INTERNATIONAL COURT OF JUSTICE

GABČÍKOVO-NAGYMAROS PROJECT

(HUNGARY/SLOVAKIA)

MEMORIAL

SUBMITTED BY THE

SLOVAK REPUBLIC

ANNEXES 1- 22

VOLUME II

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Volume II

Annex 1

Special Agreement for Submission to the International Court of Justice of the Differences between the Republic of Hungary and the Slovak Republic concerning the Gabčíkovo-Nagymaros Project

SPECIAL AGREEMENT

FOR SUBMISSION TO THE INTERNATIONAL COURT OF JUSTICE OF THE DIFFERENCES BETWEEN THE REPUBLIC OF HUNGARY AND THE SLOVAK REPUBLIC CONCERNING THE GABCIKOVO-NAGYMAROS PROJECT

The Republic of Hungary and the Slovak Republic,

Considering that differences have arisen between the Czech and Slovak Federal Republic and the Republic of Hungary regarding the implementation and the termination of the Treaty on the Construction and Operation of the Gabcikovo-Nagymaros Barrage System, signed in Budapest on September 16, 1977 and related instruments (hereinafter referred to as "the Treaty"), and on the construction and operation of the "provisional solution";

Bearing in mind that the Slovak Republic is one of the two successor States of the Czech and Slovak Federal Republic and the sole successor State in respect of rights and obligations relating to the Gabcikovo-Nagymaros Project;

Recognizing that the Parties concerned have been unable to settle these differences by negotiations;

Having in mind that both the Czechoslovak and Hungarian delegations expressed their commitment to submit the differences connected with the Gabcikovo-Nagymaros Project in all its aspects to binding international arbitration or to the International Court of Justice;

Desiring that these differences should be settled by the International Court of Justice;

Recalling their commitment to apply, pending the Judgment of the International Court of Justice, such a temporary water management regime of the Danube as shall be agreed between the Parties;

Desiring further to define the issues to be submitted to the International Court of Justice,

Have agreed as follows:

Article 1

The Parties submit the questions contained in Article 2 to the International Court of Justice pursuant to Article 40, paragraph 1, of the Statute of the Court.

Article 2

(1) The Court is requested to decide on the basis of the Treaty and rules and principles of general international law, as well as such other treaties as the Court may find applicable,

(a) whether the Republic of Hungary was entitled to suspend and subsequently abandon, in 1989, the works on the Nagymaros Project and on the part of the Gabcikovo Project for which the Treaty attributed responsibility to the Republic of Hungary;

(b) whether the Czech and Slovak Federal Republic was entitled to proceed, in November 1991, to the "provisional solution" and to put into operation from October 1992 this system, described in the Report of the Working Group of Independent Experts of the Commission of the European Communities, the Republic of Hungary and the Czech and Slovak Federal Republic dated 23 November 1992 (damming up of the Danube at river kilometer 1851,7 on Czechoslovak territory and resulting consequences on water and navigation course);

(c) what are the legal effects of the notification, on May 19, 1992, of the termination of the Treaty by the Republic of Hungary.

(2) The Court is also requested to determine the legal consequences, including the rights and obligations for the Parties, arising from its Judgment on the questions in paragraph (1) of this Article.

Article 3

(1) All questions of procedure and evidence shall be regulated in accordance with the provisions of the Statute and the Rules of Court.

(2) However, the Parties request the Court to order that the written proceedings should consist of:

(a) a Memorial presented by each of the Parties not later than ten months after the date of notification of this Special Agreement to the Registrar of the International Court of Justice;

(b) a Counter-Memorial presented by each of the Parties not later than seven months after the date on which each has received the certified copy of the Memorial of the other Party;

(c) a Reply presented by each of the Parties within such time-limits as the Court may order.

(d) The Court may request additional written pleadings by the Parties if it so determines.

(3) The above-mentioned parts of the written proceedings and their annexes presented to the Registrar will not be transmitted to the other Party until the Registrar has received the corresponding part of the proceedings from the said Party.

Article 4

(1) The Parties agree that, pending the final Judgment of the Court, they will establish and implement a temporary water management regime for the Danube.

(2) They further agree that, in the period before such a regime is established or implemented, if either Party believes its rights are endangered by the conduct of the other, it may request immediate consultation and reference, if necessary, to experts, including the Commission of the European Communities, with a view to protecting those rights; and that protection shall not be sought through a request to the Court under Article 41 of the Statute.

(3) This commitment is accepted by both Parties as fundamental to the conclusion and continuing validity of the Special Agreement.

Article 5

(1) The Parties shall accept the Judgment of the Court as final and binding upon them and shall execute it in its entirety and in good faith.

(2) Immediately after the transmission of the Judgment the Parties shall enter into negotiations on the modalities for its execution.

(3) If they are unable to reach agreement within six months, either Party may request the Court to render an additional Judgment to determine the modalities for executing its Judgment.

Article 6

(1) The present Special Agreement shall be subject to ratification.

(2) The instruments of ratification shall be exchanged as soon as possible in Brussels.

(3) The present Special Agreement shall enter into force on the date of exchange of instruments of ratification. Thereafter it will be notified jointly to the Registrar of the Court.

In witness whereof the undersigned, being duly authorized thereto, have signed the present Special Agreement and have affixed thereto their seals.

Done in Brussels, this 7th day of April, 1993, in triplicate in English.

For the Republic of Hungary	For the Slovak Republic

Annex 2

Treaty of 16 September 1977 between the Hungarian People's Republic and the Czechoslovak Socialist Republic Concerning the Construction and Operation of the Gabčíkovo-Nagymaros System of Locks

[TRANSLATION — TRADUCTION]

TREATY[1] BETWEEN THE HUNGARIAN PEOPLE'S REPUBLIC AND THE CZECHOSLOVAK SOCIALIST REPUBLIC CONCERNING THE CONSTRUCTION AND OPERATON OF THE GABČÍKOVO-NAGYMAROS SYSTEM OF LOCKS

The Hungarian People's Republic and the Czechoslovak Socialist Republic,

Considering their mutual interest in the broad utilization of the natural resources of the Bratislava-Budapest section of the Danube river for the development of water resources, energy, transport, agriculture and other sectors of the national economy of the Contracting Parties,

Recognizing that the joint utilization of the Hungarian-Czechoslovak section of the Danube will further strengthen the fraternal relations of the two States and significantly contribute to bringing about the socialist integration of the States members of the Council for Mutual Economic Co-operation, have therefore

Decided to conclude an Agreement concerning the construction and operation of the Gabčíkovo-Nagymaros system of locks, and have for this purpose appointed as their plenipotentiaries:

The Presidium of the Hungarian People's Republic:

Mr. György Lázár, Chairman of the Council of Ministers of the Hungarian People's Republic;

The President of the Czechoslovak Socialist Republic:

Dr. Lubomír Štrougal, Prime Minister of the Czechoslovak Socialist Republic,

who, having exchanged their full powers, found in good and due form, have agreed as follows:

CHAPTER I. PURPOSE OF THE TREATY

Article 1. THE JOINT INVESTMENT

1. The Contracting Parties shall construct the Gabčíkovo-Nagymaros system of locks* (hereinafter referred to as the "System of Locks") as a joint investment; the System of Locks shall comprise the Gabčíkovo system of locks and the Nagymaros system of locks and shall constitute a single and indivisible operational system of works.

2. The principal works of the Gabčíkovo system of locks shall be as follows:

(*a*) The Dunakiliti-Hrušov head-water installations in the Danube sector at r.km. (river kilometre(s)) 1860-1842, designed for a maximum flood stage of 131.10 m.B. (metres above sea-level, Baltic system), in Hungarian and Czechoslovak territory;

(*b*) The Dunakiliti dam and auxiliary navigation lock at r.km. 1842, in Hungarian territory;

[1] Came into force on 30 June 1978, the date of the exchange of the instruments of ratification, which took place at Prague, in accordance with article 28 (2).

Slovak Footnote:
"lock" is a mis-translation. The correct translation is "Weir".

(c) The by-pass canal (head-water canal and tail-water canal) at r.km. 1842-1811, in Czechoslovak territory;

(d) Series of locks on the by-pass canal, in Czechoslovak territory, consisting of a hydroelectric power plant with installed capacity of 720 MW, double navigation locks and appurtenances thereto;

(e) Improved old bed of the Danube at r.km. 1842-1811, in the joint Hungarian-Czechoslovak section;

(f) Deepened and regulated bed of the Danube at r.km. 1811-1791, in the joint Hungarian-Czechoslovak section.

3. The principal works of the Nagymaros system of locks shall be as follows:

(a) Head-water installations and flood-control works in the Danube sector at r.km. 1791-1696.25 and in the sectors of tributaries affected by flood waters, designed for a maximum flood stage of 107.83 m.B., in Hungarian and Czechoslovak territory;

(b) Series of locks at r.km. 1696.25, in Hungarian territory, consisting of a dam, a hydroelectric power plant with installed capacity of 158 MW, double navigation locks and appurtenances thereto;

(c) Deepened and regulated bed of the Danube, in both its branches, at r.km. 1696.25-1657, in the Hungarian section.

4. The concept of the System of Locks shall include the joint investment programme. The technical specifications relating to the System of Locks shall be included in the joint contractual plan drawn up as provided in the Agreement, signed at Bratislava on 6 May 1976, between the Government of the Hungarian People's Republic and the Government of the Czechoslovak Socialist Republic concerning the drafting of a joint contractual plan for the Gabčíkovo-Nagymaros System of Locks (hereinafter referred to as "the Agreement").

Article 2. National investment

1. With a view to taking advantage of the opportunities afforded by the System of Locks, the Contracting Parties may, in addition to the joint investment, also undertake national investments exclusively in their own interest and for their own purposes.

2. The costs of national investment shall be borne in full by each Contracting Party.

3. National investment may not have a detrimental effect on the results of the joint investment.

Chapter II. EXECUTION OF THE TREATY

Article 3

1. Operations connected with the realization of the joint investment and with the performance of tasks relating to the operation of the System of Locks shall be directed and supervised by the Governments of the Contracting Parties through delegates (hereinafter referred to as "government delegates") appointed by them for that purpose.

2. The government delegates shall establish appropriate permanent and temporary joint agencies for the performance of their functions and, pending the ap-

proval of the joint contractual plan, shall make regulations governing the organization and activities of those agencies.

3. The principal functions of the government delegates shall be as follows:

(*a*) At the time of the realization of the joint investment:

(1) To ensure that construction of the System of Locks is properly co-ordinated in the territories of the Contracting Parties and is carried out in accordance with the approved joint contractual plan and the project work schedule;

(2) To provide for supervision over labour and supplies and for co-ordination between the agencies of the Contracting Parties;

(3) To approve proposals for the modification of the technical procedures adopted in the joint contractual plan;

(4) To determine the justification for and extent of additional costs arising from the circumstances specified in article 7;

(5) To provide for and approve the records and settlement of differences relating to the apportionment of labour and supplies in equal measure in the cases specified in article 7;

(6) To provide for the acceptance of individual works from the supplying agencies and the delivery thereof to the authorized operating agencies.

(*b*) At the time of the operation of the System of Locks:

(1) To establish the operating and operational procedures of the System of Locks and ensure compliance therewith;

(2) To ensure the performance of tasks connected with the operation, maintenance and possible reconstruction of jointly-owned works of the System of Locks, including the performance of tasks connected with the generation and distribution of electric power;

(3) To approve the technical-economic plans and the reciprocal settlement of accounts relating to the operation, maintenance and possible reconstruction of the works of the System of Locks;

(4) To supervise compliance with the water balance approved in the joint contractual plan;

(5) To supervise and co-ordinate the activities of national operating agencies in times of flood or ice disposal.

4. The activities of the government delegates shall be governed by the joint statute approved by the Governments of the Contracting Parties.

CHAPTER III. REALIZATION OF THE SYSTEM OF LOCKS

Article 4. PREPARATION AND REALIZATION OF THE JOINT INVESTMENT

1. The joint investment shall be carried out in conformity with the joint contractual plan, which, for the purposes of the preparation of the joint investment, shall be drawn up by the agencies of the Contracting Parties on the basis of the Agreement.

2. The joint contractual plan shall:

(*a*) Determine the main dimensions of the works of the System of Locks, the technical specifications of technical equipment, the final project work schedule and responsibility for the costs referred to in article 12, paragraph 2;

(b) Serve as a basis for:

(1) Ordering the technical equipment, construction materials, machinery and steelwork for the System of Locks;

(2) Drawing up the construction plans and specifications.

3. Approval of the joint contractual plan shall be effected in conformity with the national laws and regulations of the Contracting Parties, and the government delegates shall inform each other of its approval.

4. Operations relating to the joint investment shall be organized by the Contracting Parties in such a way that the power generation plants will be put into service during the period 1986-1990.

Article 5. RESPONSIBILITY FOR THE COSTS OF THE JOINT INVESTMENT, APPORTIONMENT OF LABOUR AND SUPPLIES

1. The costs of carrying out the joint investment shall be borne by the Contracting Parties jointly in equal measure.

2. The Contracting Parties shall defray their portion of the costs of carrying out the joint investment on the basis of an apportionment of labour and supplies in equal measure according to the labour and supplies actually provided.

3. The costs of carrying out the joint investment shall be as follows:

(a) Costs of the research, exploration and planning operations required for drawing up the joint contractual plan and the construction plans and specifications;

(b) Costs of carrying out the works provided for in the joint investment, including such costs of carrying out works in the nature of joint investment and coming within the joint investment programme as were incurred by the Contracting Parties before the entry into force of this Treaty and as have by mutual agreement been included in the joint contractual plan;

(c) Costs of acquiring immovable property which, either on a temporary or a permanent basis, is required for carrying out the joint investment.

4. The apportionment of planning, research and exploration operations under the joint contractual plan shall be provided for in the Agreement.

5. The labour and supplies required for the realization of the joint investment shall be apportioned between the Contracting Parties in the following manner:

(a) The Czechoslovak Party shall be responsible for:

(1) The Dunakiliti-Hrušov head-water installations on the left bank, in Czechoslovak territory;

(2) The head-water canal of the by-pass canal, in Czcechoslovak territory;

(3) The Gabčíkovo series of locks, in Czechoslovak territory;

(4) The flood-control works of the Nagymaros head-water installations, in Czechoslovak territory, with the exception of the lower Ipel district;

(5) Restoration of vegetation in Czechoslovak territory;

(b) The Hungarian Party shall be responsible for:

(1) The Dunakilite-Hrušov head-water installations on the right bank, in Czechoslovak territory, including the connecting weir and the diversionary weir;

(2) The Dunakilite-Hrušov head-water installations on the right bank, in Hungarian territory;

(3) The Dunakiliti dam, in Hungarian territory;
(4) The tail-water canal of the by-pass canal, in Czechoslovak territory;
(5) Deepening of the bed of the Danube below Palkovičovo, in Hungarian and Czechoslovak territory;
(6) Improvement of the old bed of the Danube, in Hungarian and Czechoslovak territory;
(7) Operational equipment of the Babčíkovo system of locks (transport equipment, maintenance machinery), in Czechoslovak territory;
(8) The flood-control works of the Nagymaros head-water installations in the lower Ipel district, in Czechoslovak territory;
(9) The flood-control works of the Nagymaros head-water installations, in Hungarian territory;
(10) The Nagymaros series of locks, in Hungarian territory;
(11) Deepening of the tail-water bed below the Nagymaros system of locks, in Hungarian territory;
(12) Operational equipment of the Nagymaros system of locks (transport equipment, maintenance machinery), in Hungarian territory;
(13) Restoration of vegetation in Czechoslovak territory. *

6. The apportionment of labour and supplies under the joint investment as provided in paragraph 5 shall be evaluated by the Contracting Parties in monetary terms in the joint contractual plan. The valuation of the labour and supplies shall not affect the apportionment of the works (labour) specified in paragraph 5; however, any amount due for settlement may not exceed 2.5 per cent of the budgetary value of the work and deliveries to be carried out by the Contracting Parties in accordance with paragraph 5. The settlement of any difference as aforesaid shall also take the form of labour and supplies. The costs of carrying out the joint investment shall be specified in the joint contractual plan on the basis of the mutually agreed budgetary figures and shall be expressed in the Hungarian forint and the Czechoslovak koruna at the annual rate of exchange in effect on 1 January 1975.

7. Each Contracting Party shall bear the full amount of all costs of works to be carried out and labour and supplies to be provided by it in accordance with the apportionment of labour and supplies under the joint investment.

8. The Contracting Parties shall, on the basis of the apportionment of labour and suplies under the joint investment, prepare construction plans and specifications for the works to be carried out and the operations to be performed by them within their sphere of authority in accordance with the approved joint contractual plan, and they shall, on the basis of such plans and specifications, ensure within their sphere of authority the execution of the said works.

9. The Contracting Parties shall ensure, and shall be responsible to each other for doing so, that the planning and execution of works and operations are in accord with the approved joint contractual plan.

Article 6. AGENCIES RESPONSIBLE FOR THE REALIZATION OF THE JOINT INVESTMENT

1. The Contracting Parties shall rely on their own investment agencies to ensure that the objectives connected with the realization of the joint investment are achieved.

Slovak Footnote:
This sub-article should read: "Restoration of vegetation in Hungarian territory".

2. Supervision and co-ordination of the activities of the investment agencies of the Contracting Parties shall be ensured by the government delegates.

Article 7. SETTLEMENT OF COSTS IN EXCESS OF THE JOINT INVESTMENT

1. Subsequent to the apportionment of labour and supplies under the joint investment, there shall be no settlement between the Contracting Parties of additional costs under the joint investment relating to the construction of the System of Locks, save in the following cases:

(*a*) Damage arising in the course of the realization of the investment by reason of unavoidable circumstances (*vis major*);

(*b*) The emergence of unforeseeable geological conditions;

(*c*) Mutually agreed modifications of the technical procedures adopted in the approved joint contractual plan.

2. The expression "unforeseeable geological conditions" means a situation where the geological conditions determined in the course of construction differ markedly from the conditions determined on the basis of the exploration conducted for the purposes of the joint investment programme and the joint contractual plan. Additional costs arising from faulty exploration, planning errors or faulty methods of construction may not be regarded as consequences of unforeseeable geological conditions.

3. Costs arising in consequence of the cases enumerated in paragraph 1 shall be borne by the Contracting Parties in equal measure after approval by the government delegates.

4. The Contracting Parties shall endeavour, if possible in the course of the construction, to settle, in the form of labour and supplies, any differences that arise subsequent to the apportionment in equal measure of labour and supplies.

