Hydraulic Structures in the Bulgarian – Romanian Section of the Danube River

1. INTRODUCTION

The Danube River is the biggest international water artery of Europe. It passes through eight European countries and connects Western with Eastern Europe.

At present the Danube River is used predominantly as an international waterway connecting Rhine-Main-Danube and the Cherna Voda – Konstanza canal. A lot of the tributaries of the Danube River are also navigable.

A number of hydropower projects were built along the upper section of Danube River, passing through Germany, in the period between the First and the Second World Wars for power production and multipurpose water use.

The first international project along the river named Ibs-Persenbeug, was built up after year 1944, at the border between Germany and Austria.

Along the Austrian section of the Danuve River were built 13 hydropower projects in the perdio between 1946 and 2008. The last one is located at the capital of Austria - Vienna.

In Slovakia, a big complex of hydraulic structures was built on the Danube River, next to Bratislava, named Gabchikovo.

Between Hungary and Slovakia, a hydropower project named Upstream of Marosh was designed but suspended later due to political reasons.

Between Yugoslavia (Serbia) and Romania were built two hydropower projects:

- “Iron Gate I” – with the highest installed capacity on the Danube River in the amount of 2 192 MW
- “Iron Gate II” – directly above upstream of the border of Bulgaria with both Yugoslavia and Romania – the Timok River.

The design of hydropower projects in the lower section of the Danube River – jointly with Romania dates back to year 1959 with elaboration of a scheme for complex use of the waters of the Danube River.

A number of hydropower project sites were considered in the preliminary studies of the joint Bulgarian – Romanian section: from the town of Vidin to the town of Silistra. Pre-feasibility studies were developed in detail for hydropower projects sites in the area of Somovit – Izlaz and Belene - Cioara.

In 1973 the dam site at Nikopol - Turnu Magurele (Belene-Cioara) was selected, a basic design was developed consisting of 25 volumes. Also, partial detailed designs were prepared and used for commencing the construction which was later suspended.

In the pre-feasibility study for the area of Tutrakan – Cherna Voda were studies 5 dam sites for the hydropower project.

Two dam sites were selected and for them were carried out detailed studies. One of them is located downstream of the town of Silistra, at the border, and the other one is upstream the town of Silistra.

The proposal of the Bulgarian party is to construct the project site located upstream of the town of Silistra. Thus, the high water level, formed by the backwater effect, is avoided, as well as the construction of protective dykes within the region of the town.

Construction of a hydropower project is also planned downstream of Cherna Voda, in the Romanian section of the Danube River.

The Danube River is an exceptional natural fact. It exerts an intense impact and will have growing up significance for the progress of our country in the future, which a number of national and international problems ensue from.

Our country has used the Danube River mainly as a transport thoroughfare so far, partially for water supply, irrigation and fishing. Lately industrial enterprises have been built up along the bank of the Danube River (the Nuclear Power Plant Kozloduy and others), which require bigger quantities of water. Naturally, this does not exhaust the use of the big hydraulic potential.

As a significant part of the dykes on the Romanian bank was built up during the time period from 1960 to 1980, this resulted in certain increase of the elevations of the high waters of the Danube River. This considerably reduced the security of the already built up dykes on the Bulgarian bank from flooding, which imposes their additional superstructure in the current regime of the Danube River. The protected valleys and in particular the Vidin low land and the town of Vidin and Nikopol were in a critical condition. At the same time the existing dewatering systems are aged and not very effective. The filtered subsoil waters go out onto the surface in big areas from the protected valleys (30-40%) almost annually, and some of them are already salinized and are not used by the agriculture.

Along our bank there are big towns as Vidin, Lom, Oryahovo, Kozloduy and Nikopol and 20 villages which are not well protected against the water element of the Danube River. Some low districts of these settlements are frequently directly flooded or get drenched. The banks in a lot of sections are subjected to erosion from the Danube River, with which valuable land is lost, in particular after the commissioning of the hydropower project Iron Gate II.

The complex use of the Danube River through building up of the hydraulic structures at Nikopol – Turnu Magurele and Silistra - Karalash solves these problems in general and at the same time creates great possibilities for strenuous development of the sectors: energy, industry, agriculture, transport (water, road and railway), urbanization, tourism, recreation, etc.

