channel is trapezoidal. On this channel can sail in parallel, in the opposite direction, convoys with a length between 275-285 m, with a width of approx. 34.2 m, with a large tonnage of approx. 27,000 tdw. Following all the areas between Călărași and Negoii, the distance between the canal and the Danube could be between 300 m and 3 km maximum, depending on the populated areas next to which it will pass. This minimum distance of approx. 300 m, compared to the Danube shore, is a safety one, in the area where the construction works would not affect the area immediately adjacent to the shore. These distances, between the canal and the Danube, will be chosen according to the geodetic situation in each area. Ideally, this canal should cross as close as possible to the Danube, so as not to need more road bridges, in the areas of the localities, which have cultivated agricultural areas, between them and the river. The remaining area between the canal and the Danube can be used for replanting with trees, so as to ensure a green area along the entire length of the canal. Depending on this distance, the width of the navigable channel will also be chosen, depending on the size of the ships that will sail on this channel. The maximum width of 90 m of the channel, with the maximum width at ground level of approx. 110-120 m, plus protection areas of approx. 10 m on each side, would lead to a width of approx. 130-140 m. In addition, there will be connection areas, ports and locks, which will occupy a certain space. In order to adopt the optimal solution of the technical characteristics of the canal, simulations regarding the transport of goods will be necessary, mainly, the dimensions of the ships and convoys, which will sail on the canal, after the completion of the construction.

**2. Making bridges over the canal.** Assessing the situation of the intersections of the canal with the roads and railways, a number of 33 road bridges, 3 railway bridges and 4 mixed bridges, road and railway will be needed. These are presented in table 2, where: E = European road, NR = national road, CR = county road, RLI = road of local interest. RF = road in the field.

Table no. 2. Road and railway bridges over the canal

No	TYPE OF CONSTRUCTION	LOCATIONS AND AREAS
1.	<b>Road bridges</b>	1.Călărași West-NR 3. 2.Bogata-RF. 3.Oltenița-NR 4. 4.Gostinu-CR 507. 5.Comasca-RF. 6.Malu-RF. 7.Pietroșani-RF. 8.Zimnicea-NR 51. 9.The Lake Suhaia-RF. 10.Poiana-RLI 34. 11.Turnu Măgurele-NR 52. 12.Islaz East-NR 54. 13.Islaz North-CR 642. 14.Islaz West-NR 54. 15.Corabia East-CR 543. 16.Corabia North-RLI 124. 17.Corabia West-NR 54. 18.Orlea East-NR 54 A. 19.Bechet-NR 55. 20.Negoii-NR 55 A. 21.Rastu Nou-CR 561 D. 22.Rastu Nou-CR 561 E. 23.Moțâței West-NR 56 (E 79). 24.Cetate North-CR 552. 25.Dârvari West-CR 562. 26.Cearângu-CR 563. 27.Recea-NR 56 A. 28.Nicolae Bălcescu-CR 564. 29.Hotărâni-CR 606. 30.Rogova South-CR 562 A. 31.Rogova West-NR 56 A. 32.Hinova South-NR 56 A. 33.Hinova Port-NR 56 B.
2.	<b>Railway bridges</b>	1. Oltenița. 2. Zimnicea. 3. Turnu Măgurele.
3.	<b>Mixed bridges: road and railway</b>	1. Giurgiu East. 2. Giurgiu Port. 3. Giurgiu West. 4. Moțâței-Station.

Source: author's study.

**3. Arrangement of ports and connections with large rivers.** A particularly important aspect is the arrangement of the main ports (Călărași, Oltenița, Giurgiu), the secondary ones (Zimnicea, Turnu Măgurele, Corabia) and the connections with the big rivers (Argeș, Olt and Jiu), with the small rivers and canals of irrigation and drainage. Following the configuration of the mouths of the main rivers, the areas of their discharge into the Danube can be arranged, allowing the entrances on the South Canal. Basically, the entrances and exits on the canal would be in Călărași, Oltenița, Giurgiu, Olt, Jiu and Hinova. The other rivers (Vedea, Călmățui) and the irrigation canals have small dimensions and flows, which would require dredging and special arrangements, which would make them navigable from the intersection with the canal to the Danube. The completion of the Bucharest - Danube canal would also lead to the arrangement of the Oltenita port, which would be integrated in the South Canal project. Considering the current situation of the river ports, most of them abandoned, it is necessary the modernization and arrangement of the ports, their endowment with operating installations, the realization of the logistic spaces, their real integration on the multimodal transport circuits.

