Documentation

Saving the Danube's inland delta

The following is excerpted from a publication issued by Slovakia's state-owned Water Management Construction company (Vodohospodarska Vystavba), under its director Julius Binder, an engineer who was interviewed in our Nov. 18, 1994 issue.

Thousands of hydroelectric projects have been built during the last century. However, none of them has faced such a systematic international campaign as has been launched against the Gabcikovo-Nagymaros Project. A variety of alleged disastrous implications for nature, fauna and flora, farming, woods, fishing, sources of drinking water, etc., have been used as an excuse without taking into consideration the Danube's current adverse status. At the present time, the completed project is providing economic and environmentally precious benefits.

In this publication, we would like to make use of facts and of approximately a year's experience gained while operating the Gabcikovo facilities, in order to prove to the world that all negative forecasts made about this project were unsubstantiated, fabricated for other than environmental purposes.

The Danube leaves mountainous Austria through the rocky sill of the Devin gate and flows onto the Danubian depression in Slovakia's southwest lowlands. Here, long ago, the river flowed to the Panonian sea, where its flow gradient decreased and the flow velocity and carrying capacity slowly disappeared. The river has been depositing sand and gravel at this point since time immemorial, bringing it along from its mountainous track in the Alps. Because of this sedimentation activity, the current split into a multitude of branches. It was mainly during floods that the river changed its bed.

Thus, the Danube's inland delta came into existence, its branches interweaving the vast lowlands.

The cultivation of the delta area, farming, flood control activities, date back virtually to the beginning of the 12th century, and to the time when the area was becoming more densely populated. These activities resulted in a gradual contraction of the delta area. Out of an enormous multitude of branches which initially existed here, two major branches finally remained, namely the Small Danube, which demarcates the Major Zitny ostrov on the northern side, and the southside branch called the Moson Danube, which delimits the Minor Zitny ostrov.

The delta began within Bratislava's confines. The delta entirely and irreversibly vanished from this site over the past 200 years.

In the 18th century, the Danube delta and its branches had no stable main river bed.

In addition to soil cultivation, international navigation was for centuries a major factor influencing the Danube's flow. The northernmost branch was used for navigation during the whole Middle Ages up to the 19th century. It was not until the second half of the 19th century that the shipping route near Bratislava definitively turned south, where, with human endeavor, the present main river bed began to be formed.

The invention of the steam engine imposed greater demands on navigation and therefore work began in the last century with the aim of establishing a "united river bed," which at the same time meant a gradual decline of collateral branches.

After World War II, Austria started the construction of water-power projects along its entire section of the Danube.

The completion of these projects nearly resulted in a severe reduction of gravel movements in the bed, which, until that time, amounted to about 600,000 cubic meters of gravel a year. In response to this, the river began to erode and deepen the gravel-bottom of its bed, decreasing its level at the same time. For instance, the level of the river in Bratislava has decreased by 2 meters in the past 30 years. These lowered levels in the Danube's main bed resulted in a situation where collateral branches of the river were only supplied during periods of high water and remained half-empty during most of the year. As a result, many of them dried up regularly.

Thus, the little Danube in Slovakia and the Moson branch on Hungarian territory were without water during the greater part of the year (on average, 83% of the time).

The lowering of the Danube's level was accompanied by a declining groundwater table in the wetland wooded area, which began to dry out.

Since the water table continued to decline because of river bed dredging necessary to maintain navigation, the disappearance of wetland woods on either side of the Danube would have been unavoidable just as in the previous century on the Rhine, before the construction of dams.

However, the situation of the half-empty branches, as well as the Moson branch, has changed since the commissioning of the Gabcikovo project.

The technical solution

After many years of studies, an alternative was finally chosen, with a reservoir placed in the vicinity of Bratislava and a diversion channel on the left bank, i.e., the Slovak side, while the Nagymaros stage was situated on Hungarian territory [see map]. With regard to the route of the diversion channel, it should be emphasized that it led outside inundated areas and the Danube delta. This is, in comparison with the construction of dams on the Rhine, an invaluable experience from the point of view of preserving deltas for future generations of Europeans. Diversion channels on the Rhine are built in inundated areas, thus destroying the chance to preserve the river delta as a unique natural form.

It should be noted that, notwithstanding the fervent continual attacks waged against this project at high international forums by Hungary's political leadership, and despite catastrophic predictions, these water projects on the Danube have invaluable environmental benefits. The experience gained on an already-functioning hydraulic project has already demonstrated the usefulness of this project, as well as the acumen and farsightedness of the engineers who designed it, on both banks of the Danube.