2. GENERAL DESCRIPTION OF THE HYDRAULIC STRUCTURES

2.1. NIKOPOL-TURNU MAGURELE HYDRAULIC STRUCTURES

(1) Location

The site (the place where the dam will be located) of the hydraulic structures (HS) Nikopol – Turnu Magurele is at km 580^{+650} on the Danube River, at 7 km to the northwest of the town of Belene.

(2) Main parameters of HS Nikopol – Turnu Magurele – hydropower plant and water reservoir

The hydraulic structures comprise two main sites – *hydropower plant and water reservoir. The hydropower plant* is the main flow-barrier facility and it creates the backwater effect on the river and the *water reservoir* accumulates and re-distributes the river run-off.

MAIN PARAMETERS AND INDICATORS OF HS "NIKOPOL-TURNU MAGURELE"

- Backwater elevation 30,75
- Design head 9,90 m
- Average annual run-off of the river 180.10^9 m^3
- Average over-year water flow 6120 m^3/sec
- Installed water quantity 9600 m^3/sec
- Maximum design water discharge for the spillways 24400 m^3/sec
- Installed capacity 2x402 MW (2x450 MW)
- Annual usability 5500 h
- Annual generation of electricity 2x2200 GWh
- Length of the water reservoir 282 km
- Phase of elaboration of the Project: Basic design with partial detailed designs

Hydropower plant site

The hydropower plant site is composed by the following structures:

- Two hydropower plants – one on each bank. Two overflow concrete walls, each one of them with 8 overflow bays 21 m wide, equipped with segment gates, with dimensions 21/15 m;
- Two navigation locks with upstream and downstream quays and access channels – one on each bank.
- Fish passage, which is located on the Bulgarian bank next to the hydropower plant, with the designation to let pass in the migration period (from the month of March to the month of May) the valuable sturgeon fish from the tailrace to the water reservoir;
- Embankment dam;
- Railway line (single) and a motorway (four traffic lanes) through the hydropower plant site.
- Power connection between the switchyards on the two banks.

Water reservoir

The river-bed of the Danube River, corrected by protection dykes, turns into a water reservoir of the hydropower project with total length of 282 km and average width from 1,5 to 2,0 km.

Within the zone of influence of the water reservoir on the Bulgarian bank fall 14 agricultural low lands, 28 populated areas, 6 ports and 11 quays, high banks, roads and road bridges, railway stations and lines, some less significant industrial sites and others.

The construction of protective dykes, dewatering facilities, ports, roads, railway lines and water supply facilities is allowed for. The eventual adverse consequences from the construction and the operation of the hydraulic structures will not only be eliminated with the quoted measures within the zone of influence of the water reservoir, but the operational conditions will considerably improve and economic effects will be realized for the relevant users.

(3) Designs and executed construction works

The feasibility studies were conducted in 1965-66 jointly with the Romanian Party.

A joint Bulgarian – Romanian basic design was completed in 1975. Partial detailed designs were elaborated on these grounds and some temporary construction facilities were built, inclusive the enclosure of the construction pit on the Romanian bank, road connection from the town of Belene to the hydropower project site, flushout of the building site, building up of electric power supply, temporary settlement and other buildings and communications on our bank.

The building site of the island is enclosed by a dyke on the Romanian bank, the branch of the Danube River and now the entire water quantity passes only through the main bed of the river. Roads, a temporary settlement and communications were built.

A program was coordinated in 1992 for updating some design solutions for the hydraulic structures, inclusive of:

- Increasing the installed capacity of the hydropower plant to 480 MW for each country in consequence of the increase of the efficiency coefficient and the number of turbines;
- Displacement of the route of the protective dykes to the bank of the main bed, by which the filtration conditions in the valley are improved and preservation of the floodable area with the forestry fund (trees and grass areas) is attained;
- Updating of the designs of the hydropower project and the protective measures for the low lands and the populated areas.

The construction of the Nikopol-Turnu Magurele Hydraulic Structures commenced in 1978. It was suspended in 1980 and was restored again in 1986. In 1990 by Resolution No 9/26.03.1990 of the Council of Ministers it was frozen. The Government revoked in full the resolution for the construction of Nikopol – Turnu Magurele Hydraulic Structures by Decree No 194 of 5 September 2003 for revocation of Decree No 48 of the Council of Ministers of 1986 for the construction of the Nikopol-Turnu Magurele Hydraulic Structures.

The construction of Nikopol-Turnu Magurele hydropower project will have the advantage to use in events of need the available enormous construction and assembly base with Belene NPP, the relevant port, equipped by two cranes with total loading capacity of 500 t and others.