**4. Connecting the current irrigation systems with the canal.** Given the fact that throughout the year, the water level in the canal will remain almost constant, it can provide the necessary water in agriculture, which currently, in small quantities, is obtained from the Danube. Considering the fact that many irrigation systems, among those that have been built, and currently many of them are in ruins, the irrigation program can be relaunched throughout the “Romanian Plain”. The second strategic role of the South Canal is to obtain a strategic reserve of drinking water, in a constant amount.

**5. Photovoltaic panel system.** Extensive areas of photovoltaic panels can be installed on the banks of the canal, which can provide the electricity needed for the operation of all monitoring, control, lighting and lock installations. Considering the construction projects of some electric river ships, from these panels, stations can be arranged for the supply of electricity to the river ships. The remaining electricity can be transferred to the national energy system. It is also possible to build a power supply system for electric river vessels, according to the system used for electric trolleybuses.

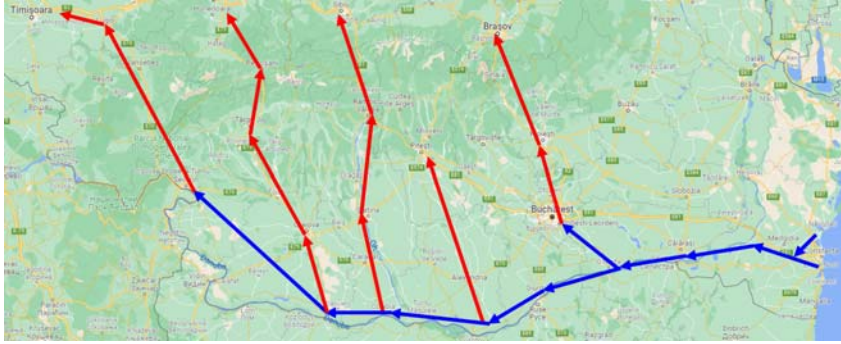
**6. Dam systems.** Before the points of intersection with the canal, it will be necessary to make some embankment systems, for the protection of the areas adjacent to the rivers and of the entrance areas on the canal, but also the waiting ports of the ships.

**7. “Green line”.** On the edge of the canal, in the adjacent space, a green line can be made, formed by planted trees. It would also have a role in consolidating the areas, in order to reduce soil erosion near the canal.

**8. Fish farms.** On the canal, fish farms can be arranged, for the protection of the Danube species, but also for the consumption of the population and for sport fishing.

**9. Transfer of freight from land to canal.** The transfer of freight transport, from roads, to the canal is the third strategic reason, which justifies its realization. Freight transport, in large quantities, will be oriented towards the transfer from inland roads and railways, to river vessels, which will sail on this canal. An integrated information system on freight transport on the canal can be used by manufacturers, carriers and beneficiaries. The transfer by road will lead to substantial savings and the reduction of pollution generated by heavy road transport vehicles. The connection of the capital Bucharest with Constanța to the east, on canals and river and to the west, towards Drobeta Turnu Severin, will lead to the decrease of the costs per ton of transported goods. With the help of this channel, the main freight flows, from the port of Constanța, to the interior of the country, will be oriented as in figure 4, which will have major implications on the development of multimodal transport. As well as the reverse flows, they will come from inside the country and will use the southern channel, on both East-West directions. The blue arrows indicate the directions on the water, and with red, the ones on land, on the roads and railways.