Article 8. OWNERSHIP OF WORKS CARRIED OUT UNDER THE JOINT INVESTMENT

1. Among the works of the System of Locks carried out as joint investment, the following shall be jointly owned by the Contracting Parties in equal measure:

(*a*) The Dunakiliti dam (article 1, paragraph 2 (*b*));

(*b*) The by-pass canal (article 1, paragraph 2 (*c*));

(*c*) The Gabčíkovo series of locks (article 1, paragraph 2 (*d*));

(*d*) The Nagymaros series of locks (article 1, paragraph 3 (*b*));

2. On the basis of the joint ownership, the Contracting Parties shall have the rights and obligations arising from the relevant provisions of this Treaty.

3. Ownership of the other works of the System of Locks carried out as joint investment shall vest in the Contracting Party in whose territory they were constructed.

CHAPTER IV. OPERATION OF THE WORKS OF THE SYSTEM OF LOCKS

Article 9. SHARE OF THE CONTRACTING PARTIES IN THE USE OF THE SYSTEM OF LOCKS

1. The Contracting Parties shall participate in the use and in the benefits of the System of Locks in equal measure.

2. The output of the hydroelectric power plants shall be available to the Contracting Parties in equal measure, and they shall participate in kind, in equal

measure, in the base-load and peak-load power generated at and conducted from the said plants.

3. In the event of the construction of planned locks on the Danube directly above or below the System of Locks, the Contracting Parties shall individually agree on taking the impact of the works on each other into consideration.

Article 10. METHOD OF OPERATION OF THE WORKS OF THE SYSTEM OF LOCKS

1. Works of the System of Locks constituting the joint property of the Contracting Parties shall be operated, as a co-ordinated single unit and in accordance with the jointly-agreed operating and operational procedures, by the authorized operating agency of the Contracting Party in whose territory the works were built.

2. Works of the System of Locks owned by one of the Contracting Parties shall be independently operated or maintained by the agencies of that Contracting Party in the jointly prescribed manner.

3. The Contracting Parties shall ensure that the agencies operating the System of Locks maintain, in accordance with the regulations in force, operating conditions that satisfy the requirements for co-ordinated and effective operation of the entire System of Locks.

4. The following principles shall in particular be observed in the operation of the power-plant facilities of the System of Locks:

(*a*) The hydroelectric power plants of the two series of locks in the System of Locks shall be so operated as not only to take into account the requirements of the energy-related agencies of the Contracting Parties but also to satisfy the demands of efficiency and economy;

(*b*) Electric output and the distribution and consumption of electric power shall be determined by agreement between the State load-distribution dispatchers of the Contracting Parties.

Article 11. AGENCIES OPERATING THE WORKS OF THE SYSTEM OF LOCKS

1. The Contracting Parties shall entrust the operation of those structures of the jointly-owned works of the System of Locks which are in their territories to the following national operating agencies:

(*a*) To energy-related agencies in the case of energy-related works;

(*b*) To water-resource management agencies in the case of water-resource-management and navigational works.

2. Supervision and co-ordination of the activities of the national agencies responsible for the operation of the System of Locks shall be ensured by the government delegates.

Article 12. RESPONSIBILITY FOR THE PAYMENT AND ACCOUNTING OF THE OPERATING COSTS OF THE SYSTEM OF LOCKS

1. Operating, maintenance (repair) and reconstruction costs of jointly-owned works of the System of Locks shall be borne jointly by the Contracting Parties in equal measure.

2. Those works constituting the property of one of the Contracting Parties the operating, maintenance (repair) and reconstruction costs of which are borne jointly by the Contracting Parties in equal measure shall be specified in the joint contractual plan.

3. Costs not mentioned in paragraphs 1 and 2 and flood-control costs incurred in their own territory shall be borne separately by each of the Contracting Parties.

4. Only direct costs may be included under the heading of operating, maintenance and reconstruction costs. The sphere of direct costs shall be defined by the operators before operations begin. The definition thereof shall be approved by the government delegates. Direct costs may not be construed as including general (overhead) costs, taxes and State levies, amortization costs, and charges for water used for the production of electric power.

5. The planning and accounting of the jointly-borne costs referred to in paragraphs 1, 2 and 4 shall be effected in the following manner:

(*a*) The operating agencies shall draw up annual operating, maintenance and reconstruction plans, which shall be approved by the government delegates. These plans shall include a breakdown of the operations according to whether they were performed by the operating agencies or by outside undertakings;

(*b*) The accounting of operations performed by outside undertakings shall be carried out on the basis of invoices verified by the operators;

(*c*) The accounting of the operations which are carried out on the basis of the plans shall be approved each year by the government delegates;

(*d*) Detailed instructions on planning and accounting procedures shall, before the commencement of the operations, be drawn up by the operating authorities, with the agreement of the financial authorities of the Contracting Parties, in accordance with guidelines given by the government delegates.

6. The annual amount of jointly-borne operating costs shall be expressed in national currencies converted into transferable roubles. If, at the commencement of operations, no generally applicable exchange rates are available, the financial authorities of the Contracting Parties shall come to a decision on them.

7. The Contracting Parties shall endeavour to ensure that any differences arising from operating costs are, so far as possible, settled by work performed within the framework of the annual operating, maintenance and reconstruction plan of the System of Locks. The procedure for the settlement of differences still outstanding shall be determined by agreement between the competent authorities of the Contracting Parties.

CHAPTER V. WATER-RESOURCE MANAGEMENT FUNCTIONS

Article 13. FLOOD CONTROL AND ICE DISCHARGE

1. Flood-control operations shall be carried out by the water-resource management authorities of the Contracting Parties.

2. On the occasion of flooding or ice movement in the System of Locks, the government delegates shall ensure co-ordination of the activities of the flood-control authorities of the Contracting Parties.

3. On the occasion of flooding or ice movement, the opertions of the works of the System of Locks shall be subject to flood-control requirements.

4. High water and ice shall be discharged through the head-water installations and the series of locks of the System of Locks in accordance with the operating and operational procedures of the System of Locks.

Article 14. Withdrawal of water from the Danube

1. The discharge specified in the water balance of the approved joint contractual plan shall be ensured in the bed of the Danube between r.km. 1842 and r.km. 1811 unless natural conditions or other circumstances temporarily require a greater or smaller discharge.

2. The Contracting Parties may, without giving prior notice, withdraw from the Hungarian-Czechoslovak section of the Danube, and make use of, the quantities of water specified in the water balance of the approved joint contractual plan.

3. In the event that the withdrawal of water in the Hungarian-Czechoslovak section of the Danube exceeds the quantities of water specified in the water balance of the approved joint contractual plan and the excess withdrawal results in a decrease in the output of electric power, the share of electric power of the Contracting Party benefiting from the excess withdrawal shall be correspondingly reduced.

Article 15. Protection of water quality

1. The Contracting Parties shall ensure, by the means specified in the joint contractual plan, that the quality of the water in the Danube is not impaired as a result of the construction and operation of the System of Locks.

2. The monitoring of water quality in connection with the construction and operation of the System of Locks shall be carried out on the basis of the agreements on frontier waters in force between the Governments of the Contracting Parties.

Article 16. Maintenance of the bed of the Danube

Maintenance of the bed of the Danube, including the old bed of the Danube, shall be incumbent upon the competent State agencies of the Contracting Parties. Maintenance operations shall be carried out in accordance with the approved operating and operational procedures of the System of Locks and with due regard for the provisions of the agreements on frontier waters in force between the Governments of the Contracting Parties.

Article 17. Water-use permits and water-use supervision

The water-use permits and water-use supervision of structures in their territories constituting jointly-owned works of the System of Locks shall be provided for by the Contracting Parties in accordance with their own laws and regulations.

Chapter VI. NAVIGATION

Article 18

1. The Contracting Parties, in conformity with the obligations previously assumed by them, and in particular with article 3 of the Convention concerning the regime of navigation on the Danube, signed at Belgrade on 18 August 1948,[1] shall ensure uninterrupted and safe navigation on the international fairway both during the construction and during the operation of the System of Locks.

2. The construction of the System of Locks will, when the Dunakiliti dam is put into service, make it necessary to re-route shipping and, for a short time, to interrupt shipping. Shipping shall be re-routed through the Dunakiliti navigation lock in such a way as to require the minimum interruption of navigation. The re-routing of shipping and the movement of shipping through the Dunakiliti lock shall take place

[1] United Nations, *Treaty Series*, vol. 33, p. 181.

at the time of least shipping traffic so as to be able to continue for the minimum period specified in the joint contractual plan.

3. Navigation in the System of Locks shall be governed by the regulations of the navigation authorities of the Contracting Parties.

4. The conditions for navigation in the old bed of the Danube shall be specified in the operating and operational procedures.

CHAPTER VII. PROTECTION OF THE NATURAL ENVIRONMENT

Article 19. PROTECTION OF NATURE

The Contracting Parties shall, through the means specified in the joint contractual plan, ensure compliance with the obligations for the protection of nature arising in connection with the construction and operation of the System of Locks.

Article 20. FISHING INTERESTS

The Contracting Parties, within the framework of national investment, shall take appropriate measures for the protection of fishing interests in conformity with the Danube Fisheries Agreement, concluded at Bucharest on 29 January 1958.[1]

CHAPTER VIII. PROVISION OF LAND

Article 21

The Contracting Parties shall in good time prepare and make available to each other the land required for the preparatory construction stage, the construction and the operation of the works of the System of Locks.

CHAPTER IX. DETERMINATION OF THE BOUNDARY LINE OF THE STATE FRONTIER AND CROSSING OF THE STATE FRONTIER

Article 22. DETERMINATION OF THE BOUNDARY LINE OF THE STATE FRONTIER

1. The Contracting Parties have, in connection with the construction and operation of the System of Locks, agreed on minor revisions of and changes in the character of the State frontier between the Hungarian People's Republic and the Czechoslovak Socialist Republic, as follows:

(*a*) Subsequent to the construction of the System of Locks, the movable character of the State frontier in the old bed of the Danube between the r.km. 1840 and r.km. 1811 segments shall remain unchanged, and the position of that frontier shall be defined by the centre-line of the present main navigation channel of the river;

(*b*) In the r.km. 1842-1840 sector, up to the division of the bed, the State frontier shall run, as though fixed, along the centre-line of the present main navigation channel;

(*c*) In the Dunakiliti-Hrušov head-water area, the State frontier shall run from r.km. 1842 along the centre-line of the present main navigation channel up to boundary point 161.V.O.á.;

(*d*) In the Dunakiliti-Hrušov head-water area, the State frontier shall run from boundary point 161.V.O.á. to boundary stone No. I.5. in a straight line in such

[1] United Nations, *Treaty Series*, vol. 339, p. 23.

a way that the territories affected, to the extent of about 10-10 hectares, shall be offset between the two States.

2. The revision of the State frontier and the exchange of territories provided for in paragraph 1 shall be effected by the Contracting Parties on the basis of a separate treaty.

3. The Contracting Parties shall, in the tail-water canal and head-water canal and in the main shipping lane in the Dunakiliti-Hrušov head-water area extending to r.km. 1850.4, continue without change to exercise the rights and comply with the obligations to which they were entitled, or by which they were bound, in this sector of the river before the conclusion of this Treaty, notwithstanding that the international shipping lane has in this sector been shifted to the tail-water canal or head-water canal, respectively, situated in Chechoslovak territory.

Article 23. CROSSING OF THE STATE FRONTIER

1. In the course of the preparations for and the construction and operation of the System of Locks, the two Contracting Parties shall ensure that authorized persons possessing the appropriate documents are able to cross the State frontier, subject to extremely simplified formalities, for the purpose of performing the tasks arising from this Treaty, and that the necessary conditions are provided for the performance of the said tasks in their territories.

2. The competent authorities of the Contracting Parties shall agree separately on detailed regulations concerning the crossing of the State frontier in accordance with paragraph 1 and the stay of the relevant persons in the territory of the other Contracting Party.

CHAPTER X. CUSTOMS PROVISIONS

Article 24

1. Separate agreements shall be concluded by the competent authorities of the Contracting Parties concerning the transfer to the territory of the other Contracting Party of documents, machinery and materials required for operations connected with the preparations for and the realization and operation of the System of Locks.

2. The Contracting Parties shall make available to each other, free of financial levies (duties, taxes, fees, etc.), the electric power to which the other Contracting Power is entitled from the power produced in the System of Locks.

CHAPTER XI. LIABILITY OF THE CONTRACTING PARTIES AND PAYMENT OF DAMAGES

Article 25. JOINT LIABILITY OF THE CONTRACTING PARTIES AND PAYMENT OF DAMAGES

1. The Contracting Parties shall be jointly liable in respect of:

(*a*) The content of the approved joint contractual plan;

(*b*) The execution of the Treaty during the construction and operation of the System of Locks, the jointly-adopted measures and decisions of the government delegates, and the joint measures and decisions of the joint agencies.

2. In consequence of their liability under paragraph 1, the Contracting Parties shall jointly and in equal measure:

(*a*) Make compensation for damage resulting from acts giving rise to their joint liability and pay the costs arising from such compensation;

(*b*) Compensate a third party for damage suffered by him as the result of acts giving rise to their joint liability.

3. The Contracting Parties shall jointly and in equal measure make compensation for damage arising in the course of the realization of the joint investment and during the period of operation of the jointly-owned works, and shall pay the costs arising from such compensation:

(*a*) In the case of damage resulting from unavoidable circumstances (*vis major*);

(*b*) In the case of damage caused by a third party, on condition that the investor or operator could not have prevented the damage even though the exercise of the diligence that might have been expected of him.

Article 26. EXCLUSIVE LIABILITY OF THE CONTRACTING PARTIES AND PAYMENT OF DAMAGES

1. Each of the Contracting Parties shall be separately and exclusively liable in respect of:

(*a*) The accomplishment of the work and deliveries which, on the basis of the apportionment of labour and supplies under the joint investment, are carried out by them, in accordance with the provisions of the approved joint contractual plan and within the time-limits specified in the project work schedule;

(*b*) The operation, and the systematic maintenance in good working order, of the jointly-owned works constructed in their territories, and the preservation of the plant and equipment of those works;

(*c*) The operation, and the systematic maintenance in good working order, of works constituting the property of one of the Contracting Parties as provided in article 8, paragraph 3, and the preservation of the plant and equipment of those works.

2. In consequence of their liability under paragraph 1, the Contracting Parties shall separately and exclusively:

(*a*) Make compensation for damage which results from acts giving rise to their exclusive liability in connection with the operations and works referred to in paragraph 1, sub-paragraphs (*a*) and (*b*), or damage which results from the action of a third party, on condition that the investor or operator could have prevented such damage through the exercise of the diligence that might have been expected of him, and shall pay the costs arising from such compensation;

(*b*) Make compensation for all damage arising from operations of the works referred to in paragraph 1, sub-paragraph (*c*), and shall pay the costs arising from such compensation;

(*c*) Compensate the other Contracting Party or a third party for damage resulting from the late or improper performance of work and deliveries carried out by them, from the deterioration of the plant and equipment of the works referred to in paragraph 1, and from operations not in conformity with the approved operating and operational procedures.

3. Determination of the extent of damage compensable and the amount of costs payable under the provisions of paragraph 2, and determination of the causes of the damage and the ensuing obligations to pay compensation or damages shall, as

regards the common interests of the Contracting Parties, come within the sphere of authority of the government delegates.

4. Payment of compensation between the Contracting Parties shall be governed by the provisions of article 12.

CHAPTER XII. SETTLEMENT OF DISPUTES

Article 27

1. The settlement of disputes in matters relating to the realization and operation of the System of Locks shall be a function of the government delegates.

2. If the government delegates are unable to reach agreement on the matters in dispute, they shall refer them to the Governments of the Contracting Parties for decision.

CHAPTER XIII. FINAL PROVISIONS

Article 28

1. This Treaty shall be ratified, and the instruments of ratification shall be exchanged at Prague.

2. The Treaty shall come into force on the date of the exchange of the instruments of ratification.

IN WITNESS WHEREOF the plenipotentiaries have signed this Treaty and have affixed thereto their seals.

DONE at Budapest, on 16 September 1977, in duplicate, in the Hungarian and Slovak languages, both texts being equally authentic.

For the Government of the Hungarian Peopleś Republic:

[GYÖRGY LÁZÁR]

For the Government of the Czechoslovak Socialist Republic:

[LUBOMÍR ŠTROUGAL]

Annex 3

(Translation)

Agreement of 6 May 1976 between the Government of the Czechoslovak Socialist Republic and the Government of the Hungarian People's Republic on Drafting of a Joint Contractual Project of the Gabčíkovo-Nagymaros System of Locks

System of Hydropower Projects Gabčíkovo-Nagymaros, Joint Contractual Project, Summary Documentation, 1978

AGREEMENT

Between the Government of the Czechoslovak Socialist Republic and the Government of the Hungarian People's Republic on Drafting of a Joint Contractual Project of the Gabcikovo-Nagymaros System of Locks.

The Government of the Czechoslovak Socialist Republic and the Government of the Hungarian people's Republic considering the accordant standpoint reached at the meeting of party and governmental delegations of both states to the joint construction of Czechoslovak-Hungarian System of Locks decided to conclude an Agreement on Drafting of a Joint Contractual Project of the System of Locks.

They have for this purpose appointed as their plenipotentiaries:

The Government of the Czechoslovak Socialist Republic
Jan Rendek
Deputy Minister for the Forestry and Water Management
of the Slovak Socialist Republic
The Government of the Hungarian People's Republic
Miklos Breinich
First Deputy of the State Water management Agency
of the Hungarian People's Republic
who, having exchanged their full powers, found in good and due form, have agreed as follows:

ARTICLE 1

PURPOSE OF THE AGREEMENT

The Contracting Parties decided to draft a Joint Contractual Project of the Construction of the Gabčikovo-Nagymaros System of Locks /hereinafter referred to as the "Joint Contractual Project"/, which shall be the basis for the realization of the construction.

ARTICLE 2

CONTENT OF THE JOINT CONTRACTUAL PLAN

1/ The joint Contractual Plan consists of three main parts:

I. Complex documentation of the System of Locks
II. Gabcikovo System of Locks - Project documentation
III. Nagymaros System of Locks - Project documentation

ARTICLE 3

PRINCIPLES OF THE DRAFTING OF THE JOINT CONTRACTUAL PLAN

1/ The Joint Contactual Plan of the System of Locks shall be drafted as a complex project. For its drafting it is necessary:

- a concept of the adopted joint investment project,
- unified project directives,
- contents of the Joint Contractual project
- mutually adopted results of the Czechoslovak state expertise and the Hungarian evaluation procedure, as it is demanded by the joint investment project.