(4) Objectives and effect of the hydraulic structures

Effect on navigation

Conditions will be created with the construction of the structures for normal river sailing from the Rhine River to the Black Sea and for the energy utilization of the hydro-energy fall in the Bulgarian – Romanian section of the river after Hydraulic Structures Iron Gate II.

The conditions for the movement of goods and loads from Western to Eastern Europe, the countries from the former Soviet Union and the Middle East improve.

Energy effect

HC Nikopol-Turnu Magurele provides for each of the two countries 400 MW generator power and 2200 GWh annual generation of electric energy.

Other effects

The construction of the hydraulic Structures creates favorable conditions in other sectors of the economy:

- About 22 800 decares of cultivable areas will join the Danube River through displacement of routes of the protective dykes to the Danube River. The irrigation of $2{,}0x10^6$ decares of agricultural areas will be guaranteed. The development of the regional infrastructure will be promoted, inclusive of the protection of the populated areas from flooding.
- The building up of a road and railway connection between Bulgaria and Romania will be facilitated.
- Social effect: hiring of manpower during the construction and during the operational period.

2.2. SILISTRA-KALARASH HYDRAULIC STRUCTURES

(1) Location

Two variants were considered for section line of the hydroelectric development within the region of the town of Silistra:

- at km 384^{+500} over the town of Silistra;
- at km 373^{+400} below the town of Silistra (at the border with Romania).

The two countries jointly worked out TID in the time period 1978-1985 Effect of the implementation of the Project for river sailing being as with Nikopol - Turnu Magurele HS.

(2) Effects from the construction of the hydraulic Structures

Energy effect

Hydro-electric power plant is built up for each country with the following energy parameters:

No	Indicators	Measure	Section line at km 384^{+500}	Section line at km 373^{+400}
1.	Location of the section line		Above the town of Silistra	Below the town of Silistra
2.	Installed power for one hydro-electric power plant	MW	265	285
3.	Total installed power	MW	530	570
4.	Annual usability	H	6 200	6 150
5.	Annual generation for one hydro-electric power plant	GWh	1 642	1 751
6.	Annual generation - total	GWh	3 285	3 503

(3) Other effects

Stimulation and regulation of the regional infrastructure, inclusive of protection of the populated areas from flooding, protection of the agricultural lands, dewatering systems, gravity irrigation and so on.

Special protective measures are anticipated for the town of Silistra of backing up the water level at the construction of the hydroelectric development at km 373^{+400} - below the town.

Road and railway connection through the hydroelectric development with the transport measures of the two countries is anticipated.

(4) Selection of a variant

After the comparison of the two variants for section line of the hydroelectric development of Silistra – Kalarash HS, the mixed designers' collective team deems that the upper section line at km 384^{+500} (located above the town of Silistra) is more advantageous.

3. MAIN CONCLUSIONS ABOUT THE STRUCTURESES

3.1. ECONOMIC EXPEDIENCE OF THE CONSTRUCTION OF THE FACILITIES

A multitude of investigations were conducted for the use of the resources of the Danube River as a target of the water economy of the Republic of Bulgaria, the investigations and the activities for the last 25 years being regulated by over 25 documents of Governments of the Republic of Bulgaria. The resources were investigated with regard to the following economic activities enumerated in relation to priority, depending on the positive effect:

- hydro-energetics – utilization of the hydro-energy potential as renewable energy source;
- river sailing;
- infrastructure, inclusive of bank strengthening;
- irrigation;
- water supply;
- yield of aggregates;
- recreation and tourism;
- fishing; agricultural activities; industrial productions.

The economic use of the resources of the Danube River is a target of activities of the countries located along the river banks. The growing water consumption and the built up multitude of facilities in the water catchment of the river – from the springs to the Black Sea exert considerable adverse effect over the natural hydrological regime of the river in the Bulgarian sector. This adverse effect is stated in the reduction of the water and of the deposition run-off of the river in its lower section. Effects of climatic nature were also added along with the anthropogenic effects in the last 18 years, which are directed at the reduction of the water and of the deposition run-off as well resulting in an integral irreversible negative effect over the conditions for river sailing and over the development of the river morphological process.