Figure no. 4. Freight flows from the port of Constanta



Source: author's study, google.maps

**10. Bucharest-Danube Canal.** It is not completed, but must be considered, as a first step, for the start of the big project. This canal was designed to have a length = 73 km, a width = 80 m, the minimum water depth = 4.5 m, the level difference of 53 m (10 m above sea level in Oltenița and 63 m in Bucharest). The plan includes four locks and three ports: two in Bucharest, the first near 1 Decembrie commune on Argeș and the second in Glina, on the Dâmbovița river, and the third in Oltenița. From this it was made approx. 70%, but in 31 years since the cessation of construction, large parts of the works were damaged and a number of components was stolen. In 2008, an attempt was made to resume its construction, but the project remained unfinished. The advantages of building this canal can be summarized as follows: reducing the cost of freight transport, on East-Center-West flows and setting up a large container terminal in Bucharest; reducing road traffic on the routes between Constanța, Bucharest, Craiova, Drobeta Turnu Severin and Timișoara; construction of micro hydropower plants at hydro technical nodes; water use for irrigation of over 150,000 ha of arable land; elimination of the flood danger for 11 localities and approx. 30,000 ha of agricultural land.

## 5. Sources of financing and costs

The European Union has developed several strategies for the sustainable development of river and inland waterway transport, and the Danube occupies a central place among them (EC, 2010, pp. 44-50). Legislation exists, as do funds, which can be obtained through various local, regional and transnational funding programs. But, as assessed in the documents prepared by the European Court of Auditors, (ECA, 2018, pp. 14-15, 38), “it was found that EU strategies for inland waterway transport do not have a solid and comprehensive analytical basis, and the cost of eliminating traffic bottlenecks in Europe (around € 16 billion) far exceeded the funding available from the EU budget for inland waterway infrastructure. Therefore, additional funding from national and/or private sources is needed to address this shortfall”. And Romania is on one of the last places, in terms of investments in the field of river transport. From the point of view of the specialized literature, many works and reports have been published, regarding the river transports, starting with the legal, technical, environmental and economic aspects.

Such a “Southern Canal” project is large-scale and can be defined in simple terms as a true “Country Project”. Considering the experience of building the “Danube-Black Sea”, “Poarta Albă-Midia Năvodari” and “Călărași-Siderca” canals, certain parallels can be made and even certain information can be used. In 2012, Romania submitted a project to the “European Strategy for the Danube Region”, for the resumption of works on the “Bucharest-Danube” Canal, with a financing estimate of approx. 800 million euros. A joint statement of the foreign ministers of the countries from the Danube region followed (MFA, 2013, page 1) and since then, nothing has been done until this year. On 23.02.2021, the tender for the launch of a new feasibility study for the completion of this channel was launched. The feasibility study will be carried out over 11 months. From the latest estimates, the cost of completion would reach approx. 1.44 billion euros without VAT (Andone, 2021, pg.1), and the canal will be ready in approx. 5 years. The completion of the “Bucharest-Danube” Canal would have a series of advantages related to financing, design-evaluation, restitution of related lands, construction, endowment and especially, the experience of those who

will be involved in this project. I consider that it is a first stage, very important, in order to be able to move on to the “South Canal” project. Following the costs for the construction of the “Danube-Black Sea” Canal, they were estimated at approx. 10,000 billion lei 1984. This is a lot. But the construction of the canal was done by the Army, 40 km, the Communist Youth Union (pupils and students), 10 km, and the remaining 16.4 km, by civilian workers. The design was made by approx. 1,000 specialists, and currently, 50,000 people worked on the canal. The construction lasted 8 years. The very high costs were primarily due to the very large number of people. Even if the military in term, the pupils and students were not paid in full salaries, still, the value of their work was transferred to the institutions to which they belonged. Comparing and analyzing the situation then, with the possibilities of the current economy of Romania, it can be appreciated that a series of changes have appeared, which are directly constituted in advantages, as in table 3.