2/ Division of the project, research and exploration works between relevant agencies of the Contacting Parties is stated in Annex 2 of this Agreement.

3/ At drafting of the Joint contactual Project for the different objects of the System of Locks there shall be used in general these state technical norms and regulations which are valid on the territory of the Contacting Party where the object will be realized.

4/ To safeguard the unity of the Joint Contactual project the unified project directives for the objects stated in the Annex 3 of this Agreement shall be used and they shall be elaborated before the beginning of drafting of the Joint Contractual Project.

5/ The work schedule for the project, research and exploration operation shall be elaborated according to the results of the negotiations about the credit from the U.S.S.R. The date of the drafting of the Joint Contractual project shall be determined in such way that it will allow to start the construction in accordance with the Treaty between the Czechoslovak Socialist Republic and the Hungarian People's Republic on the construction and Operation of the Gabčikovo-Nagymaros System of Locks.

ARTICLE 4

ORGANIZATIONS

1/ Investment and project organizations responsible for the drafting of the Joint Contractual Project:

<u>On the Czechoslovak side:</u>

- investment agency of the water management part:
  Vodohospodarska vystavba, investorsky podnik /VVIP/ Bratislava

- investment agency of the energetical part:
  Slovenske energeticke podniky /SEP/
  General riaditelstvo Bratislava
- general project organization:
  Hydroconsult Bratislva /HYCO/ Bratislava

On the Hungarian side:

- investment agency of the water management part:
  Orszagos Visugyi Beruhazo Vallalat /OVIBER/
  Budapest
- investment agency of the energetical part:
  Eromu Beruhazasi Vallalat /ERBE/
  Budapest
- general project organization:
  Vizugyi Tervezo Vallalat /VIZITERV/
  Budapest

2/ Elaboration of the Joint Contractual Project is managed and controlled by relevant central agencies - Czechoslovak-Hungarian Joint technical Commission.

ARTICLE 5
COOPERATION PRINCIPLES OF THE INVESTMENT AND PROJECT ORGANIZATION

1/ The investment and project agencies shall establish the joint coordination group to ensure the cooperation in drafting of the Joint contactual Project.

2/ The Joint Coordination Group
- coordinates project, research and exploration works,
- comments and confirms finished parts of the Joint Contractual Project on the day-to day basis
- ensures completion of the Joint Contractual Project for the relevant adoption

3/ The Joint Coordination Group consists of equal number of members of Czechoslovak and Hungarian side. The Joint Coordination Group comes to agreement on basis of approval of Czechoslovak and Hungarian parts.

ARTICLE 6

DRAFTING OF THE JOINT CONTACTUAL PROJECT

1/ According to the order of the investment agencies the general project organization will work out relevant parts of the Joint Contractual projects as stated in Annex 2 of this Agreement. The general project organizations are obliged to control each part of the Joint Contractual Project on day-to-day basis and mutually control and confirm it in the Joint Coordination Group.

2/ The general project organizations shall give the Joint Contractual project as a complete documentation to the general investment agencies and they are jointly responsible for it.

3/ Investment agencies shall submit the Joint contractual Project to the Czechoslovak-Hungarian Joint Technical Commission for the confirmation.

ARTICLE 7

FINANCING AND MUTUAL ACCOUNTING OF PROJECT, RESEARCH AND EXPLORATION WORKS

1/ The Joint Investment Project earmarks for project, research and exploration works in the amount of 4,6 per cent of the joint investment costs. For the project works it is 3,3 per cent and for the research and exploration works it is 1,3 per cent.

2/ Defray of the total costs for project works will be made according to the budget regulation adopted for the preparation of the Joint Investment Project. The final accounting basis shall be the costs of the joint investments specified in the Joint Contractual Project.

3/ In cases when the joint contractual project shall be worked out be the relevant organization of one Contracting Party and the construction project shall be done by the relevant organization of the other Contracting Party, from the total costs earmarked for the project works it shall be defrayed 45 per cent for the elaboration of the joint contractual project. The rest in the amount of 55 per cent of the overall costs shall cover the working out of the construction projects and is pertinent to the contracting Party which carried out construction project.

4/ The Joint contractual Project earmarks 1,3 per cent of the overall costs of joint investments to cover all costs of research and exploration works.

5/ In cases when the joint contractual project shall be worked out by the relevant organization of one contracting Party and the construction project shall be done by the relevant organization of the other Contracting party, from the total costs earmarked for the research and exploration works it shall be defrayed 0,8 per cent for the covering of research and exploration works of the joint contractual project and the amount of 0,5 per cent shall cover the research and exploration works of the construction project.

6/ Apportionment of the costs of carrying out the project, research and exploration works in the equal measure of 50:50 per cent shall be realized in the framework of division of works and supplies in the Joint Contractual Project.

ARTICLE 8

SETTLEMENT OF DISPUTES

In cases when investment and project organization commissioned to elaborate the Joint contractual Project shall not come into an agreement in solving of differences in the frameworks of the Joint Coordination Group, the investment agencies shall submit the joint report these differences to the Czechoslovak-Hungarian Joint technical Group for decision.

ARTICLE 9

FINAL PROVISIONS

This Agreement shall come into force on the date of signature.

Done in Bratislava, on May 6, 1976, in duplicate, in the Slovak and Hungarian languages, both texts being equally authentic.

For the Government of the Czechoslovak Socialist Republic	For the Government of the Hungarian People's Republic
(Ján Rendek)	(Miklős Breinich)

SYSTEM OF HYDROPOWER PROJECTS GABČÍKOVO-NAGYMAROS

Joint Contractual Project

SUMMARY DOCUMENTATION

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0 - 1

S U M M A R Y   R E P O R T

HYDROCONSULT Bratislava	VIZITERV Budapest
Director: Ing.K.Zmeškal	General Director: Ing.Á.Kocsis
Vice-director: Ing.Z.Gemeran	Vice-director: Ing.I.Dobó
HIP: Ing.T.Rosina	HIP: Ing.Á.Páncélos
Customer: VVIP Bratislava	Customer: OVIBER Budapest
Project No. 13450	Project No. 19222

Done in Slovak and Hungarian languages, both texts being equally authentic

Title of the Hungarian documentation

GABČÍKOVO - NAGYMAROSI VÍZLÉPCSÖRENDSZER
közös egyezményes terv

ÖSSZEFOGLALÓ DOKUMENTÁCIÓ

0 - 1

ÖSSZEFOGLALÓ LEÍRÁS

Approved by the Joint Coordination Group of Investors and Designers:

Chief of the Czechoslovak side:	Chief of the Hungarian side:
Ing. Jozef Obložinský	Ing. Szántó Miklós
VVIP	OVIB
Bratislava	Budapest

1. Introduction

The Danube River with its adjacent territories is considered generally as a precious natural asset, the complex utilization of which will serve to further economical development of respective Danube country. The Danube is a mighty potential source of water and hydropower, and an international water way connecting eight Danube countries. After final solution of all water management and water resources development problems on the riparian territories /flood protection, waterlogging control, groundwater level and soil moisture regulation/, further intensification of agricultural and forest production will be possible, as well as proper layout of industrial enterprises, requiring large volumes of water for their production and inexpensive raw material transport and produced goods traffic by means of the water way.

The Czechoslovak Socialist Republic and the Hungarian Peoples' Republic have been jointly studying the potential complex utilization of the common Danube reach since 1952. The first agreement between the Czechoslovak Socialist Republic and the Hungarian People's Republic on the common utilization of the Danube was signed at the level of governmental delegations on August 2, 1952, when it was mutually agreed, that the lower part of the common reach would be used jointly by means of the river project at Visegrád-Nagymaros, and several alternatives would be worked out for common utilization of the upper part.

In the course of elaboration of technical-economical alternative designs of the scheme of the complex utilization of the common Danube reach and their comparison, consultations with Soviet experts took place over the years 1956 - 1960. The chosen scheme was included into the general scheme of the complex Danube utilization from the Devín Gate down to the Black Sea, and was approved by the Permanent COMECON Commission for energetics and for agriculture in September 1961.

Governmental delegations of the Czechoslovak Socialist Republic and the Hungarian People's Republic approved the chosen scheme on April 20, 1963 and decided, that a joint investment task for the construction of the System of Hydropower Project Gabčíkovo-Nagymaros will be worked out.

On the basis of comments to the first design of the joint investment task the requirement to elaborate two additional alternatives of the utilization scheme was accepted. After completion and technical-economical estimation of the alternatives both parties confirmed the correctness of the final scheme, according to the agreement of governmental delegation from 1963. A new joint investment task was prepared in 1967, considering the comments of competent authorities of both countries to the first draft of the investment task. This second joint investment task was commonly supplemented in 1970.

A new incentive to enhance the Danube utilization as a common natural resource was the "Comprehensive Programme of further strengthening and improvement of cooperation and development of the socialist-economic integration of the COMECON countries", approved at the XXV COMECON session in Bucurest in 1971. The joint Czechoslovak-Hungarian Committee for economic and scientific-technical cooperation recommended at the IXth meeting in December 1971, that the plenipotentiaries for boundary water issues in cooperation with concerned authorities should re-open their consultations on technical and economical problems involved in the preparation of the joint construction of hydropower projects on the Danube. Within the scope of those consultations the parties jointly modified the draft of the joint investments task from 1967 and its supplement from 1970 and this final draft was submitted for estimation and approval to competent authorities of both countries in June 1973.

The Cabinet of the Czechoslovak Socialist Republic approved the submitted Joint Investment Task by the Decree No. 25 of January 24, 1974. The Council of Ministers of the Hungarian People's Republic approved this investment task by the Decree No. 3056/1974 and gave permission to prepare investments.

On the basis of the approved Joint Investment Task both parties started to work out the Joint Contractual Project.

The agreement between the governments of the Czechoslovak Socialist Republic and the Hungarian People's Republic on preparation of the Joint Contractual Project was signed by plenipotentiaries of both governments on May 6, 1976. The agreement specified:

- investor and design organizations which will provide preparation of the Joint Contractual Project and principles of

cooperation,
- contents of the Joint Contractual Project,
- distribution of design, research and survey works and methods of their financing and statement of accounts.

Joint Contractual Project
- is the joint project documentation of the system of hydropower projects, worked out on the basis of Unified design regulations and instruction, in the same depth, of the basis of measurements made in 1975, making no difference on which country's territory the structures occur:,
- defines the main dimensions of the System of Hydropower Project structures, technical characteristics of technological equipments and schedule of realization.

For elaboration of the Joint Contractual Project as basis data were used:
- the Joint Investment Task from 1973,
- Unified Design Regulations, involving general regulations, static and constructional regulations, list of standards and technical provisions, evaluation of preparatory works executed earlier, and programme of additional preparatory works /surveys, research, studies/, detailed design regulation for respective main structures,
- results of agreed survey, research and study works,
- offers of contractors.

The parties participated in working out of the Joint Contractual Project according to the Agreement of May 6, 1976, discussed the documentation and then agreed the final stage at negotiations of the working group of investors and designers of both parties.

2. BASIC DATA

2.1 Name and location of the construction

System of Hydropower Project Gabčíkovo - Nagymaros
The reach of the Danube Bratislava - Budapest
/territory: the Czechoslovak Socialist Republic: Bratislava, the Capital of Slovakia: West-Slovakia Region,
territory: the Hungarian People's Republic: countries Gyor - Sopron, Komárom and Pest/

2.2 Superior authorities

Czechoslovak side:

Ministerstvo lesného a vodného hospodárstva SSR

Ministry of Forestry and Water Management SSR

/water management/

Federálne ministerstvo palív a energetiky ČSSR

Federal Ministry of Fuels and Energetics of the Czechoslovak Socialist Republic

/energetics/

Federálne ministerstvo dopravy ČSSR

Federal Ministry of Transport Czechoslovak Socialist Republic

/navigation/

Hungarian side:

Országos Vízugyi Hivatal

State Water Management Office

/competent management authority for water management/

Nehézipari Minisztérium

Ministry of Heavy Industry

/energetics/

Kozlekedés-és Póstaügyi Minisztérium

Ministry of Transport and Communications

/navigation/

2.3 Investor authorities and organizations

Czechoslovak side:

Ministry of Forestry and Water Management SSR

/central investor for water management and navigation/

Water management construction, investor organization

/direct investor for water management and navigation/

Federal Ministry of Fuels and Energetics of the Czechoslovak Socialist Republic

/central investor for energetics/

Investment construction of the Slovak energetics, concern purpose organization /direct investor for energetics/

Hungarian side:

/direct investor for water management and navigation/

/direct investor for the technological part of energetics/

/direct investor for electrical networks/

2.4 Project organization

- Czechoslovak party:

HYDROCONSULT Bratislava
/general designer/

- Hungarian party:

VIZITERV Budapest
/general designer/

2.5 Contractors

- Czechoslovak party:

HYDROSTAV Bratislava, national enterprise
/superior contractor of the engineering part/
ČKD Blansko, national enterprise
/superior contractor of the technological energetic part/
SIGMA Lutín, national enterprise
/superior contractor of the water management technological part/

- Hungarian party:

superior contractors of construction works:
Mélyepíto Vállalat
Vízépítôipari Tröszt
Folyam szabályozó és Kavicskotró Vállalat
superior contractor of technological equipments:
Ganz-MÁVAG Mozdony - Vagon-és Géppyár - Budapest

2.6 Benefits

	together	Č S S R	H P R
Electric energy /power//GWh/ year/x/	3 680	1 840	1 840
Development of navigable way /km/	210	88	122
Improvement of flood control /km/	415	235	180
Other branches /see Chapter 3.4/			

2.7 Predetermination of construction terms

Launching of the construction:

preparatory works	1. 4. 1978
main construction works	1. 7. 1981
Completion of construction:	31.12. 1991

Partial putting into operation:	
hydropowr project Gabčíkovo:	
- putting into test operation the first aggregate	1. 6. 1986
- putting into test operation the last aggregate	1. 6. 1989
hydropower project Nagymaros:	
- putting into test operation the first aggregate	1. 7. 1989
- putting into test operation the last aggregate	1.10. 1990
Putting into continuous operation:	
hydropower project Gabčíkovo	31.12. 1991
hydropower project Nagymaros	31.12. 1992

x/ approximate annual production in average year

10 REALIZATION

Realization of the System of Hydropower Project G-N will be executed by the Czechoslovak Socialist Republic and the Hungarian People's Republic jointly and in the equal ratio on the basis of the Interstate Treaty x/. The parties will realize their proportions of the realization of joint investment on the basis of division of works and deliveries by means of actual execution of those works and deliveries.

It is to be noticed, that the whole realization of the System of Hydropower Project G-N construction would require a close interstate cooperation, precise specification of works and duties of respective parties, especially in case of works, which will be carried out by the Hungarian party on the territory of the Czechoslovak Socialist Republic. Accurate definition of those rules will be dealt with in separate agreements in the sense of the Interstate Treaty.

x/ Treaty between the Hungarian People's Republic and the Czechoslovak Socialist Republic concerning the construction and operation of the Gabčíkovo-Nagymaros system of locks

10.1 Distribution of works and deliveries

Works and deliveries connected with the realization of the joint investment were distributed as follows:

a/ the Czechoslovak party will realize:

1. Left-bank structures of the Hrušov-Dunakiliti reservoir on the Czechoslovak territory,
2. Diversion canal - inlet canal on the Czechoslovak territory,
3. Gabčíkovo project on the Czechoslovak territory,
4. protection measures of the Nagymaros reservoir on the Czechoslovak territory, except for the Dolný Ipeľ area,
5. Recultivation on the Czechoslovak territory.

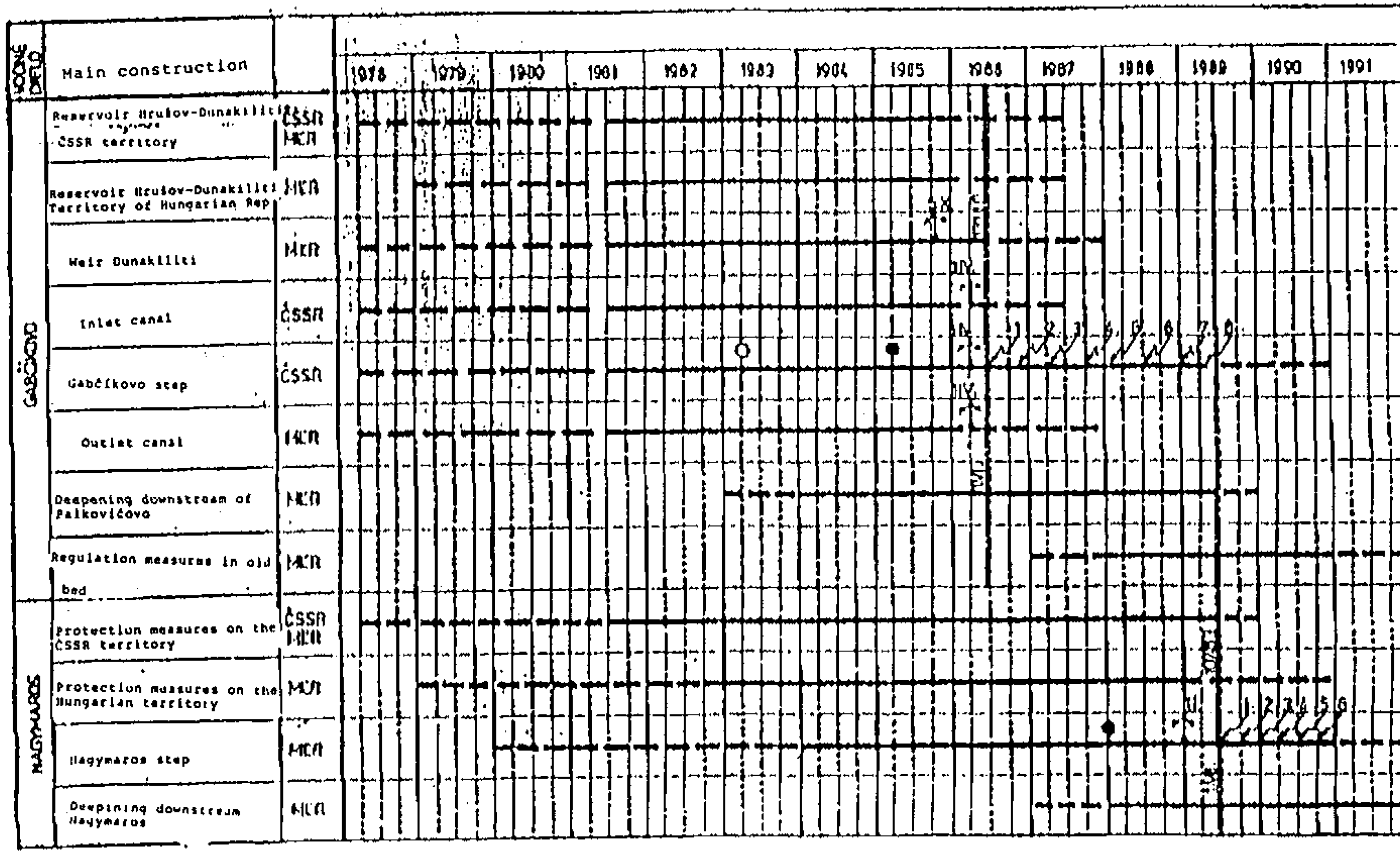
b/ the Hungarian party will realize:

1. Right-bank structures of the Hrušov-Dunakiliti reservoir on the ČS territory, including the connecting dam and guiding dyke,
2. right-bank structures of the Hrušov-Dunakiliti reservoir on the Hungarian territory,
3. the Dunakiliti weir on the Hungarian territory,
4. diversion canal - outlet canal on the Czechoslovak territory,
5. channel deepening downstream of Palkovičovo, on the Czechoslovak and Hungarian territory,
6. training of the old Danube channel on the Czechoslovak and Hungarian territory,
7. operation equipment for the Gabčíkovo project on Czechoslovak territory /transportation means-conveyance and machines for maintenance/.
8. protection measures of the Nagymaros reservoir for the Lower Ipeľ area on the ČS territory,
9. protection measures of the Nagymaros reservoir on the Hungarian territory,
10. the Nagymaros step on the Hungarian territory,
11. channel deepening downstream of Nagymaros step on the Hungarian territory,
12. operation equipment of the Nagymaros project on the Hungarian territory /conveyance and machinery for maintenance/,
13. recultivation on the Hungarian territory.