Possible solution with regard to these negative effects will be the construction of the two Nikopol-Turnu Magurele Hydraulic Structures and, respectively, Silistra-Kalarash. Critical for river sailing sections along transport corridor VII – the Danube River will be eliminated as an effect of the construction of these facilities, its navigability will be improved and substantial advantages for the water transport as compared to road transport will be created. This effect is of essential significance at rendering an account of the fact that the water transport is the cheapest kind of transport and most completely satisfies the ecological requirements, owing to which it has the biggest share of transported cargos, both worldwide and in European and national plan. In this respect, the European Union in its White Book on Transport draws up as priority the need of its development with priority and anticipates special policies for its promotion.

In addition to that, in Bulgaria over 2/3 of the international trade in physical volumes is served by the water (river and sea) transport, respectively passes through the ports which fact, with the intensely open nature of the Bulgarian economy, determines the effectiveness of the water transport and our ports as one of the paramount factors for the competitiveness of the Bulgarian economy and in particular – of the main branches of industry.

The statistics indicates that the freight turnover has increased in the last few years and this also brings up the sharp issue for investments, state-of-the-art equipment and port technology, concessioning and so on. It should be noted that the tendency is not unambiguous and stable. The positive tendency for growth of the activity of the port of Rousse is predominantly due to the natural potential and in particular to its location, whilst the other Danubian ports undergo through significant fluctuation in the work load and respectively – in their effectiveness.

Further to the issues stated hereinabove, a question specific for the region, brought up repeatedly at various forums, is how to make the river sailing along the Danube River more effective in the Bulgarian – Romanian section and thus to realize the Pan-European transport corridor Rotterdam – Constanza which has been planned for a long time. In this connection, the adopted Memorandum at the Conference on Inland-Water Transport (5-6.IX.2001), which was held in Rotterdam (the Netherlands), signed by Bulgaria as well, aims at mutual understanding and cooperation in the sphere and the development of the basic (main and ancillary) infrastructure of transport corridor VII (the Danube River), inclusive of the main infrastructure (the river), ancillary infrastructure (ports) and legislative frame (harmonized requirements to the transport process). As a result of the execution of these components, development of the multimodal transport and transfer of the main quantities of cargos to the inland-water transport as ecological transport with low transportation prices should be attained. At this moment the Danube is a shipping river but it in no event satisfies the requirement for transport corridor – provision at permanent depth in conformity with the fairway of 2.50 m with Low Shipping and Regulation Level (LSRL) in conformity with the recommendations of the Danubian Commission.

It may be stated on the grounds of studies conducted in our country and foreign experience that the natural potential of the Danube River may be used in complex solely and only via its aerial inspection, in three main directions:

- generation of electric energy;
- transportation – water, railway and road;
- irrigation and so on.

Further to that, the aerial inspection of the river will exert beneficial influence over the erosion of the river banks, the tourism, fishing, the retention of big quantities of water and so on. The erosion of our bank after the Timok River will be eliminated in consequence of the work of Iron Gate II.

Other countries along the banks of the Danube River have used these rich natural resources for a long time and have a various number of hydraulic structures (HS), the facts being as follows:

- Upper section of the Danube River
  - Germany – six hydraulic complexes exclusive of hydro-electric power plants and plans for construction of another one
  - Austria – eight hydraulic complexes inclusive of hydro-electric power plants
- Middle section of the Danube River
  - Slovakia - one hydraulic complex inclusive of hydro-electric power plants
- Lower section of the Danube River
  - Serbia and Romania – two hydraulic complexes inclusive of hydro-electric power plants.

The two projects will result in the construction of over 660 MW (700 MW) installed capacity for the generation of about 3.8 GWh (4,06 GWh) of electric power per year from renewable energy source, which in practice means diversification of the energy sources, utilization of local energy resource in an economically effective manner and preservation of the environment via generation of electric energy with zero emissions of greenhouse gases. In addition to that, the contribution of the future plants to the attainment of the commitments undertaken also at the level of the Community for the promotion of the electric power generation from renewable energy sources – indicative objective for Bulgaria – 11 % of the gross internal electric power consumption up to year 2010 will be a direct effect as well; Objective of the Community up to year 2020 - 20%. The indirect effect in connection with the construction of NPP Belene should also be taken into consideration namely – the provision of balancing capacities as well as the achievement of a synergy effect with additional and maximal utilization of the construction and assembly base with NPP Belene.

It should be noted down that the two hydro-electric power plants of the Danube River work at full capacity in summer (May – September), when the high waters are. The Thermal Power Plants and the Nuclear Power Plants stop functioning for repairs and replenishment. Thus the expensive fuel from the coals for TPP will be economized.