The principal environmental benefits of the project:

- The reservoir placement at a site where the Danube's water enters the Zitny ostrov subsoil and the elevation of the river level by several meters at this site make the groundwater regimen dramatically more dynamic in the entire region, thus contributing to the diluting and washing away of layers contaminated by farming.
- An increase in the water level at the reservoir site will increase the volume of water filtered into the subsoil, water suitable for drinking, water supply, and irrigation.
- Elevation of the water level in the reservoir will provide continuous water supply to the branches as required throughout the year, including periods of generally low levels when the branches are usually half-dry or completely dry. This will create conditions for the revitalization and lasting conservation of the Danube's delta, as well as diversifying this region's flora and fauna, which due to unfavorable conditions have markedly diminished over the past years.
- The placement of the diversion channel outside the delta area will separate the river's economic functions, i.e., electricity generation, navigation, and flood control measures, from its biological function. Thus, conditions will be created on a 30-km-long stretch for an undisturbed natural preserve with fully developing flora and fauna, pisciculture, hunting, forestry, and recreation areas.

Over the past decades, the Danube's bed has significantly deepened. Diverting part of the Danube's flow into the canal caused a further decrease in the water level and also raised the draining properties of the bed.

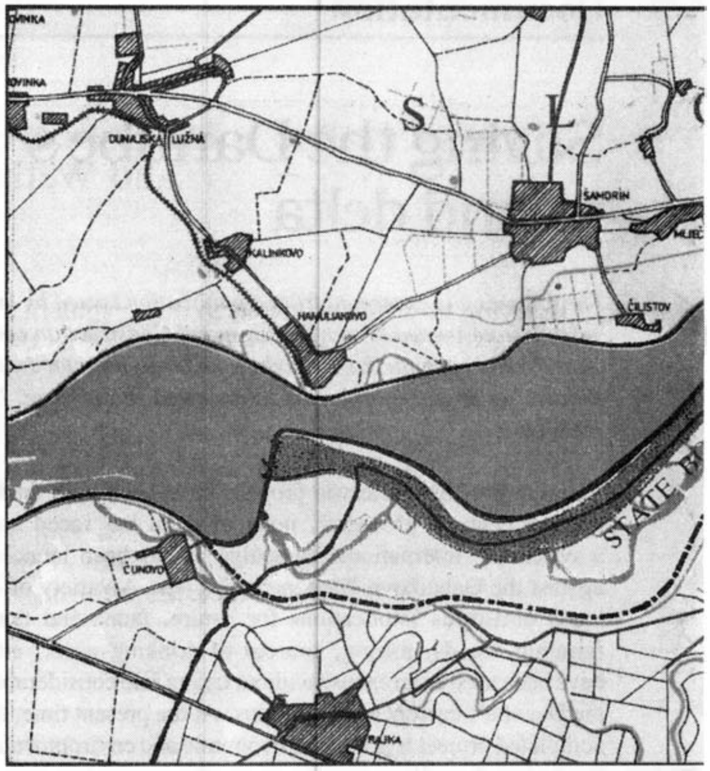
Two types of nature conservation provisions have been proposed in the design to save and improve the natural state of the Danube's inland delta and canal section:

a) provisions along the inundation area

b) provisions in the proper river bed.

Provisions on the left bank inundation: Impounding facility lines have already been built on the left bank, in the form of embankments and in inundation areas with spillways and outlets. There is a total of seven such lines, which together form eight closed areas with a required water level kept impounded in a cascaded grade.