Distribution of works and deliveries of the joint investment between the Czechoslovak Socialist Republic and the Hungarian

Table No. 6

SYSTEM OF HYDROPOWER PROJECTS GABČÍKOVO - NAGYMAROS
Time schedule of the construction



LEGEND
- Ready for combined assembly
- Ready for assembly
- Putting navigation lock into operation
- Putting [illegible] into [illegible] operation

People's Republic was estimated in accordance with Article 5 of the Interstate Treaty. Evaluation in Ft increases the 50% value of the whole investment volume of works falling to the Hungarian party by 1,34%, and according to evaluation in Kčs increases the 50% value of the whole investment volume by 0,96. Considering the results of evaluation a compensation and accounting between the parties is not required according to the Article 5 of the Interstate Treaty.

10.2 Time schedule of the construction

As basis for elaboration of the time schedule of the realization of the System of Hydropower Project G-N /Fig.23/ were used:
- joint investment task,
- approved technical solution of the Joint Contractual project,
- offers for delivery and assembly of technological equipment,
- Czechoslovak-Hungarian agreements connected with the realization, determining the sequence of construction, main delivery times and most important construction terms.

Due to that the terms of starting and completion of the construction had been changed as compared with the Joint Investment Task and thus also the construction period.

Main construction terms:

Gabčíkovo step	
- starting of preparatory works	1. 4. 1978
- starting of main construction works	1. 7. 1981
- starting reservoir and approach canal filling	1. 2. 1986
- diversion of navigation into the approach canal	1. 4. 1986
- putting into test operation the first aggregate	1. 7. 1986
- putting into test operation the 8th aggregate	1. 6. 1989
- completion of the construction	31.12. 1990
Nagymaros step	
- starting of preparatory works	1. 1. 1980
- starting of main construction works	1. 1. 1984
- starting of filling of Nagymaros reservoir	1. 1. 1989
- full impoundment /backwater/	1. 7. 1989
- putting into test operation the first aggregate	1. 7. 1989
- putting into operation the 6th aggregate	1.10. 1990
- completion of the construction	31.12. 1991

Conditions of keeping terms and decisive time schedule:

a/ Providing construction preparation /interstate agreements, from the territorial and investor point of view/ so, that it would be possible to start the preparatory works in given term.

b/ To complete within the I. stage the preparatory works in such an extent, that it would be possible to start in time with main construction works:

- clearing of the construction site /relaying of mains and wiring, demolition of buildings, etc./,
- removal of topsoil - humus,
- provide fillings and embankments,
- providing of temporary buildings, engineering networks and facilities,
- fencing of the construction site,
- set up of the temporary Danube channel,
- construction of grouted vat and underground walls,
- drainage,
- other smaller structures of preparatory works.

c/ Providing continuous construction works on outlet and approach canal, and permanent abundant supply of gravelsand on the dumping round.

d/ Equipment of construction and assembly organizations in time with special devices and heavy-duty construction mechanisms, as for instance:

- large-capacity excavators /min.4.5 m^3/,
- loading machines /7,5 m^3/,
- conveyances /40 - 50 Mp/,
- floating hydraulic dredges /400 m^3/h/, together with vessels of required capacities,
- tower cranes with radius 40 - 50 m /over 250 Mp/,
- high-duty concrete production and screening equipments for aggregates, as well as providing of transportation and deposition of concretes,
- drilling rigs and outfits for work with rocks with grabs 1 m^3/ for manipulation with stones.

e/ Providing of construction organizations with special equipment, required for grouting of vats, e.g.:

- drilling outfits for depths 35 - 50M,
- facility for grouting mixture production and for grouting,
- facility for construction of underground sealing walls for depths of 50 m.

f/ Ensuring of the first part of technological deliveries, which will be set in concrete for the Gabčíkovo project by the ed of 1982, and continuous ensuring of further deliveries of equipments, which will be installed in the shaft from the beginning of 1985.

All above mentioned conditions are to be fulfilled as to keep the time schedule of the construction. The time terms of construction were based on volumes of main works, presented in the Table.

10.3 Construction sites

Hydropower project Gabčíkovo

COnstruction sites for the structures of the Gabčíkovo project are divided according to the main structures and located within the Danube alluvial plain in the stretch from Bratislava to Medveďov, and in the reach from Hrušov to Palkovičovo also in the protected area behind the leftside protection embankment of the Danube /approach canal, Gabčíkovo project, and outlet canal/. The layout of the construction sites has lowland character, covered with riverine woodlands /floodplain forest ecosystems/. Other areas are mostly agricultural lands. Only a few agricultural enterprises, buildings of public administration and individual houses and cottages are to be dismantled due to the construction.

Hydropower project Nagymaros

Construction sites for the structures of the Nagymaros project spread on water side and opposite side of the Danube protection embankments and of its tributaries.

The construction site of the Nagymaros project is located within the Danube channel and on both river banks within the protected territory. In this section the Danube flows through a mountainous massif in a narrow valley with steep slopes of a relative height of about 300 - 400 m. Only a few agricultural, administrative buildings and a larger number of family houses and cottages are to be demolished and transfer of a machine industry at Nagymaros, will be necessary.

10.4 Equipment of construction sites

A part of the structures of construction sites equipment, required for realization of the construction, was determined by means of the global from construction and assembly works, a part of structures was determined according to items /entries/.

Structures of social and operation equipment of construction sites /accommodation, medical care, recreation after work, structures of operation equipment/ are designed as concentrated into centres, e.g.:

- on the Czechoslovak territory

close to Rusovce, Šamorín, Dobrohošť, Horný Bar, Gabčíkovo, Palkovičovo, Komárno and Štúrovo,

- on the Hungarian territory

adjacent to Dunakiliti, Komárom, Esztergon and Nagymaros.

In addition, also mobile units of structures sites will be provided in respective localities of concentrated works /pumping stations, etc./

Table No.4

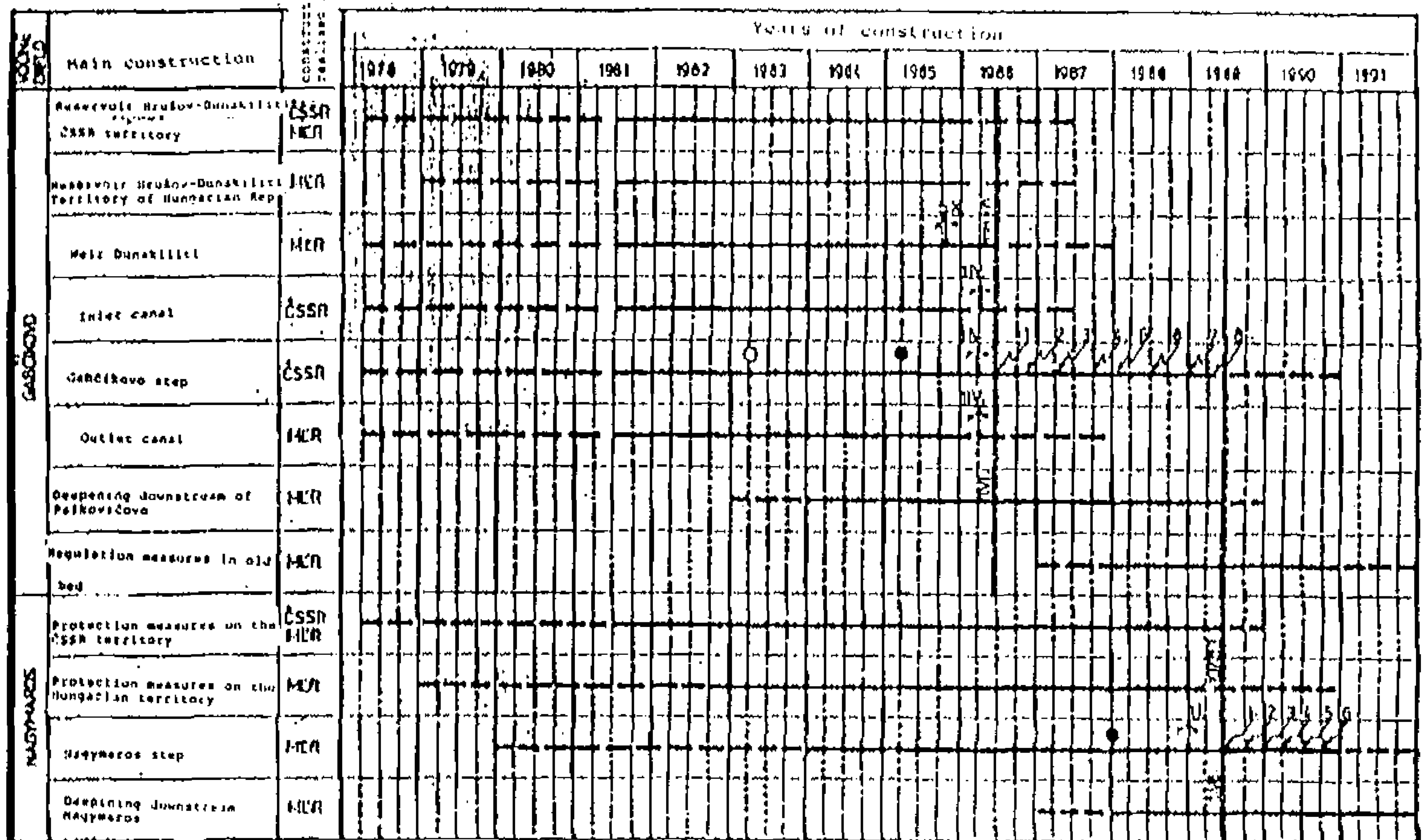
SPECIFICATION OF MAIN CONSTRUCTION WORKS

No	Main construction works	Unit	Construction realized by	Hydropower project		Total
				Gabčíkovo	Nagymaros	
1	Primary excavations including topsoil	1000 m^3	CSSR MLR	46457 36369 82826	8206 15715 23921	54663 52084 106747
2	Exploitation by means of floating mechanisms	1000 m^3	CSSR MLR	— 51721 51721	— 11396 11396	— 63117 63117
3	Compacted embankments fillings/except clays/	1000 m^3	CSSR MLR	44592 10238 54830	4327 13542 17869	48918 23780 72699
4	Clayey sealing core and aprons	1000 m^3	CSSR MLR	11609 4224 15833	1281 827 2108	12890 5051 17941
5	Gravel-sand filters	1000 m^3	CSSR MLR	1249 869 2118	577 574 1151	1826 1443 3269
6	Rock breaking	1000 m^3	CSSR MLR	— — —	— 632 632	— 632 636
7	Sealing vats bottom grouting	1000 m^3	CSSR MLR	1292 400 1692	— — —	1292 400 1692
8	Underground sealing screens	1000 m^3	CSSR MLR	300 119 419	1072 218 1290	1372 337 1709
9	Concrete and reinforced concrete	1000 m^3	CSSR MLR	1321 297 1618	115 734 849	1436 1031 2467
10	Concrete sealings and fortifications	1000 m^3	CSSR MLR	1712 546 2258	366 448 814	2078 994 3072
11	Stone fortification/rockfills/	1000 m^3	CSSR MLR	339 2171 2510	224 1620 1844	563 3791 4354
12	Operation building	1000 m^3 OSP	CSSR MLR	32 12,2 44,2	9 84 93	41 96,2 137,2
13	Technological equipment	1000 t	CSSR MLR	34,5 4,4 38,9	0,7 32,2 32,9	35,2 36,6 71,8

Table No.5

SPECIFICATION OF MAIN CONSTRUCTION MATERIAL

	Construction material	Unit	Construction realized by	Hydropower project		Total
				Gabčíkovo	Nagymaros	
14	Gravel-sand for structures	1000 m^3	ČSSR MLR	3870 1437 5307	301 1227 1528	4171 2664 6835
15	Cement	1000 t	ČSSR MLR	640 180 820	208 353 561	848 535 1381
16	Reinforcing bars	1000 t	ČSSR MLR	52,4 17,5 69,0	4,6 45,5 50,1	57 63 120
17	Wood	1000 m^3	ČSSR MLR	45 11,2 56,2	3,8 26,2 30,0	48,8 37,4 86,2
18	Il /bentonite/ for sealing walls	1000 t	ČSSR MLR	96,8 16,8 113,6	81 6 87	177,8 22,8 200,6
19	Stone	1000 m^3	ČSSR MLR	347 2162 2509	235 1594 1829	582 3756 4338
20	Larsen sheet piles	1000 t	ČSSR MLR	0,3 3,4 3,7	— 4,4 4,4	0,3 7,8 8,1



LEGEND

Ready for combined assembly

Ready for assembly

Putting navigation lock into operation

Putting aggregates into test operation

Annex 4

(Translation)

Agreement of 31 May 1976 between the Government of the Czechoslovak Socialist Republic and the Government of the Hungarian People's Republic on Regulation of Water Management Issues on Boundary Waters

AGREEMENT

BETWEEN THE GOVERNMENT OF THE CZECHOSLOVAK SOCIALIST REPUBLIC AND THE GOVERNMENT OF THE HUNGARIAN PEOPLE'S REPUBLIC ON REGULATION OF WATER MANAGEMENT ISSUES ON BOUNDARY WATERS

(Translation)

The Government of the Czechoslovak Socialist Republic and the Government of the Hungarian People's Republic decided to conclude an Agreement on regulation of water management issues on boundary waters.

For this purpose they have appointed as their plenipotentiaries,

The Government of the Czechoslovak Socialist Republic:
Mr. František Hagara
Minister for the Forestry and Water Management
of the Slovak Socialist Republic,

The Government of the Hungarian People's Republic:
Dr. István Gergely
President of the State Water Management Office,

who, having exchanged their credentials, found in good and due form, have agreed as follows:

Article 1

Territorial scope of application

Territorial scope of application of the Agreement extends on boundary waters which are reaches of rivers and other natural water courses, as well as canals, where state boundaries run /hereinafter "boundary waters"/ as well as surface and groundwaters in sections where they are crossed by state boundaries.

Article 2

Application

Application of the Agreement extends to all water management measures which taken on boundary waters, the consequences of which can lead to changes in natural water conditions, in particular water course regulation, construction of reservoirs and flood-control dykes, water-resource meliorations, measures aimed to water sources utilization, protection of surface and groundwaters against pollution, utilization of hydro energy, maintenance and marking of the water way and demarcation of a navigation route, protection against inner waters, floods and ice runs, as well as all water management measures which can cause changes in mutually agreed hydrologic conditions in upstream or downstream sectors of boundary water courses or in sections of boundary waters.

Article 3

General obligations

1/ The Contracting Parties undertake that

a/ without mutual agreement they shall not take any water management measures, which could adversaly affect mutually agreed hydrological conditions,

b/ they shall maintain channels of boundary water courses, water reservoirs and facilities on boundary waters on their state territories in good conditions and utilize them in such a manner that they shall not cause mutually harm,

c/ they shall inform each other on their long term development plans for the water management, in particular with regard to the effect of water management measures on boundary waters,

d/ they shall engage in prior consultations on the effects of water management measures which can cause in sections mentioned in Article 2, the change in mutually agreed hydrological conditions.

2/ On boundary waters, the Contracting Parties are entitled, unless otherwise agreed, to one half of the natural discharge of water not augmented by technical means.

Article 4

Securing of the course, character and marking of the state boundaries

1/ Competent authorities of the Contracting Parties shall maintain in good conditions boundary waters, including constructions, works and facilities on them, with regard, inter alia, to the need to secure the permanent course of state boundaries.

2/ When taking water management measures on boundary waters, it is not allowed, without prior consent of competent authorities of the Contracting Parties, to remove or displace boundary and other measurement marks which serve for delimitation and demarcation of state boundaries. When taking these measures, it is necessary to protect border and measurement marks against damaging.

Article 5

Czechoslovak-Hungarian Commission for Boundary Waters

1/ For solving tasks set up in this Agreement, the Contracting Parties establish Czechoslovak-Hungarian Commission for Boundary Waters (hereinafter "Commission for Boundary Waters") consisting of Government plenipotentiaries of the Contracting Parties, their deputies and other members.

2/ Decisions of the Commission for Boundary Waters will enter into force upon their approval by the Contracting Parties.

3/ The composition, competence and activities of the Commission for Boundary Waters are regulated by the Statute contained in Annex 1 to this Agreement.

Article 6

Maintenance

The Contracting Parties shall provide on their territories for the maintenance in good conditions of water works and other facilities on boundary waters and shall perform all works necessary for protection of river bed of boundary waters against degradation. Furthermore, they shall provide for the removal of harmful deposits and vegetation from the river bed and maintenance of navigation route.

Article 7

Technical planning

1/ Guidelines for technical planning of water management measures to be carried out on boundary waters, will be set up by the Commission for Boundary Waters.

2/ Contracting Parties shall provide documentation for technical planning of water management measures to be carried out their state territories. This principle applies even if the water management measures serve the interests of the other Contracting Party, unless otherwise decided by the Commission for Boundary Waters. The competent authorities of the Contracting Parties shall exchange data necessary for technical planning.