With the construction of the two hydraulic structures sites significant increase of the level of the river will result, which creates appropriate conditions also for effective irrigation of the fertile terraces along the two banks of the river. Beneficial conditions will be thus created for the solution of the problem of irrigated agriculture – a vitally significant task for the overcoming of eventual drought. The estimates made prove that with the construction of the two hydraulic structures sites realistic possibilities will be created for the irrigation of arable lands, which for Bulgaria add up to over 250 000 ha, and in Romania - over 450 000 ha.

3.2. COMPLEX EFFECT OVER THE ECONOMIC SECTORS

The following should be taken into consideration during the evaluations of similar big-sized projects:

- The Danube River is the most international river;
- From the beginning of last century the Danube River gradually turned into a main transport corridor connecting the North Sea and the Black Sea via the canal system Rhine-Main-Danube.

- There are no other so serious sources of water energy on the Balkans, which were not utilized or which are being utilized at the moment;
- The developing erosion processes along the Danube River in its lower stream may not be suspended or compensated solely by engineering measures, and it is due to that that the navigable conditions will become more and more difficult unless the two hydraulic structures sites are constructed;
- The erosion on the banks and the islands will continue unless they are completely protected and the threshold sections will increase and they will become more and more critical with the digging up of the bottom of the river which is being conducted in certain sections at the moment;
- Bulgaria and Romania will lose from their territories as a result of the erosion on the banks and the islands;
- There are no sufficient sources for yield of river aggregates on the Balkans and this yield will have to be suspended under the conditions of predominantly developing erosion processes.

Taking the above into consideration, the following conclusions may be drawn about the future benefits from the construction of the two hydraulic structures projects:

- Annual yield of energy from renewable energy sources adding up to 3.8 GWh (4,06 GWh) will be realized, which at the current level of consumption represents about 9.9% of the gross internal electric power consumption for the country for year 2006.
- Navigable conditions of full value will be realized from Silistra to Iron Gate II all the year round. The annual dredging works for the maintenance of depths along the fairway will be eliminated.
- Significant yield of river aggregates with low cost price will be provided, which will increase the competitiveness of the construction industry within the region.
- Improvement of the transport connections between Bulgaria and Romania will be realized by another railway and motor vehicle connections located in places with comparatively prepared structures. This will result in the realization of a significant flow of goods and excellent integration of the economies of the two countries, respectively enhancement of their competitiveness in European and global scale. The building up of the hydroelectric development with a road and railway connection will be considerably more effective than the construction of bridges only.
- The living conditions along the two banks will be improved via the reliable protection from flooding and construction of new settlements beyond the floodable zones.
- The conditions of use of the waters of the Danube River for water supply and irrigation not solely in the proximity of the river bank but also inside along the tributaries will improve.

3.3. SOCIAL BENEFITS

The construction of the hydraulic structures in the Bulgarian section of the Danube River will have a great affirmative effect in the following directions related to the enhancement of the quality of life and direct social benefits such as:

- Creation of new workplaces in areas with a big percentage of unemployment: about 2300 new workplaces will be created in conformity with preliminary estimates during

the construction, and after commissioning - about 850 permanent workplaces for highly qualified specialists for each of the countries (Bulgaria and Romania);

- Solution of the problem with the permanent erosion of the Bulgarian bank and the islands (in particular after the Timok River); improvement of the conditions for sports, tourism and fishing.

3.4. IMPACT OVER ENVIRONMENTAL COMPONENTS

The tendencies for changes in the climate which have been observed in the last 10 years and the signs for increase of the average temperature impose bigger and bigger restrictions over productions and technologies emitting hazardous gases into the atmosphere.

From this point of view the production of electric energy through renewable energy sources, inclusive of hydro-electric power plants, acquires a qualitatively new measurement – it improves the effectiveness of the energy system with 1) coverage of the loads, 2) preservation of the environment and 3) exceptionally low expenses. In addition to that, the following will be attained by the construction of the two hydraulic structures sites:

- Improvement of the condition of the dykes in the Bulgarian and Romanian section of the Danube River and protection of the eco-systems and the populated areas on the two territories;
- Reduction of the floodable areas within the terrace of the Danube River through the displacement of the dykes nearer to the river-bed and the increase of the cultivable areas.

No blocking of deposits of subsoil assets registered in the National Balance of Reserves and Resources is expected with the construction of the two sites. The enhancement of the potential for irrigation of the agricultural areas may also be accepted as positive.