Table no. 3. Advantages of southern canal construction

No	CURRENT SITUATION OF THE ECONOMY	ADVANTAGES
1.	Computer aided design.	- Design is much easier, simulations and tests can be done. - Will work with a small number of specialists.
2.	Use of modern equipment.	- Digging machines have high speeds and working capacities. - Increased the transport capacity of the excavated soil, by using high speed and capacity conveyor belts. - The working perimeters are established with the help of satellites, through the GPS system and Google Maps.
3.	The problem of excavated land.	- It will be used for: dams, strengthening the banks of rivers that intersect the canal and other adjacent areas.
4.	Project financing.	- European Union funds. - The state budget. - The budgets of the County and Local Councils from the 6 counties (Călărași, Giurgiu, Teleorman, Olt, Dolj and Mehedinți).
5.	Creating new jobs.	- In research, at specialized institutes and partner universities. - To the companies that will win the tenders and perform the works. - In the administration and maintenance of the new canal.
6.	Providing the necessary drinking water.	- Water for irrigation and consumption. - Preservation of a large amount of water, as a strategic reserve of the state.
7.	Constant water level.	- Constant navigation throughout the year.
8.	Container transport transfer.	- From the roads and the railway, on the canal, considering that there is a highway only between Fetești and Bucharest, and between Bucharest, Alexandria, Craiova, Turnu Severin, there are national roads, which are not modernized.
9.	Other activities.	- Fish farming, sports and leisure.

Source: author's study

Carrying out a series of documentations regarding the prices of some excavation works, of the hydro technical works, of the construction of the public roads and of the bridges, we obtained an amount of approx. 25 billion euros, without VAT, with an additional reserve of approx. 3 billion euros. This amount is necessary for the construction of canals, locks, ports, bridges, paved and paved roads, port facilities, monitoring and control centers, solar panels, tree plantations, fish farms, etc. The estimated duration is as follows: 1 year for carrying out legal proceedings, 1 year for launching and carrying out the feasibility study, 2 years for designing the canal and all related elements, and then expropriating the land and carrying out the works. For approx. 100 km, an estimated working time of approx. 4 years, because the area between Călărași and Negoii is on soft ground, easy to dig. Finally, a term of approx. 22-25 years, it is reasonable to achieve it.

Funding must be done in the following stages:

- Preparation and elaboration of documents, by the National Company ”Administration of Navigable Canals”, which must make all the initial legal steps of the project, informing the Ministry of Transport and Infrastructure, ministries of finance, research, environment and foreign, etc., followed by informing the European Union and Danube Commission. After obtaining all the authorizations and approvals, the elaboration of the documents for the launch at auction of the realization of the feasibility study follows.



- After obtaining the approvals and authorizations, the financing planning must follow, which will include the financing of the feasibility study, from internal or governmental sources.

- Carrying out the feasibility study, on the basis of which the configuration of the canal, the number of locks, bridges, arrangements and connections, the lands that will be returned, etc. will be established. After completing this study, the costs of carrying out all works, collateral investments (roads, ports, port equipment, etc.) must be estimated. The plan of financing and the construction costs become the most important document, which will be constituted in a “National Strategic Plan”, for the construction of the canal.

- Based on the financial estimate of the project, the documents for the tenders for the construction of the canal and all its components will be elaborated. Depending on the amounts allocated annually and the budget construction, construction tenders will be launched. The main problem at present is related to the fact that in Romania there are no more companies with experience in the field of hydromechanics, that the old economic units that built the previous canals, have been abolished or have restricted activity. Therefore, the tenders that will be organized for the completion of the “Bucharest-Danube” canal, will help us to understand which are the economic units with the potential to build this canal. The steps to be taken by the “Administration of Navigable Canals”, which is the competent state authority in this field, are the following: concluding financing agreements with the EU, from the State Budget and the budgets of the counties through which the canal passes. The construction of the canal will require efforts both from the central authorities, but also from the county and local ones.

## 6. Conclusions

This channel will lead to the relaunch of scientific research in Romania. In order to carry out the project, collaborations between Administration of Navigable Canals, research institutes and universities will be necessary, for the projection, elaboration of the financial plan, of the environmental impact and of other aspects and situations that will appear. The need for construction materials will mean a demand that will generate an offer and that the economic units will have to make. This will mean the relaunch of the economy horizontally, in the fields of production of: cement, metal structures, electrical cables, stone, sand, gravel, bitumen, photovoltaic cells, paint, machinery and equipment for hydraulic constructions, river barges, trucks and wagons for transport, and so on. It will generate a large number of jobs, for projection, construction and after completion, for monitoring and maintenance. Given the current efficiency of the machines, manual work will be reduced in almost all areas. The future must be anticipated in this area as well, in time and with great care.

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