3/ Prior to their approval by the competent authorities of the Contracting Parties technical plans shall be submitted to the Commission for Boundary Waters for consideration. The competent authorities of the Contracting Parties can agree on amendments of considered plans which do not alter design parameters or budget costs. The amendments shall be reported to the Commission for Boundary Waters.

Article 8

Carrying out of water management measures

1/ Water management measures envisaged in Art.2 of this Agreement shall be carried out on the basis of the programme agreed upon by the Commission for Boundary Waters.

2/ The Contracting Parties shall provide for carring out of water management measures on their respective territories. The Commission for Boundary Waters may decide otherwise.

Article 9

Flood protection measures

1/ Flood protection works on the territories of their respective states - with exception of works mentioned in para./2/ shall be undertaken by competent authorities of Contracting Parties on their own expenses, on the basis of technical plans approved by the Commission for Boundary Waters in full compliance with the principle of equal grade of safety on the territories of both States.

2/ In accordance with the Agreement between Czechoslovak Republic and the Republic of Hungary on water management issues related to the transfer of territory following to Article 1, para 4, "c" of the Paris Peace Treaty signed on October 9, 1948 in Bratislava, the protection dyke in the section from Čunovo up to the sluice-gate Rajka is a protection dyke of common interest. The costs connected with reinforcement and reconstruction of this dyke on the basis of the jointly approved plan shall be shared in the ratio of the surface of inundation /concerned/ territory, i.e. 44% by the Czechoslovak Party and 56% by the Hungarian Party. According to the jointly agreed plan, the reinforcement and reconstruction of this dyke exceeding the volume of works envisaged by the jointly approved plan will be borne by each Contracting Party on its own territory.

3/ Every year in the autumn the competent water management authorities of the Contracting Parties shall carry out a joint on site inspection during which they shall check the conditions of the dyke referred to in para/2/ above and conditions of protection dykes and structures on boundary waters as well as the flood protection readiness.

Article 10

Flood protection, protection against inner waters and ice run

1/ Each Contracting Party shall undertake on its own territory measures aimed at flood protection, protection against inner waters and ice run.

2/ In the event of emergency, the competent authorities of the Contracting Parties shall jointly enable their water management authorities, - after prior notice to the border guard - to cross the state border without travel documents in order to perform the on site inspection on the spot in the interest of protection of their own territory.

3/ In the event of emergency, each Contracting Party shall provide to the other one, upon its request, immediate assistance, and, without delay which could be caused by granting official authorization, it shall make available manpower, material and equipment. The costs will be borne by the Contracting Party receiving the assistance.

4/ The guidelines for flood protection, protection against inner water and ice run shall be set up by the Commission for Boundary Waters.

Article 11

Protection of waters against pollution

1/ Contracting Parties shall make every effort to guarantee the purity of boundary waters, and, in accordance with their economic and technical possibilities, to reduce the pollution by constructing and modernizing sewage plants.

2/ The competent authorities of the Contracting Parties shall systematically monitor the purity of boundary waters, they shall jointly collect water samples, analyze them and collate the results of the analyses.

3/ If the event of an accidental boundary water pollution, the competent authorities of the Contracting Party on the territory of which the pollution took place, shall inform without delay competent authorities of the other Contracting Party and undertake immediate measures aimed at eliminating the source of pollution and preventing the repetition of the pollution.

Article 12

Dredging

1/ The Commission for Boundary Waters shall annually determine the necessity, location, extent and ways of dredging for maintaining the boundary water courses, safeguarding navigation route and excavation of materials as well as the mode and location of deposition of the dredged material.

2/ The authorization for dredging shall be granted by the competent water resource management authority of the Contracting Party on the territory of which the works will take place.

Article 13

Maintenance and marking of waterway

1/ The competent authorities of the Contracting Parties shall maintain and mark the waterway and mark the navigation route on the Danube in accordance with recommendations of the Danube Commission.

2/ The competent authorities of the Contracting Parties shall make available information on navigation conditions as well as data concerning ford sections.

3/ Unless agreed otherwisé, navigation obstacles in the river bed shall be removed by the competent authorities of the Contracting Party on the territory of which they exist.

Article 14

Reimbursement of costs

1/ The Contracting Parties bear the costs of works envisaged by this agreement as follows:

a/ each Contracting Party shall bear the full amount of all costs of works carried out on its territory and serving exclusively its own interests.

b/ costs of works which are carried out on the territory of one Contracting Party and which serve only the interests of the other Contracting Party shall be borne solely by the Contracting Party concerned.

c/ costs of works which serve the interests of both Contracting Parties shall be borne in the proportion of their respective interests.

d/ costs of the regulation of the river bed, dredging of fords, regulation dredging and marking of the navigation route on the joint section of boundary water courses shall be borne by the Contracting Parties in ratio 50:50.

e/ each Contracting Party shall on its own state territory and at its own expenses remove wrecks from the period of the Second World War from the river bed of the Danube.

2/ The provisions of para /1/ apply mutatis mutandis on costs of the alignment, exploration, research and technical planning as well as on costs of the maintenance and operation of the water works and facilities, unless the Commission for the Boundary Waters decides otherwise.

Article 15

Accounting of work performed and reimbursement of costs

1/ The works referred to in Article 14 shall be accounted for during the first half year of the year following the year under consideration. The guidelines for the accounting shall be set up by the Commission for the Boundary Waters.

2/ Balance resulting from the accounting in favour of one

Contracting Party shall be made good by another Contracting Party in kind through performing work and rpoviding supplies of materials under this Agreement.
3/ If accounting for the period of 5 years shows the balance which cannot be made good in kind, the debt shall be settled under agreement on payments which is in force between two States.

Article 16
Technical and financial control

During joint works, works of joint interest and works performed by one Contracting Party in the interest of the other Contracting Party the Contracting Parties shall made possible mutual technical and financial control. The Commission for Boundary Waters shall set up rules for such a control.

Article 17
Providing of hydrological and hydrometeorological data

1/ The competent water management authorities of the Contracting Parties shall regularly exchange data concerning water levels acquired from agreed water gauges, data on atmospheric precipitations and ice conditions.
2/ In the interest of assuring flood protection, protection against inner water and ice threats, the competent authorities of the Contracting Parties shall provide each other without delay and directly all data necessary for the other Contracting Party, including the data on permanent or temporary changes of natural discharge conditions caused by the water release from reservoirs.
3/ Measurements necessary for obtaining hydrological data concerning boundary waters, their evaluation, recording as well as other measurements and research shall be realized by competent authorities of the Contracting Parties on the basis of a joint plan and their results shall be mutually colloted and approved on a regular basis.

Article 18
Measurements marks

The competent authorities of the Contracting Parties shall on their own territories protect, maintain and, if necessary, supplement and renew the elevation and direction marks which are necessary for water management measures. The competent authorities of the Contracting Parties shall be mutually entitled to use these marks and shall exchange information on them.

Article 19

Procedure concerning water uses

1/ In procedures concerning water uses the decisions shall be taken by the authorities of the Contracting Party on the territory of which the works under this Agreement are to be realized, in accordance with its legal regulations.

2/ When water management works and constructions should take place on the territories of both Contracting Parties, the competent water management authorities shall grant the water use authorization for that part of works and constructions, for which they are competent. The procedures concerning water uses shall as much as possible take place simultaneously or they will follow one after another.

The competent authorities of Contracting Parties shall mutually consult and approve the draft authorizations concerning water uses.

3/ The competent authorities of both Contracting Parties shall be in direct contact in all cases of procedures concerning water uses authorizations and they shall inform about their activities the Commission for Boundary Waters.

4/ Disputed questions between water management authorities of Contracting Parties relating to the planning documentation shall be solved by the Commission for Boundary Waters.

Article 20

Crossing of the state border

Crossing of the state border and staying on the territory of the other state for the purpose of realization of tasks or works according to this Agreement, are governed by provisions of the Annex 2. Details will be agreed upon by the competent central authorities of the Contracting Parties.

Article 21

Customs provisions

1/ The construction material and fuel which are transported from the territory of one state on the territory of another state according to this Agreement are free of any import and export charges and duties. The export and import limitations do not apply to these materials.

2/ The working means /machines, equipments, vehicles, transport means, tools etc./ shall be temporarily exempt from customs duties if they are transported back in terms set up by the customs authorities.

3/ Both Contracting Parties shall assure a simplified, priority and free of charge customs examination of construction materials, fuel and working means according to para. /1/ and /2/.

Article 22

Disputes settlement

Disputes arising from interpretation or implementation of this Agreement which cannot be solved by the Commission for Boundary Waters, shall be submitted to both governments.

Article 23

Final Provisions

1/ This Agreement is subject to approval according to the internal rules of both Contracting Parties and shall enter into force upon the date of exchange of the diplomatic notes on its approval.

2/ The Agreement shall remain in force for the period of ten years. The validity of the Agreement shall be automatically extended for another five years period unless one of both Contracting Parties denounces the Agreement six months prior to the expiration of the respective period of validity.

3/ On the day of entry of this Agreement into force, the Agreement between the Czechoslovak Republic and Hungarian People's Republic on the regulation of technical and economic questions concerning boundary water courses, signed in Prague on April 16, 1954, loses its validity.

4/ The arrangements and guidelines adopted for implementation of the Agreement referred to in para./3/ and all not yet fulfilled obligations arising therefrom remain valid.

Done in Budapest on May 31, 1976 in duplicate, each of them in the Slovak and Hungarian languages, both texts being equally authentic.

For the Government of the Czechoslovak Socialist Republic
(Signed)
František Hagara

For the Government of the Hungarian People's Republic
(Signed)
Gergely István

ANNEX 1

S T A T U T E

of the Czechoslovak-Hungarian Commission for Boundary Waters

Article 1

Composition of the Commission for Boundary Waters

1/ The Commission for Boundary Waters /hereinafter "Commission"/ is composed of eight members. Each Contracting Party shall appoint one plenipotentiary, one deputy plenipotentiary and two other members into the Commission. If need be, the experts can be invited to participate in negotiations.

2/ For solution of its tasks the Commission may establish working groups .

3/ The plenipotentiaries may meet directly and during the period between sessions discuss current issues. They shall inform the Commission thereof at its next session and record the measures they adopted in the protocol of the session.

4/ The Commission shall adopt its Rules of procedure.

Article 2

The Commission's competence

The competence of the Commission includes the consideration and implementation of tasks following from this Agreement, in particular:

a/ assuring water management cooperation and solution of technical and economic questions as well as determination of water conditions on boundary waters,

b/ establishing guidelines for designing of water management works, realization of hydrotechnical works and other necessary guidelines,

c/ approval or adoption of plans for hydrotechnical projects works and water management works and setting up of the construction schedule,

d/ supervising of works, the technical and financial control and accounting of works envisaged by this Agreement,

e/ providing of works, control of their realization and control of the implementation of decisions,

f/ systematic monitoring of purity of boundary waters and care about fulfilment of measures related to the protection of

boundary waters against pollution,
g/ assuring the exploration research and measurements, as well as preparation of studies related to hydrotechnical and water management works,
h/ consideration of issues related to the maintenance and marking of water route and navigation line,
i/ undertaking necessary measures for agricultural utilization of parts of state territories isolated as a result of natural changes of river beds of boundary waters or of their agreed relocation,
j/ submitting disputes for solution,
k/ submitting proposals concerning preceding provisions or possible amendements of this Agreement to the Contracting Parties.

Article 3
The session of the Commission

1/ The regular session of the Commission takes place at least once a year. At the request of one of the plenipotentiaries, a special session shall be convened within one month.
2/ The Commission shall meet - unless agreed otherwise - - alternately on the territory of the Czechoslovak Socialist Republic and the Hungarian People's Republic.
3/ The session shall be convened by the plenipotentiary of the Contracting Party on the territory of which the session has to take place.
4/ The agenda of the session shall be agreed by the plenipotentiaries prior to the session and may by amended during the session by agreement.
5/ Each Contracting Party shall bear expenses of its members and experts related with the session of the Commission.

Article 4
Deliberations of the Commission

1/ Deliberations shall be chaired by the plenipotentiary of the Contracting Party, on the territory of which the session takes place.
2/ The working languages of the Commission are Slovak or Czech and Hungarian.

3/ The Commission shall make the decisions unanimously.

4/ A protocol containing decisions shall be drafted from each session in two copies, each in Slovak or Czech and Hungarian language which shall be signed by the plenipotentiaries.

Article 5

Approval of the decisions of the Commission

The decisions of the Commission shall be submitted for approval to the Contracting Parties. The plenipotentiaries shall inform each other about the approval withou delay.

Annex 2

Regulation

concerning the crossing of State border and staying on the territory of the other State

1/ Persons fulfilling the duties or realizing works envisaged by this Agreement shall cross State borders with the State border laissez-passer /hereinafter "laissez-passer"/ issued in Czech or Slovak and Hungarian language. As a title for the State borders crossing there shall be following text inscribed in the laissez-passer: "Water management duties"

2/ The laissez-passer authorising the entry on the territory of the Hungarian People's Republic shall be issued by the competent security office of the Czechoslovak Socialist Republic, while laissez-passer authorizing the entry on the territory of the Czechoslovak Socialist Republic shall be issued by the passports department of the Ministry of Interior of the Hungarian People's Republic. The laissez-passer samples shall be exchanged between the competent authorities of the Contracting Parties.

3/ The laissez-passers shall be issued for the period up to five years and, if need be, their validity can be prolonged.

4/ The laissez-passer entitles to repeated crossings of the State borders on border check points and in the sections indicated in the laisser-passer and to stay on the territory of the other State within five kilometres from the State border. In exceptional cases, when fulfilling of duties envisaged by this Agreement makes it absolutely necessary, the laissez-passer shall be issued with entitlement to stay also at the following places:

a/ Bratislava, Dunajská Streda, Banská Bystrica, Zvolen, Lučenec, and Košice on the Czechoslovak territory,

b/ Győr, Tata, Visegrád, Nagymaros, Budapest, Miskolc and Nyíregyháza on the Hungarian territory.

5/ Any State borders crossing outside off border check points together with place and time of the State borders crossing is to be notified in advance to the competent authorities of the sending Contracting Party

6/ Persons, to whom the issuance of the laissez-passer is not substantiated, may cross State borders, when necessary, with a names list only if accompanied by the holder of the laissez-passer which laisser-passer gives such an entitlement. The names list in two copies identifying up to twenty persons, shall be issued by the water management organization sending the persons. The competent security office shall legalize it for Czechoslovak citizens, and the competent border authority for Hungarian citizens. The persons on the names list may cross the borders only together and may stay on the territory of the other state only for such a time and in such a distance from the borders as the holder of the laissez-passer itself is entitled. The persons on the names lists are obliged to present their identity cards while crossing the State borders.

7/ As a principle, the holders of the laissez-passer as well as the persons listed on the names lists may cross the state borders during the daytime. If there is a need for crossing of State borders or staying on the territory of the other State also in night time, the entitlement to this end shall be indicated in the laissez-passer.

8/ The crossing of State borders offside of check points shall be controlled by the competent border authorities.

9/ The loss of the laisser-passer shall be reported by its holder without delay to the issuing authority. If the loss happened on the territory of the other state, it has to be also reported without delay to the nearest border authority of this Contracting Party.

10/ In case of emergency referred to in Article 10 of this Agreement, the securing and rescue teams of one Treaty Party are entitled to cross the State borders without laissez-passer if the competent authorities of the other Contracting Party asked for assistance. In these cases, the crossing of the State borders shall be notified in advance to the competent border authorities.

11/ The persons referred to in paragraph /10/ are entitled to cross the State borders at any place and to stay on the territory of the other State for the very necessary period. They may, without any special authorization, take with them all equipment necessary for their work. For the return they shall, whenever possible, use the nearest border check point.

12/ Demarcations ships with agreed distinctive signs, may land on the bank of border watercourse of the other State and their crew may do the works envisaged by this Agreement without prior notice.

Annex 5

(Translation)

Agreement of 16 September 1977 between the Government of the Czechoslovak Socialist Republic and the Hungarian People's Republic on Mutual Assistance in the Constructions of the Gabčíkovo-Nagymaros System of Locks

Agreement between the government of the Czechoslovak Socialist Republic and the Hungarian People´s Republic on mutual assistance in the constructions of the Gabčíkovo-Nagymaros system of locks.

The government of the Czechoslovak Socialist Republic and the government of the Hungarian People´s Republic referring to the

Treaty between the Hungarian People´s Republic and the Czechoslovak Socialist Republic concerning the construction and operation of the Gabčíkovo-Nagymaros system of locks, signed in Bratislava on September 16, 1977, in order to ensure effective progress in the construction of the G/N system of locks

have decided to conclude the following agreement for mutual assistance at the constuction.

Por this purpose they have appointed their plennipotentiaries:

The government of the Czechoslovak Socialist Republic

Ing. Rudolf Pohlíček, Dr.Sc., Vice-Premier of the Czechoslovak Socialist Republic, the Chairman of the Czechoslovak part of the joint Czechoslovak-Hungarian committee for economic, scientific and technical cooperation.

The government of the Hungarian People´s Republic:

Dr. Szeker Gyula, the vice-chairman of the Council of Ministers of the Hungarian People´s Republic, the chairman Hungarian part of the Czechoslovak-Hungarian joint committee for economic, scientific and technical cooperation.

who, having exchanged their full powers, found in good and due form, have agreed as follows:

Article 1

1) The Contracting parties have agreed to realize the Gabčíkovo-Nagymaros System of Locks /hereinafter referred as the System of Locks/ according to the following structure:

The beginning of preparatory works 1978

The hydropower station Gabčíkovo	
Putting into operation the first generator unit	1986
Putting into operation the eighth generator unit	1989
The hydroelectric power plant Nagymaros	
Putting into operation the first generator unit	1989
Putting into operation the sixth generator unit	1990

The final term of construction works

2) The general schedule of the construction is annexed to this agreement. The deailed schedule will be elaborated in the course of this agreement as a part of the Joint Contractual Project.