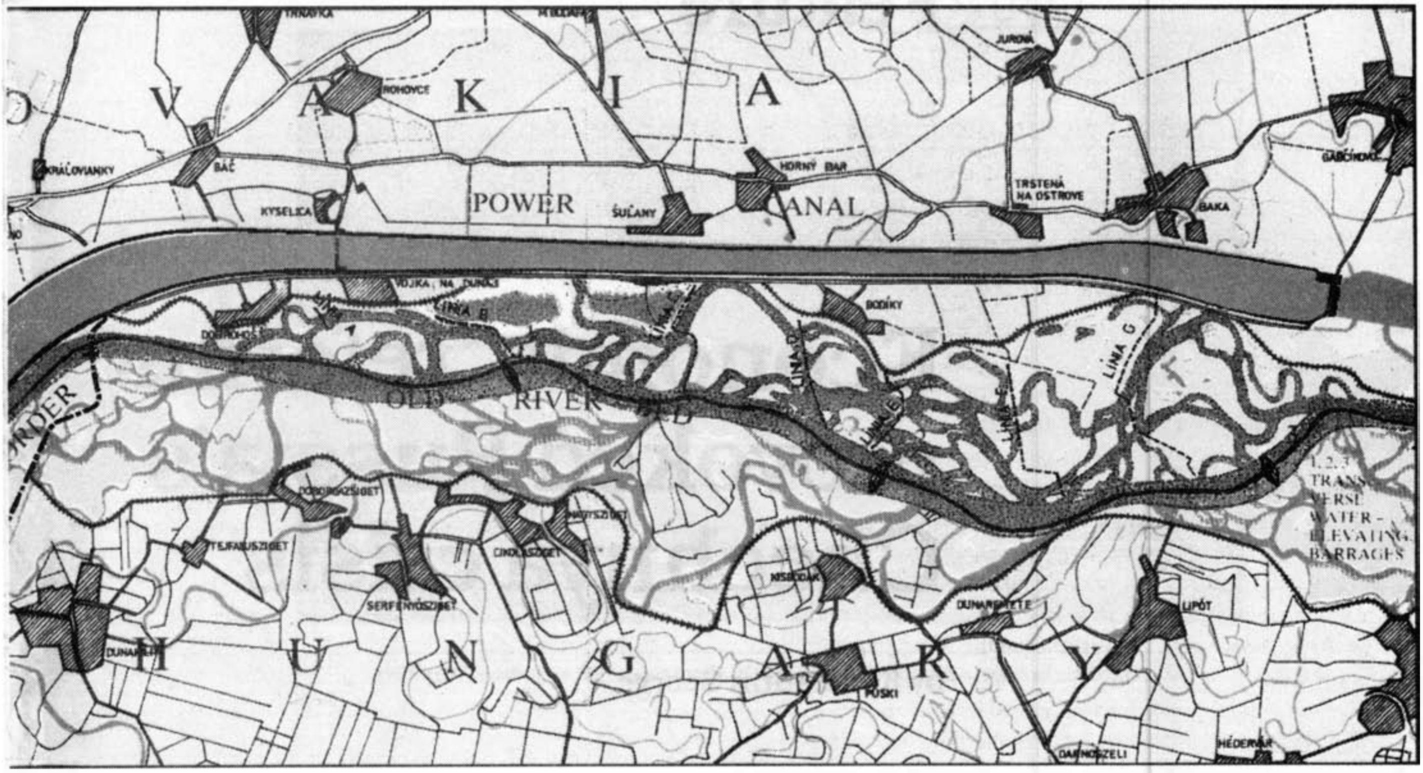
Restoring the Danube's inland delta



If needed, artificial flooding can be effected in the area. The entire system will be supplied with water in amounts of up to 250 m^3/sec as required through the inlet structure near Dobrohost, which was commissioned in early May 1993.

Already, in March 1993, a provisional pipeline began to fill the system of branches at a flow rate of 7 m^3/sec. The water inlet structure at Dobrohost was completed and put into operation in early May 1993. Water started to flow into the branches in volumes of approximately 60 m^2/sec and successfully filled all left-bank branches. It was indeed a historic moment, because it marked the instant when water flow into the branches would be permanently secured and the danger of the delta's decline would be eliminated forever. Water means life.

Provisions in the old Danube bed. In addition to the measures to be taken in the flooded areas, the design envisions small transverse weirs to be built in the original river bed. There will be a total of five such weirs designed to elevate the water level in the Danube's old bed to the natural flow of 1,340 m^3/sec, which is assumed to provide optimal conditions for branch and forest conservation and development. Thus, the function of transverse barrages on the Danube's bed will be supplemented by small weirs in the branch system. These weirs could be used to create a flood control mechanism that would be used to fill the branches along the right side of the Danube, thus solving the problems of a low underground water table in this and surrounding areas.



Under such circumstances, 50-200 m^3/sec of water could be fed into the old river bed as stipulated under the 1977 agreement.

These transverse weirs have not yet been built. Their construction was to coincide with the damming project so that its effects would already be felt in the following growing season.

What is the reality?

Saving and improving the status of the inland delta of the Danube. Of crucial importance for improving the status of nature and the Danube's delta conservation is not the volume of water in the old river bed, but its level. The deepening of the river bed and a reduction of the groundwater table resulted when the flow was both full and natural. The solution used for nature conservation on the Rhine water work projects was not the discharge but the water levels when approximately only 2-3% of the original flow was fed into the old river bed. A request to release a larger portion of the flow into the old river bed is in variance with the legal agreement. A release of flow into the bed would mean a partial waste of effort on the part of the Gabcikovo hydroelectric plant, and a reduction in the environmentally friendly production of electrical energy would have to be compensated for by burning of coal, thus increasing the eutriphocation properties of the water in the reservoir and the canal.

The level, productivity, and quality of underground water. Underground water table level: A favorable rise within the surrounding territory of the Slovak Republic (below Bratislava as much as 3 m). A decreased level, which was discovered in only 6% of the affected area, was compensated for by flooding the system of left side branches. In view of this, it was not possible to secure the same kind of improvements in the status of the right side underground water table, because the Hungarian side did not construct the provisions in the old Danube bed.

Underground water table quality: The supply of drinking water is unchanged, despite an increase in well capacity of between 30 and 40%. In fact, it has improved within the reservoir on the right side of the Danube, including an increased oxygen content. Increasing the level of the underground water basin from the reservoir increases the dynamics of the flow. A very unclean upper layer of underground water dilutes itself and is forced out, and the seepage canals supply a rich source of irrigation and useful water.

Influence on the population. One of the main impulses to construct the Gabcikovo-Nagymaros Project was because the population demanded, following catastrophic floods in Hungary in 1954 and later in Slovakia in 1965, a high level of security with definitive counter-flood protection measures. The Gabcikovo project fully supplies the protection by separating flood flows and decreasing the burden on the old flood dikes, especially the subsoil with its smooth, shore-washed gravel.