The joining of about 23 000 decares of “cultivable areas“ to the territory of Bulgaria is affirmative on the one hand, but the loss of the Bulgarian islands flooded from the dam lakes should be taken into consideration as well.

The benefits and the damages over the environment should be analyzed in greater detail after updating the feasibility studies, which should be taken into account during the economic analyses and the pricing of the Project. The trans-border location of the Projects should also be rendered an account of which assumes joint work with the Romanian country.

3.5. POTENTIAL PROBLEMS

The specific technical solution for the construction of the two hydraulic structures sites should be preceded and substantiated by a detailed feasibility study with regard to the economic, social and ecological aspects from the implementation of the projects, as the existing technical economic studies and working documentation (elaborated during the time period 1965 - 1980 by teams of Bulgaria and Romania) need substantial updating, in view of the dynamics of the environment. Special attention should be paid during the feasibility study and the subsequent design of the facilities to the eventual future adverse impacts it exerts:

- Nikopol - Turnu Magurele project directly affects protected zone Nikopol Highlands and protected zone Persina, and in the proximity of Silistra – Kalarash project – a maintained biospheric reserve Sreburna.

- State-of-the-art dykes with the relevant anti-filtration measures in their base of piling walls and geo-membrane technologies are anticipated in the designs aimed at not increasing the levels of the underground waters in associated areas beyond the dykes as well as building up of systems of dewatering pumping stations, for the work of which a part of the yielded energy will be used (the initial evaluations are that the quantity of energy used for the purpose will be within the framework of about 2% of the generated one), and no increase of the levels of the underground waters will be allowed for, as this will result in salinization of the soils as well.
- Further to the main dams, the construction and superstructure of dykes along significant parts of the Bulgarian and the Romanian banks within the backing up zone will be needed, which as facilities represent earth embankment facilities with significant sizeable parameters. These dykes will protect from the high waters of the Danube River.
- Taking into consideration the fact that the hydraulic structures sites will have flowing water reservoirs and during high waters the river will be completely open, it may be forecast that the deposition run-off of the Danube River to the Black Sea will be reduced by not more than 25-30% of the present level.
- Improvement of the quality of the waters inflowing into the Black Sea – result of the treatment effect of the flowing water reservoirs.
- The slope to the elevation of the high waters in the river on the Bulgarian high bank where there are existing landslides will be sufficiently well consolidated by modern geo-composite protective measures.

4. CONCLUSION

The technical infrastructure for water supply and sewerage of the populated areas in the Bulgarian section of the Danube River built up in the last 20 to 25 years should be profoundly analyzed during the conduct of supplementary investigations for the two Projects. The lifting of the subsoil waters, in consequence of the backing up of the river, will require technical solutions resulting in the increase of the water density of the new dykes, especially in the sections of the populated areas, as well as building up of dewatering systems in some sections. It is recommendable as the first stage to construct the needed facilities related to the protection and the normal operation of the existing technical infrastructure in the populated areas and beyond them and during the second stage – the facilities for yield of energy and the communication between the two countries should be included in the projects. A complete technical and economic evaluation should also be performed, taking into consideration the state-of-the-art technical and technological solutions as well as the needed expenditures for the project, inclusive of an approximate assessment of the size of the terrains representing agricultural and forestry lands, which will be affected during the implementation of the projects and the funds which will be anticipated for the conduct of the procedures for the change of the designation of these lands.

The implementation of these two projects will exert substantial impact over the overall development of the Danubian region and will considerably improve the energy balance of the Republic of Bulgaria.

The Nikopol – Turnu Magurele Hydrualic Structures are with indisputably better technical and economic parameters and its construction should be commenced first.

The feasibility study should be updated, aimed at proving the technical, economic and ecological effectiveness and expedience under the existing conditions and rendering an account of all the aspects from the building up of the facilities, on the basis of updating and modernization of the existing multiple developments.

On the basis of the stated initial motivations for the economic expedience, the structures' impact over the development of the economic sectors, the social benefits and the effect over all the components of the environment, the potential problems and advantages from the investment over the affected countries, the following should be initiated:

- Updating of the feasibility study, aimed at proving the technical, economic and ecological effectiveness and expedience under the existing conditions and rendering an account of all the aspects from the construction of the facilities;
- Coordination with the countries interested in the implementation of the projects, inclusive of the European Commission, with a view to the Pan-European significance of the Danube River (transport corridor No VII).

For more information please contact me!

Dr. Mag. Valentin Ivanov