Article 2

1) Except for the tasks for which the Czechoslovak party is responsible according to the apportionment of works and supplies mentioned in the Treaty between the Czechoslovak Socialist Republic and the Hungarian People's Republic concerning the construction and operation of the Gabčíkovo-Nagymaros System of Locks /hereinafter referred as the Treaty/, the Czechoslovak party will carry out the following works within 1978-1981:
a/ The Hrušov-Dunakiliti reservoir, the transfer of the state road Rusovce-Rajka and of the whole long-distance cable at the right side of the river on the Czechoslovak territory. The value of the works /in 1974 price level/ is 7 million Kcs /15 million forints respectively/ according to the joint investment task.
b/ The works on the tail-water canal, the value of which is 261 million Kcs /540 million forints respectively/ and which, at the 1974 price level means 39% of the total volume of works on the tail-water canal according to the joint investment project.
2) Except for the task for which the Hungarian party is responsible according to the apportionment of works and supplies in the Treaty, the Hungarian party shall, by the end of 1986, carry out the works in the value of 60 million Kčs /134 million forints respectively/, at the 1974 price level. The works will be carried out on the Czechoslovak side in the area of the low Hron river and at the Gabčíkovo step at the transition section adjacent to the tail-water canal.

3) The works and supplies will be specified in a detailed construction schedule as part of the joint contractual project.

Article 3

The compensation for the mutual assistance of the contracting parties is based on the following principles:
a/ the differences councerning the works and supplies referred to in the article 2 of this agreement will be compensated by the Hungarian party by supplies of 848 GWh electrical energy from its share generated at the hydropower plant Gabčíkovo in 1986-1988.
b/ with regard to the fact that the Czechoslovak party will invest earlier, during the beginning period of the Gabčíkov power station operation, the contracting parties will share of the produced electrical energy as follows:

	1986	1987	1988	1989
ČSFR in %	53.3	54.1	53.9	50.0
HPR in %	46.7	45.9	46.1	50.0

With regard to the planned quantity of electrical energy to be produced at the Gabčíkovo power station and according to the principles mentioned in a) and b) the contractual parties will share the power supplies as follows:

		1986	1987	1988	1989
ČSFR	GWh	199	1513	1523	1340
HPR	GWh	-	100	1090	1340

Article 4

All differences which shall emerge in the framework of mutual assistance shall be settled by the government plenipotentiasies in accordance with the respective articles of the Treaty.

Article 5

This agreement shall enter into force at the same day as the Treaty.

In witness whereof the plenipotentiaries have signed this agreement and have affixed thereto their seals.

Done at Budapest, on September 16, 1977, in duplicate, in the Hungarian and Slovak languages, both texts being equally authentic.

For the government of the Czechoslovak Socialist Republic	For the government of the Hungarian People's Republic

Annex 6

Agreement of 11 October 1979 between the Government of the Czechoslovak Socialist Republic and the Government of the Hungarian People's Republic on the Joint Statute of the Government Plenipotentiaries, which Regulates Their Activities at the Construction and Operation of the Gabčíkovo-Nagymaros System of Locks

AGREEMENT

Between the Government of the Czechoslovak Socialist Republic and the Government of the Hungarian Peoples Republic on the Joint Statute of the Government plenipotentiaries which Regulates Their Activities at the Construction and Operation of the Gabčíkovo-Nagymaros System of Locks.

The Government of the Czechoslovak Socialist Republic and the Government of the Hungarian People s Republic decided according to the provisions of Article 3, par.4 of the Treaty Between the Czechoslovak Socialist Republic and the Hungarian People's Republic Concerning the Construction and Operation of the Gabčíkovo Nagymaros System of Locks signed at Budapest on September 16, 1977 to conclude an Agreement on Joint Statutes, which regulates their activities at the construction and operation of the Gabčíkovo-Nagymaros System of Locks:

ARTICLE 1

/1/ The contracting Parties in accordance with the Article 3,par. /1/ of the Treaty Between the Czechoslovak Socialist Republic and the Hungarian People s Republic Concerning the Construction and Operation of the Gabčíkovo Nagymaros System of Locks //hereinafter referred to as the "Treaty"/ shall came one plenipotentiary each /hereinafter referred to as "government plenipotentiaries"/.

/2/ The appointment and the recall of plenipotentiaries shall be announced by the Conftacting Parties through the diplomatic channels.

ARTICLE 2

Government plenipotentiaries shall direct and supervise operations connected with the realization of the joint investment and with the performance of tasks relating to the operation of the GAbčíkovo-Nagymaros System of Locks /hereinafter referred to as the "System of Locks"/, ensuring coordination between the Czechoslovak and Hungarian organizations and agencies according to the Agreement's provisions.

ARTICLE 3

/1/ The government plenipotentiaries shall act and take decisions jointly when exercising rights and duties emanating from the Treaty and at solving problems which occur at the realization and operation of the System of Locks.

/2/ The government plenipotentiaries shall ensure implementing of the jointly taken decisions on the territory of the Contracting Party according to the international regulations and principles of the management.

/3/ The government plenipotentiaries shall settle disputes according to the Article 27 of the Treaty.

/4/ Each government plenipotentiaries has a right to stipulate for announcing its position to any question in 30 days time, if other date is not agreed.

ARTICLE 4

/1/ The principal functions of the government plenipotentiaries at the realization of the joint investment shall be as follows:

a/ To supervise and coordinate the activities connected with the elaboration of the joint project documentation,

b/ To supervise that the construction of the System of Locks is properly coordinated in the territories of the Contracting Parties and is carried out in accordance with the approved joint contractual plan and the project work schedule.

c/ To provide for supervision over labour and supplies and for coordination between the agencies of the Contracting Parties.

d/ To approve proposals for the modification of the technical procedures adopted in the joint contractual plan.

e/ To determine the justification for and extent of additional costs arising from the circumstances specified in article 7.

f/ To provide for and approve the records and settlement of differences relating to the apportionment of labour and supplies in equal measure in the cases specified in Article 7.

g/ To provide for acceptance of individual works from the supplying agencies and the delivery thereof to the authorised operating agencies.

h/ To provide for supervision and coordination of activities of the Contracting Parties investments organizations at realizing tasks connected with the joint investment.

/2/ The functions of the government plenipotentiaries at the time of the operation of the System of Locks shall be as follows:

a/ To establish the operating and operational procedures of the System of Locks and ensure compliance therewith.

b/ To ensure the performance of tasks connected with the operation maintenance and possible construction of jointly owned works of the system of Locks, including the performance of tasks connected with the generation and distribution of electric power in compliance with mutual agreements of the state energetical centres of the Contracting Parties.

c/ To approve the technical-economic plans and the reciprocal settlement of accounts relating to the operation, maintenance and possible reconstruction of the works of the System of Locks.

d/ To supervise compliance with the water balance approved in the joint contractual plan.

e/ To supervise and coordinate the activities of national operating agencies which are responsible for the operation of the System of Locks.

f/ To supervise and coordinate the activities of national operating agencies in times of flood ice disposal and emergency situations.

g/ To supervise in times of flood and ice movement at the System of Locks coordination of the activities of the flood-control authorities of the Contracting Parties.

/3/ According to the Articles 25 and 26 of the Treat the government *plenipotentiaries* shall evaluate extent of the damages and costs, as well as its causes, and the necessity to pay for the damages or to receive compensations.

ARTICLE 5

/1/ The government plenipotentiaries shall be in permanent contact and discuss quarterly fulfilment of tasks stated in the Treaty.

/2/ Emergency meeting can be held upon the request of one of the government plenipotentiaries in agreed date.

/3/ Meetings of the government plenipotentiaries shall bo held alternatively on the territory of the Czechoslovak Socialist Republic and the Hungarian People s Republic.

/4/ The government plenipotentiaries of the Contracting Party on which territory the meeting is held shall be the chairman of the meeting and he shall be responsible for the providing of adequate conditions.

ARTICLE 6

/1/ The government plenipotentiaries shall establish appropriate permanent and temporary joint agencies and shall make regulations governing the organization and activities of those agencies.

/2/ The permanent joint agencies are established by the government plenipotentiaries for coordination and control of the construction and operation of the System of Locks.

/3/ The permanent joint agency is the Joint Group consisting of the representatives of the ministries concerned and central agencies, or other agencies.

/4/ The temporary joint agencies shall be established by the government plenipotentiaries when necessary to review:

a/ settlement of costs in excess of the joint investment project
b/ manipulation and operational schedules,
c/ separate economical and technical questions.

/5/ Representation of both Contracting Parties in joint agencies shall be on the principle of parity.

/6/ Recommendations of the joint agencies shall be valid after the approval by the government plenipotentiaries.

/7/ Members of the joint agencies are responsible for the fulfilment of their tasks to the respective government plenipotentiaries of the Contracting Party.

ARTICLE 7

/1/ Meetings of the government plenipotentiaries shall be held in Slovak or Czech and Hungarian language.

/2/ A protocol from the meeting shall be written in Slovak of Czech and in Hungarian language. Both text are equally authentic.

ARTICLE 8

Costs for the activity of its government plenipotentiaries representatives and experts in joint agencies shall be borne by each Contracting party.

ARTICLE 9

With the conclusion of this Agreement, the government plenipotentiaries are given responsibilities of the Broaden Joint Scientific and Technology Commission /BJSTC/ established according to the Article 4, par.3.Article 6, par.3 and Article 8 of the Agreement between the Government of the Hungarian People s Republic Concerning the Drafting of a Joint Contractual Plan for the Gabčíkovo-Nagymaros System of Locks.

ARTICLE 10

/1/ The government plenipotentiaries for border waters under the Agreement of the Czechoslovak Socialist Republic and the Hungarian Peoples Republic on Water Regime of Border Waters shall supervise water resource management functions, water meliorations, measures to utilize water resources, protection of surface and underground waters against pollution, maintenance of fairway, maintenance of the bed of the Danube river, protection against the flood and ice movement.

/2/ The Government of the Czechoslovak Socialist Republic and the Government of the Hungarian Peoples Republic conclude an agreement to supervise the solving of all relevant water resource management questions in time of operation of the System of Locks.

ARTICLE 11

Additions and changes to this Agreement shall be approved by the governments of the Contracting Parties.

ARTICLE 12

The Agreement shall come into force of the date of the signature.

ARTICLE 13

Done at Bratislava, on October 11, 1979, in duplicate, in the Slovak and Hungarian languages, both texts being equally authentic.

For the Government of the Czechoslovak Socialist Republic

(Margetin)

For the Government of the Hungarian People s Republic

(Gergely István)

Annex 7

(Translation)

Protocol of 10 October 1983 amending the Treaty between the Czechoslovak Socialist Republic and the Hungarian People's Republic Concerning the Construction and Operation of the Gabčíkovo-Nagymaros System of Locks, signed in Budapest on September 16, 1977

P R O T O C O L

amending the Treaty between the Czechoslovak Socialist Republic and the Hungarian People's Republic concerning the construction and operation of the Gabčíkovo-Nagymaros system of locks, signed at Budapest on September 16, 1977

The Czechoslovak Socialist Republic and the Hungarian People's Republic have decided to amend the Treaty between the Czechoslovak Socialist Republic and the Hungarian People's Republic concerning the construction and operation of the Gabčíkovo-Nagymaros system of locks, signed at Budapest on September 16, 1977 (hereinafter referred to as the Treaty) and to this purpose they have appointed their plenipotentiaries:

The President of the Czechoslovak Socialist Republic:
Dr. Ľubomír Štrougal, Prime-Minister of the Czechoslovak Socialist Republic,

The Presidium of the Hungarian People's Republic:
Lazár György, Chairman of the Council of the Ministers of the Hungarian People's Republic,

who having exchanged their full powers, found in good and due form, have agreed as follows:

Article 1

The Article 4, Paragraph (4) of the Treaty is amended as follows: "Operations relating to the joint investment shall be organized by the Contracting Parties in such a way that the power generation plants will be put into operation during the period 1990 - 1994".

Article 2

(1) This Protocol will be ratified and the instruments of ratification will be exchanged in Budapest.
(2) This Protocol enters into force on the day of the exchange of the ratification instruments.

In witness whereof the plenipotentiaries have signed this protocol and have affixed thereto their seals.

Done at Prague, on October 10, 1983, in duplicate, in the Hungarian and Slovak language, both texts being equally authentic.

For the Czechoslovak Socialist Republic (Ľubomír Štrougal)	For the Hungarian People's Republic (Lazár György)

Annex 8

(Translation)

Protocol of 10 October 1983 amending the Agreement between the Government of the Hungarian People's Republic and the Government of the Czechoslovak Socialist Republic for Mutual Assistance in the Construction of the Gabčíkovo-Nagymaros System of Locks, signed in Budapest, on 16 September 1977

P R O T O C O L

amending the Agreement between the Government of the Hungarian People's Republic and the Government of the Czechoslovak Socialist Republic for mutual assistance in the construction of the Gabčíkovo-Nagymaros system of locks, signed at Budapest on September 16, 1977.

The Government of the Czechoslovak Socialist Republic and the Government of the Hungarian People's Republic decided to amend the Agreement between the Government of the Hungarian People's Republic and the Government of the Czechoslovak Socialist Republic for mutual assistance in the construction of the Gabčíkovo-Nagymaros system of locks, signed at Budapest on September 16, 1977, (hereinafter referred to as "the Agreement") and for this purpose appointed as their plenipotentiaries:

The Government of the Czechoslovak Socialist Republic:

Ing. Rudolf Rohlíček, DrSc., Vice-Premier of the Czechoslovak Socialist Republic, the Chairman of the Czechoslovak Part of the Joint Czechoslovak-Hungarian Committee on the Cooperation in the fields of Economy, Science and Technology,

The Government of the Hungarian People's Republic

Marjai Jozsef, Deputy Chairman of the Council of the Ministers of the Hungarian People's Republic, the Chairman of the Hungarian Part of the Joint Czechoslovak-Hungarian Committee on the Cooperation in the fields of Economy, Science and Technology,

who having exchanged their full powers, found in good and due form, have agreed as follows:

Article 1

Article 1, par. 1 of the Treaty, is amended as follows:

"1. The Contracting Parties agreed to realize the Gabčíkovo-Nagymaros System of Locks in following terms:

Beginning of the preparatory works	1978
Gabčíkovo hydroelectric power plant:	
putting into operation the first aggregate	1990
putting into operation the eight aggregate	1993
Nagymaros hydroelectric power plant:	
putting into operation the first aggregate	1993
putting into operation the sixth aggregate	1994
The final term of the construction works	1995

Article 2

/1/ The general working schedule of the construction is in Annex of this Protocol and is replacing general working schedule of the construction which was annexed to the Agreement.

/2/ According to the general working schedule of the construction, which is annexed to this Protocol, detailed working schedule of the construction shall be worked out and after its adoption according to the Article 4. par.3 of the Treaty between the Hungarian People's Republic and the Czechoslovak Socialist Republic Concerning the Construction and Operation of the Gabčíkovo-Nagymaros System of Locks, signed at Budapest on September 16, 1977 shall replace the detailed working schedule, which is a part of the Joint Contractual Project.

Article 3

Article 2, par. 1 and 2. is amended as follows:

"/1/ Except tasks apportioned to the Czechoslovak side according to the apportionment of labour and supplies in the Treaty between the Hungarian People's Republic and the Czechoslovak Socialist Republic Concerning the Construction and Operation of the Gabčíkovo-Nagymaros System of Locks /hereinafter referred to as "the Treaty"/, the Czechoslovak side shall be realizing following works in the years 1978 - 1988:

a/ the Hrušov-Dunakiliti head water installations, from the right bank objects on the Czechoslovak territory construction of the state road Rusovce-Rajka a construction of a long distance cable as a whole. The value of these works is under joint investment project 7 million Czechoslovak Crowns, or 15 million Forints at a rate of exchange of the year 1974.

b/ Works on the by-pass canal in amount of 261 million Cz.crowns, or 540 million Forints, which at a rate of exchange of the year 1974 represent 39% of the global works on the bypass canal according to the joint investment task.

/2/ except tasks apportioned to the Hungarian side according to the apportionment of labour and supplies in the Treaty, the Hungarian side shall realize works in amount of 60 million Cz. crowns, or 134 million Forints at a rate of exchange of the year 1974 at flood-control works of the Nagymaros head-water installations in Czechoslovak territory in lower Hron district and Gabčíkovo series of locks on the territory connected to the bypass canal".

Article 4

Article 3 of the Treaty is changed as follows:

"Compensation of mutual assistance of the Contracting Parties is based on these principles:

a/ differences of labour and supplies mentioned in the Article 2 of this Agreement the Hungarian side shall compensate by deliveries of electrical energy of 848 GWh produced by the Gabčíkovo hydroelectric power plant in the years 1990-1992 from the Hungarian share,

b/ taking into account that Czechoslovak side invested in advance in the years of beginning of the operation of the Gabčíkovo hydroelectric power plant, the Contracting PArties shall participate in consumption of electricity as follows:

	1990	1991	1992	1993
ČSSR in %	53.3	54.1	53.9	50.0
HPR in %	46.7	45.9	46.1	50.0

c/ taking into account the expected quantity of the produced electric energy at Gabčíkovo hydroelectric power plant and according to the principles mentioned in items a/ and b/ the Contracting Parties shall participate in consumption of electricity as follows:

	1990	1991	1992	1993
ČSSR GWh	199	1513	1523	1340
HPR GWh	-	100	1090	1340

Article 5

This Protocol shall come into force simultaneously with the Protocol amending the Treaty Between the Hungarian People's Republic and the Czechoslovak Socialist Republic Concerning the Construction and Operation of the Gabčíkovo-Nagymaros System of Locks, signed at Budapest on September 16, 1977.

In witness whereof the plenipotentiaries have signed this Protocol and have affixed thereto their seals.

Done at Prague, on October 10, 1983, in duplicate, in the Slovak and Hungarian language, both texts being equally authentic.

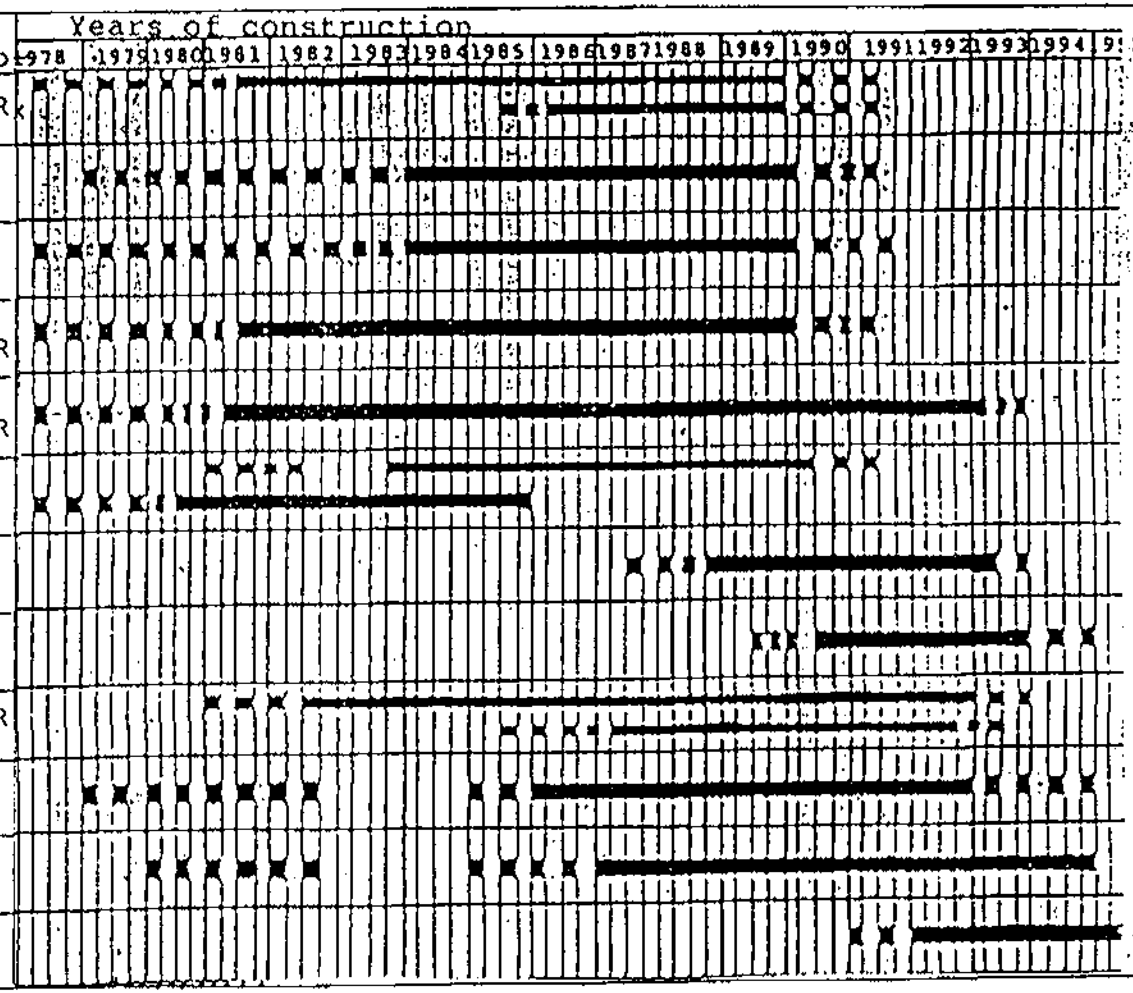
For the Government
of the Czechoslovak Socialist
Republic

(Rudolf Rohlíček)

For the Government
of the Hungarian People's
Republic

(Marjai József)

	Main construction	Resp
Waterwork GAbčíkovo	Reservoir Hrušov-Dunakiliti ČSSR territory	ČSSR HR
	Reservoir Hrušov-Dunakiliti territory of the Hung.Rep.	HR
	Weir DUnakiliti	HR
	Inlet canal	ČSSR
	Gabčíkovo step	ČSSR
	Outlet canal	HR ČSSR
	Deepening below Palkovičovo	HR
	Regulation measures in old b.	HR
WW Nagymaros	Protection measures on the ČSSR territory	ČSSR HR
	Protection measures on the Hungarian territory	HR
	Nagymaros step	HR
	Deepening under Nagymaros	HR



Annex 9

(Translation)

Protocol of 6 February 1989 amending the Agreement between the Government of the Hungarian People's Republic and the Government of the Czechoslovak Socialist Republic for Mutual Assistance in the Construction of the Gabčíkovo-Nagymaros System of Locks, signed in Budapest on 16 September 1977

(Translation)

P R O T O C O L

amending the Agreement between the Government of the Hungarian People's Republic and the Government of the Czechoslovak Socialist Republic for mutual assistance in the construction of the Gabčíkovo-Nagymaros system of locks, signed at Budapest on September 16, 1977.

The Government of the Czechoslovak Socialist Republic and the Government of the Hungarian People's Republic decided to amend the Agreement between the Government of the Hungarian People's Republic and the Government of the Czechoslovak Socialist Republic for mutual assistance in the construction of the Gabčíkovo-Nagymaros system of locks, signed at Budapest on September 16, 1977 in wording of the Protocol amending the Agreement signed at Prague on October 10, 1983 (hereinafter referred to as "the Agreement") and for this purpose appointed as their plenipotentiaries:

The Government of the Czechoslovak Socialist Republic:

Pavel Hrivnák, First Deputy Prime Minister of the Czechoslovak Socialist Republic

The Government of the Hungarian People's Republic

Dr.Peter Medgyessy, Deputy Chairman of the Council of the Ministers of the Hungarian People's Republic

who having exchanged their full powers, found in good and due form, have agreed as follows:

Article 1

Article 1, par. /1/ of the Treaty, is amended as follows:

"1. The Contracting Parties agreed to realize the Gabčíkovo-Nagymaros System of Locks in following terms:

Beginning of the preparatory works		1978
Gabčíkovo hydroelectric power plant:		
putting into operation	the first aggregate	1990
putting into operation	the eight aggregate	1992
Nagymaros hydroelectric power plant:		
putting into operation	the first aggregate	1992
putting into operation	the sixth aggregate	1993
Finishing of the construction works		1994"

Article 2

/1/ The general working schedule of the construction is in Annex of this Protocol and is replacing general working schedule of the construction which was annexed to the Agreement.

/2/ According to the general working schedule of the construction, which is annexed to this Protocol, detailed working schedule of the construction shall be worked out and after its adoption according to the Article 4. par.3 of the Treaty between the Hungarian People's Republic and the Czechoslovak Socialist Republic Concerning the Construction and Operation of the Gabčíkovo-Nagymaros System of Locks, signed at Budapest on September 16, 1977 shall replace the detailed working schedule, which is a part of the Joint Contractual Project.

Article 3

Article 2, par. 1 and 2. is amended as follows:

"/1/ Except tasks apportioned to the Czechoslovak side according to the apportionment of labour and supplies in the Treaty between the Hungarian People's Republic and the Czechoslovak Socialist Republic Concerning the Construction and Operation of the Gabčíkovo-Nagymaros System of Locks /hereinafter referred to as "the Treaty"/, the Czechoslovak side shall be realizing following works in the years 1978 - 1988:

a/ the Hrušov-Dunakiliti head water installations, from the right bank objects on the Czechoslovak territory construction of the state road Rusovce-Rajka a construction of a long distance cable as a whole. The value of these works is under joint investment project 7 million Czechoslovak Crowns, or 15 million Forints at a rate of exchange of the year 1974.

b/ Works on the by-pass canal in amount of 261 million Cz.crowns, or 540 million Forints, which at a rate of exchange of the year 1974 represent 39% of the global works on the by-pass canal according to the joint investment task.

/2/ except tasks apportioned to the Hungarian side according to the apportionment of labour and supplies in the Treaty, the Hungarian side shall realize works in amount of 60 million Cz. crowns, or 134 million Forints at a rate of exchange of the year 1974 at flood-control works of the Nagymaros head-water installations in Czechoslovak territory in lower Hron district and Gabčíkovo series of locks on the territory connected to the by-pass canal".

Article 4

Article 3 of the Treaty is changed as follows:

"Compensation of mutual assistance of the Contracting Parties is based on these principles:

a/ differences of labour and supplies mentioned in the Article 2 of this Agreement the Hungarian side shall compensate by deliveries of electrical energy of 848 GWh produced by the Gabčíkovo hydroelectric power plant in the years 1990-1992 from the Hungarian share,

b/ taking into account that Czechoslovak side invested in advance and in accordance to the provisions of the item a/ the Czechoslovak side shall receive in the first three years of operation of the Gabčíkovo hydroelectric power plant altogether 1022, 5 GWh of electrical energy from the 50% share of the Hungarian side. The time schedule of the delivery will be agreed by the Energy Distribution Dispatchers of the Contracting Parties in such a way that the Czechoslovak side shall receive 10% maximum by the end of 1990, 80% by the end of 1991 and in the year 1992 the rest of the Hungarian share of electrical energy."

Article 5

This Protocol shall come into force on the date of its signature. By the date of entering into force of this Protocol, the Protocol amending the Treaty Between the Hungarian People's Republic and the Czechoslovak Socialist Republic Concerning the Construction and Operation of the Gabčíkovo-Nagymaros System of Locks, signed at Prague on October 10, 1983 is expired.

In witness whereof the plenipotentiaries have signed this Protocol and have affixed thereto their seals.

Done at Budapest, on February 6, 1989, in duplicate, in the Slovak and Hungarian language, both texts being equally authentic.

For the Government
of the Czechoslovak Socialist
Republic

(Pavel Hrivnák)

For the Government
of the Hungarian People's
Republic

(Peter Medgyessy)

Complex schedule of the construction of the Water System of Locks Gabčíkovo-Nagymaros

	Main constructio	Resp.	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	199[illegible]
Waterwork GAbčíkovo	Reservoir Hrušov-Dunakiliti, ČSSR territ.	ČSSR HR																	
	Reservoir Hrušov-Dunak., Hungarian territory	HR																	
	Weir Dunakiliti	HR																	
	Inlet canal	ČSSR																	
	Gabčíkovo step	ČSSR																	
	Outlet canal	HR ČSSR																	
	Deepening below Palkovičovo	HR																	
	Regulation measures in old river bed	HR																	
	Protection measures on ČSSR territory	ČSSR HR																	
WW NAgymaros	Protection measures on Hungarian territ.	HR																	
	Nagymaros step	HR																	
	Deepening under Nagymaros	HR																	

Annex 10

Convention concerning the regime of navigation on the Danube (with annexes and supplementary protocol). Signed at Belgrade, on 18 August 1948

No. 518

UNION OF SOVIET SOCIALIST REPUBLICS, BULGARIA, CZECHOSLOVAKIA, HUNGARY, ROMANIA UKRAINIAN SOVIET SOCIALIST REPUBLIC and YUGOSLAVIA

Convention concerning the regime of navigation on the Danube (with annexes and supplementary protocol). Signed at Belgrade, on 18 August 1948

Russian and French official texts communicated by the Permanent Representative of Yugoslavia to the United Nations. The registration took place on 12 August 1949.

TRANSLATION — TRADUCTION

No. 518. CONVENTION[1] REGARDING THE REGIME OF NAVIGATION ON THE DANUBE. SIGNED AT BELGRADE, ON 18 AUGUST 1948

The Union of Soviet Socialist Republics, the People's Republic of Bulgaria, the Hungarian Republic, the People's Republic of Romania, the Ukrainian Soviet Socialist Republic, the Republic of Czechoslovakia and the Federal People's Republic of Yugoslavia,

Whereas the Council of Foreign Ministers on 12 December 1946 decided to convene a conference, composed of representatives of the States mentioned, to work out a new convention regarding the regime of navigation on the Danube, and

Desirous of providing for free navigation on the Danube in accordance with the interests and sovereign rights of the Danubian States and in order to strengthen the economic and cultural relations of the Danubian States among themselves and with other nations,

Have resolved to conclude a Convention regarding the regime of navigation on the Danube and for that purpose have appointed the undersigned plenipotentiaries who, after presentation of their full powers, found in good and due form, have agreed on the following:

CHAPTER I

GENERAL PROVISIONS

Article 1

Navigation on the Danube shall be free and open for the nationals, vessels of commerce and goods of all States, on a footing of equality in regard to port and navigation charges and conditions for merchant shipping. The foregoing shall not apply to traffic between ports of the same State.

[1] Came into force on 11 May 1949, date of deposit of the sixth instrument of ratification with the Government of the Federal People's Republic of Yugoslavia, in accordance with article 47.

Dates on which the instrument of ratification was deposited by each of the signatory States:

Bulgaria	22 February 1949
Czechoslovakia	23 February 1949
Yugoslavia	23 February 1949
Romania	5 March 1949
Hungary	14 March 1949
Union of Soviet Socialist Republics	11 May 1949
Ukrainian Soviet Socialist Republic	14 May 1949

Article 2

The regime established by this Convention shall apply to the navigable part of the Danube River between Ulm and the Black Sea through the Sulina arm, with outlet to the sea through the Sulina channel.

Article 3

The Danubian States undertake to maintain their sections of the Danube in a navigable condition for river-going and, on the appropriate sections, for sea-going vessels, to carry out the works necessary for the maintenance and improvement of navigation conditions and not to obstruct or hinder navigation on the navigable channels of the Danube. The Danubian States shall consult the Danube Commission (art. 5) on matters referred to in this article.

The riparian States may within their own jurisdiction undertake works for the maintenance of navigation, the execution of which is necessitated by urgent and unforeseen circumstances. The States shall inform the Commission of the reasons which have necessitated the works, and shall furnish a summary description thereof.

Article 4

Should a Danubian State be unable itself to undertake works within its own territorial jurisdiction which are necessary for the maintenance of normal navigation it shall be bound to allow the Danube Commission (art. 5) to carry them out under conditions determined by the Commission, which may not entrust the execution of such works to another State unless the section in question of the waterway forms the frontier of such State. In the latter case the Commission shall decide the conditions on which the works shall be carried out.

The Danubian States agree to afford the Commission or the State executing the said works all necessary assistance.

CHAPTER II

Administrative provisions

Section I. The Danube Commission

Article 5

There shall be established a Danube Commission, hereinafter called "the Commission", to consist of one representative of each Danubian State.

Article 6

The Commission shall elect from among its members a chairman, a vice-chairman and a secretary for a term of three years.

Article 7

The Commission shall determine the times of its meetings and its own rules of procedure.

The first meeting of the Commission shall be held within six months after the entry into force of the present Convention.

Article 8

The jurisdiction of the Commission shall extend to the Danube as defined in article 2.

The functions of the Commission shall be:

(*a*) to supervise the implementation of the provisions of this Convention;

(*b*) to prepare a general plan of the principal works called for in the interests of navigation on the basis of proposals and projects presented by the Danubian States and the Special River Administrations (articles 20 and 21), and likewise to draw up a general budget in connexion with such works;

(*c*) to execute the works in the cases provided for in article 4;

(*d*) to consult with, and make recommendations to, the Danubian States in respect of the execution of the works referred to in paragraph (*b*) of this article, with due consideration for the technical and economic interests, plans and possibilities of the respective States;

(*e*) to consult with, and make recommendations to, the Special River Administrations (articles 20 and 21), and to exchange information with them;

(*f*) to establish a uniform system of traffic regulations on the whole navigable portion of the Danube and also to lay down the basic provisions governing navigation on the Danube, including those governing the pilot service, with due consideration for the specific conditions obtaining on particular sections;

(*g*) to unify the regulations governing river inspection;

(*h*) to co-ordinate the hydro-meteorological services on the Danube, and to publish a single hydrological bulletin and short-term and long-term hydrological forecasts for the Danube;

(*i*) to produce statistics on aspects of navigation on the Danube within the competence of the Commission;

(*j*) to publish reference works, sailing directions, navigational charts and atlases for purposes of navigation;

(*k*) to prepare and approve the budget of the Commission and to fix and levy the charges provided for in article 10.

Article 9

In order to carry out the tasks referred to in the foregoing article, the Commission shall have its own secretariat and the necessary office services, the staff of which shall be recruited from nationals of the Danubian States.

The organization of the secretariat and services shall be determined by the Commission itself.

Article 10

The Commission shall draw up its budget and approve it by a majority vote of all its members. The budget shall provide for the expenses for the maintenance of the Commission and its services, to be met by equal contributions of the Danubian States payable annually.

In order to defray the cost of executing special works for the maintenance or improvement of navigability, the Commission may establish special charges.

Article 11

The Commission's decisions shall be taken by a majority of the members present, unless otherwise specifically provided for in this Convention (articles 10, 12 and 13).

Five members of the Commission shall constitute a quorum.

Article 12

The Commission's decisions on matters provided for in article 8, paragraphs (*b*), (*c*), (*f*) and (*g*) shall be taken by a majority vote of all members of the Commission but without outvoting the State of the territory on which the works are to be carried out.

Article 13

The seat of the Commission shall be at Galatz.

The Commission may, however, by a decision of a majority of all members change the seat of the Commission.

Article 14

The Commission shall have the rights of a legal entity in accordance with the laws of the State in which the Commission has its seat.

Article 15

The official languages of the Commission shall be Russian and French.

Article 16

Members of the Commission and officers authorized by it shall enjoy diplomatic immunity. Its official buildings, archives and documents of all kinds shall be inviolable.

Article 17

Officers of the Commission holding the proper credentials shall inform the competent authorities of the Danubian States of breaches of the navigation, sanitation and river inspection regulations which have come to the Commission's knowledge. The competent authorities must in turn inform the Commission of the steps taken in connexion with any breaches reported as aforesaid.

Article 18

The Commission shall have its own seal and flag, which it may fly on its official buildings and vessels.

Article 19

The Danubian States shall afford the Commission, its officers and its staff the assistance necessary to enable them to carry out their duties under this Convention.

Such officers and staff shall, subject to compliance with national law, have the right of free movement while carrying out their official duties on the river and in ports within the jurisdiction of the Commission.

Section II. Special River Administrations

Article 20

There shall be established a Special River Administration in the lower Danube (between the mouth of the Sulina channel and Braila inclusive) for the execution of hydraulic engineering works and the regulation of navigation, such Administration to consist of the representatives of the adjacent riparian States (People's Republic of Romania and the Union of Soviet Socialist Republics).

The Administration shall act on the basis of an agreement between the Governments of the countries members of the Administration.

The seat of the Administration shall be at Galatz.

Article 21

There shall be established a Special River Administration of the Iron Gates in the Iron Gates section (between Vince and Kostol on the right bank and between Moldova-Veche and Turnu-Severin on the left bank of the Danube) for the execution of hydraulic engineering works and the regulation of navigation in the said area, such Administration to consist of the representatives of the People's Republic of Romania and the Federal People's Republic of Yugoslavia.

The Administration shall act on the basis of an agreement between the Governments of the countries members of the Administration.

The seat of the Administration shall be at Orsova and Tekija.

Article 22

The Commission shall be notified of the agreements on Special River Administrations (hereinafter called "the Administrations") referred to in articles 20 and 21.

CHAPTER III

Regime of navigation

Section I. Navigation

Article 23

Navigation on the lower part of the Danube and in the Iron Gates section shall be carried out in accordance with the regulations on navigation established by the Administrations of the respective sections. Navigation on other parts of the Danube shall be carried out in accordance with the regulations established

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by the respective Danubian States through whose territory the Danube flows, and, in those sections where the banks of the Danube belong to two different States, in accordance with the regulations established by agreement between such States.

In establishing regulations on navigation the Danubian States and Administrations shall have regard to the basic provisions governing navigation on the Danube established by the Commission.

Article 24

Vessels navigating the Danube shall have the right, subject to compliance with the regulations established by the Danubian States concerned, to enter ports, to load and discharge, to embark and disembark passengers, to refuel, to take on supplies, etc.

Article 25

Vessels flying foreign flags may not engage in local passenger and freight traffic or traffic between ports of the same Danubian State, save in accordance with the national regulations of that State.

Article 26

Sanitary and police regulations in force on the Danube shall be administered without discrimination as regards the nationality of vessels, points of departure and destination, or on any other grounds.

The functions of customs, sanitary, and river inspection on the Danube shall be discharged by the Danubian States, which shall communicate to the Commission the regulations issued by them, in order that the Commission may be able to promote the unification of customs and sanitary regulations and to unify the regulations governing river inspection (article 8 (*g*)).

Customs, sanitary, and police regulations shall be such as not to impede navigation.

Article 27

When both banks of the Danube belong to the same State, the latter shall have the right to place goods in transit under seal or in charge of the customs officers. Such State shall also be entitled to require the master or owner of a vessel to make a written declaration stating only whether or not he is carrying goods the importation of which is prohibited by that State but shall not be entitled to prohibit the transit of such goods. These formalities shall not entail an inspection of the cargo or delay its transit. The master or owner of a vessel making a false declaration shall be liable under the law of the State to which the declaration was made.

When the river Danube forms the frontier between two States, vessels, rafts, passengers and goods in transit shall be exempt, while afloat, from all customs formalities.

Article 28

Vessels employed by Danubian States for river inspection (police) work must fly their national flag and, in addition, bear a distinctive and uniform mark; the descriptions and number of such vessels shall be communicated to the Commission. Such vessels, and the customs vessels of all Danubian States, may navigate the Danube only within the frontiers of the respective States whose flags they fly, and beyond such frontiers only with the consent of the Danubian States concerned.

Article 29

Ships on the Danube shall be allowed to use, for purposes of navigation, ships' wireless sets and shore communication facilities.

Article 30

Navigation of the Danube by the naval vessels of any non-Danubian country shall be prohibited.

The naval vessels of Danubian States may not navigate the Danube beyond the frontiers of the respective countries whose flags they fly save by arrangement between the Danubian States concerned.

Section II. Pilot service

Article 31

On the lower Danube and in the Iron Gates section there shall be established corps of pilots under the Administrations concerned (art. 22).

The regulations of the pilot service shall be established by the Administrations in accordance with the basic provisions governing navigation on the Danube (art. 8 (*f*)) and shall be communicated to the Commission.

Article 32

Pilotage of vessels on the lower Danube and in the Iron Gates section shall be carried out by pilots from the appropriate corps of pilots or by pilots who

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have passed an examination set by the authorities of the competent River Administration and who are licensed by such Administration to pilot vessels.

Article 33

The corps of pilots shall be recruited from nationals of the Danubian countries members of the Administrations concerned. The procedure for recruiting the corps shall be determined by special agreements between the aforesaid members of such Administrations (articles 20 and 21).

CHAPTER IV

Procedure for defraying the cost of maintenance of navigation

Article 34

Hydraulic engineering works on the Danube carried out by Danubian States in accordance with article 3 of this convention shall be financed by the Danubian States concerned.

The works referred to in article 8, paragraph (*c*), shall be financed by the Commission.

Article 35

In order to defray the cost of the maintenance of navigation the Danubian States may, by agreement with the Commission, levy on vessels navigation charges the scale of which shall be fixed in relation to the cost of maintenance of equipment and the cost of the works referred to in article 34.

Article 36

In order to defray the cost of the maintenance of navigation and of works carried out by the Administrations, the latter shall fix special charges to be levied on vessels passing through the sections between the mouth of the Sulina channel and Braila and between Vince and Kostol on the right bank and between Moldova-Veche and Turnu-Severin on the left bank of the Danube.

The Administrations shall notify the Commission of the special charges fixed by the Administrations and of the procedure for levying them.

Article 37

The extraordinary, navigation and special charges levied by the Commission, the Danubian States, and the Administrations must not be a source of profit.

Article 38

The procedure for levying the extraordinary navigation and special charges shall be laid down in instructions drawn up by the Commission, the Danubian States or the Administrations respectively. The instructions issued by the Danubian States and the Administrations shall be drawn up in agreement with the Commission.

Charges shall be calculated on the basis of the ships' tonnage.

Article 39

The execution of works on sections of the Danube forming inter-State frontiers and the apportionment of expenditure therefor shall be settled by agreement between the adjoining States concerned.

Article 40

Port dues levied on vessels shall be collected by the authorities of the Danubian States concerned. In doing so no discrimination shall be shown as regards the nationality of vessels, points of departure and destination, or on any other grounds.

Article 41

Vessels entering ports for loading or unloading shall be entitled to use loading and unloading machinery, equipment, warehouses, storage space, etc., according to agreements concluded with the appropriate transportation and forwarding agencies.

There shall be no discrimination in determining the amount charged for services rendered.

Reductions granted in accordance with commercial usage on the basis of the volume of services rendered or the nature of the cargo shall not be regarded as discrimination.

Article 42

No charges shall be levied on vessels, rafts, passengers and goods in respect merely of transit.

Article 43

Schedules of pilotage fees in the lower Danube and in the Iron Gates section shall be fixed and communicated to the Commission by the Administrations concerned.

CHAPTER V

Final provisions

Article 44

The expression "Danubian State" or "Danubian country" in this convention shall be taken to mean a State situated on a bank or banks of the Danube as defined in article 2.

Article 45

Any dispute between the parties to this Convention regarding the application or interpretation of the Convention which cannot be resolved by direct negotiation shall, at the request of either party to the dispute, be referred for settlement to a conciliation commission composed of one representative of each party to the dispute and one representative appointed by the Chairman of the Danube Commission from among the nationals of a State not a party to the dispute, or, if the Chairman of the Commission is a national of a State party to the dispute, then by the Danube Commission.

The decision of the conciliation commission shall be accepted by the parties to the dispute as final and binding.

Article 46

The present Convention may be revised at the request of the majority of the signatory States. This request shall be addressed to the Government of the Federal People's Republic of Yugoslavia, which shall as soon as possible convene a conference of all the States signatories to the present Convention. The revised provisions shall come into force only after instruments of ratification have been deposited by six of the States signatories to the present Convention.

Article 47

The present Convention and its annexes, of which the Russian and French texts are authentic, shall be subject to ratification and shall come into force upon the deposit of six instruments of ratification. Instruments of ratification shall be deposited with the Government of the Federal People's Republic of Yugoslavia, in the archives of which shall be kept the original of the present Convention.

The Government of the Federal People's Republic of Yugoslavia shall furnish certified copies of the original Convention to all the signatories to the Convention and shall inform them of the deposit of instruments of ratification as these are received.

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LIST OF ANNEXES

ANNEX I

THE ADMISSION OF AUSTRIA TO THE DANUBE COMMISSION

1. A representative of Austria shall be admitted to the Danube Commission after the question of a treaty with Austria has been settled.

2. The present annex shall come into force simultaneously with the Convention regarding the regime of navigation on the Danube and shall be an integral part thereof.

ANNEX II

THE GABCIKOVO-GÖNYÜ SECTOR

Regarding the works necessary to ensure normal conditions of navigation in the Gabcikovo-Gönyü sector (from km. 1821 to km. 1791), the Contracting Parties agree that it is in the general interest to maintain this sector in good navigable condition and that the works necessary for this purpose far exceed those which could reasonably be required of the riparian States concerned.

It is accordingly agreed that the Danube Commission shall discuss the question and decide whether, for this purpose, it would be appropriate to set up for this sector a special river administration similar to those provided for in articles 20 and 21, or whether it would be sufficient to apply to this sector the provisions of articles 4 and 31, paragraph 2, of the present Convention.

Regulations similar to those of article 20 of the present Convention, of which this annex is an integral part, shall be applied if such an administration is set up.

IN WITNESS WHEREOF, the undersigned plenipotentiaries have signed[1] the present convention and have affixed their seals thereto.

DONE in the city of Belgrade, this 18th day of August nineteen hundred and forty-eight.

For the Union of Soviet Socialist Republics:

For the People's Republic of Bulgaria:

For the Hungarian Republic:

For the People's Republic of Romania:

For the Ukrainian Soviet Socialist Republic:

For the Republic of Czechoslovakia:

For the Federal People's Republic of Yugoslavia:

[1] Signatures on opposite page.

SUPPLEMENTARY PROTOCOL

TO THE CONVENTION REGARDING THE REGIME OF NAVIGATION ON THE DANUBE

SIGNED AT BELGRADE, ON 18 AUGUST 1948

1. It is noted that the former regime of navigation on the Danube, and the instruments providing for the establishment of that regime, in particular the Convention signed in Paris on 23 July 1921,[1] are no longer in force.

2. All property owned by the former European Danube Commission shall be transferred to the Special River Administration of the lower Danube established under article 20 of the Convention, to which the present protocol refers.

3. It is agreed that all obligations of the former European Danube Commission to repay credits granted to it by Great Britain, France, Russia or other States shall be considered cancelled.

4. The obligations of the former International Danube Commission, the obligations of the former Administration of the Iron Gates and Cataracts, and the guarantees securing those obligations, shall be considered cancelled.

5. Unliquidated property of the former International Danube Commission shall be transferred to the Danube Commission provided for in article 5 of the Convention to which the present protocol refers. The part of the property of the former International Danube Commission transferred to the former Administration of the Iron Gates and Cataracts, and all the property of the former Administration of the Iron Gates and Cataracts, shall be transferred to the Special River Administration of the Iron Gates established in accordance with article 21 of the Convention, to which the present protocol refers.

[1] League of Nations, *Treaty Series*, Volume XXVI, page 173.

DONE at Belgrade, this 18th day of August 1948.[1]

For the Union of Soviet Socialist Republics:

For the People's Republic of Bulgaria:

For the Hungarian Republic:

For the People's Republic of Romania:

For the Ukrainian Soviet Socialist Republic:

For the Republic of Czechoslovakia:

For the Federal People's Republic of Yugoslavia:

[1] Signatures on opposite page.

Annex 11

Convention (with annex) concerning Fishing in the Waters of the Danube signed at Bucharest on 29 January 1958

[TRANSLATION — TRADUCTION]

No. 4845. CONVENTION[1] BETWEEN THE GOVERNMENTS OF THE ROMANIAN PEOPLE'S REPUBLIC, THE PEOPLE'S REPUBLIC OF BULGARIA, THE FEDERAL PEOPLE'S REPUBLIC OF YUGOSLAVIA AND THE UNION OF SOVIET SOCIALIST REPUBLICS CONCERNING FISHING IN THE WATERS OF THE DANUBE. SIGNED AT BUCHAREST, ON 29 JANUARY 1958

The Governments of the Romanian People's Republic, the People's Republic of Bulgaria, the Federal People's Republic of Yugoslavia and the Union of Soviet Socialist Republics,

Having a common interest in the rational utilization and expansion of the stocks of fish in the river Danube,

Recognizing the need for co-operation in working out a scientific basis for intensive augmentation of the stocks of fish and the regulation of fishing,

Have decided to conclude this Convention and have for this purpose appointed as their plenipotentiaries:

The Government of the Romanian People's Republic: Constantin Teodoru, Deputy Minister of the Consumer Goods Industry;

The Government of the People's Republic of Bulgaria: Lalyu Ganchev, First Deputy Minister of the Food Industry;

The Government of the Federal People's Republic of Yugoslavia: Nikola Džuverović, member of the Executive Council of the People's Republic of Serbia;

The Government of the Union of Soviet Socialist Republics: Aleksandr Akimovich Ishkov, Minister of the USSR;

who, having exchanged their full powers, found in good and due form, have agreed as follows:

Article 1

The Contracting Parties agree to regulate fishing in the waters of the Danube throughout its course within the territory of the Contracting Parties to the point of entry into the Black Sea, including the Danube Delta, in accordance with the provisions of this Convention.

[1] Came into force on 20 December 1958, the date of deposit of the last instrument of ratification with the Government of the Romanian People's Republic, in accordance with article 16. The instruments of ratification were deposited on the following dates:

Union of Soviet Socialist Republics	16 May 1958	Bulgaria	18 November 1958
Yugoslavia	21 October 1958	Romania	20 December 1958

Article 2

Each Contracting Party shall exercise the right of fishing in the Danube in its own waters bounded by the State frontier.

Article 3

This Convention shall apply to the waters of the Danube, including its mouth, to tributaries of the Danube up to the maximum extent of its flood waters, and to lakes, estuaries and pools permanently or temporarily connected with the Danube, in the Danube flood-basin in the territory of the Contracting Parties, including the area adjoining the mouth.

Article 4

The Contracting Parties agree to put into effect and apply on their own sections of the Danube and on the waters referred to in article 3, simultaneously with the entry into force of this Convention, the Regulations for Fishing in the River Danube which are annexed[1] to and form an integral part of this Convention.

Article 5

The Contracting Parties agree to carry out in the river Danube and in the waters referred to in article 3 improvement works and piscicultural operations to ameliorate the natural conditions for the breeding, growth and normal increase in stocks of fish of economic importance.

In the event of the erection on the Danube of water engineering works, in particular dams, which may change the hydrological and hydrobiological regime of the river, those Contracting Parties which construct and use the said works shall prepare in advance and apply jointly a plan of action to safeguard the normal migratory movements of fish.

The Contracting Parties shall at the same time carry out such piscicultural operations as will safeguard the normal breeding and development of economically valuable species of fish, in the sections of the river situated above and below the said works, under the new environmental conditions created by the erection of those works.

The question of payment of the costs of construction and use of piscicultural and water improvement works on the Danube shall be resolved in each individual case by agreement between the States concerned.

Article 6

In order to increase the stocks of economically valuable species of fish in the waters referred to in this Convention, stations for the artificial breeding of such species of fish, in particular the *acipenseridae*, shall be established as necessary.

[1] See p. 68 of this volume.

Article 7

The Contracting Parties shall work out and apply measures to prevent the contamination and pollution of the river Danube and of the waters referred to in article 3 by unclarified sewage and other waste from industrial and municipal undertakings which are harmful to fish and other aquatic organisms, and measures to regulate blasting operations.

Article 8

In the interests of rational fishing and in order to ensure the normal breeding and conservation of economically valuable species of fish, the Contracting Parties shall communicate to one another, in good time, information on the catches and migratory movements of fish in all waters to which this Convention applies.

Article 9

In order to strengthen scientific and technical collaboration in matters of fishery economy, fish breeding and hydrobiology in the Danube basin, the Contracting Parties shall co-operate with one another under the appropriate scientific and technical agreements.

Article 10

For purposes of scientific research the Contracting Parties may conduct joint experimental fishing operations in the Danube waters of any of the States Parties to this Convention, on the basis of recommendations by the Mixed Commission and by agreement between the countries concerned in each particular case.

Article 11

With a view to working out and co-ordinating measures for the application of this Convention, a Mixed Commission shall be established. Each Contracting Party shall appoint two representatives to the said Commission within three months after the entry into force of this Convention. The Governments of the Contracting Parties shall communicate to one another through the diplomatic channel the names of their representatives on the Commission.

The Mixed Commission shall meet at least once a year in the territory of each of the Contracting Parties in turn.

The Mixed Commission shall function under a statute which shall be drafted by the Commission at its first meeting after the entry into force of this Convention and approved by the Governments of the Contracting Parties.

The place and date of meeting of the Mixed Commission shall be fixed by the Commission in advance.

Article 12

It shall be the duty of the Mixed Commission :

(1) To work out agreed measures, arising out of this Convention, for the regulation of fishing and the augmentation of the stocks of fish in the river Danube;

(2) To present proposals to the Contracting Parties with a view to amending or supplementing the Regulations for Fishing in the River Danube and to take decisions on questions which it is authorized under the said Fishing Regulations to resolve;

(3) To organize the exchange of information among the Contracting Parties concerning the implementation of this Convention;

(4) To co-ordinate the planning of scientific research projects on the study of fishing in the Danube to be conducted jointly or severally by the competent agencies of the Contracting Parties;

(5) To determine the nature and scope of the statistical and other data which each Contracting Party shall furnish to the Mixed Commission for the purpose of implementing this Convention;

(6) To deal with such other matters as the Contracting Parties may refer to it.

Article 13

The Mixed Commission may make recommendations to the Contracting Parties on the matters within its competence.

The recommendations of the Mixed Commission and its decisions on the matters mentioned in article 12 above shall be deemed adopted by the Commission if they receive the favourable votes of the representatives of all the countries members thereof.

Article 14

In order that the measures to regulate fishing and operations for breeding and increasing the stocks of economically valuable species of fish may be extended to other parts of the Danube, this Convention shall be open for accession by other Danubian States.

Article 15

This Convention shall not impede the conclusion of bilateral agreements on matters relating to fishing in the Danube between any two Contracting Parties or between a Contracting Party and any other Danubian State, provided that such agreements do not conflict with the interests of the conservation of stocks of fish or with the Fishing Regulations laid down by this Convention.

Article 16

This Convention shall be ratified and shall enter into force on the date of deposit of the last instrument of ratification with the Government of the Romanian People's Republic, in whose archives the original of the Convention shall be kept.

The Government of the Romanian People's Republic shall notify the Governments of all the Contracting Parties of the date of deposit of the last instrument of ratification.

Article 17

This Convention is concluded for a term of five years.

For those Contracting Parties which do not give notice of termination of this Convention to the Government of the Romanian People's Republic not later than six months before the expiry of this term, it shall remain in force for a further period of five years.

Article 18

The Government of the Romanian People's Republic shall take the necessary action to register this Convention with the Secretariat of the United Nations.

Certified true copies of this Convention shall be transmitted by the Government of the Romanian People's Republic to all the other Parties to the Convention.

DONE at Bucharest, on 29 January 1958, in one copy in the Romanian, Bulgarian, Serbo-Croat and Russian languages, all texts being equally authentic.

For the Government of the Romanian People's Republic:	For the Government of the People's Republic of Bulgaria:	For the Government of the Federal People's Republic of Yugoslavia:	For the Government of the Union of Soviet Socialist Republics:
C. TEODORU	Lalyu GANCHEV	Nikola DŽUVEROVIĆ	A. A. ISHKOV

ANNEX

REGULATIONS FOR FISHING IN THE RIVER DANUBE AND IN THE WATERS REFERRED TO IN ARTICLE 3 OF THE CONVENTION

PART I

PROHIBITED PLACES AND TIMES FOR FISHING

Article 1

Fishing in the waters of the river Danube shall be prohibited each year for a period of thirty days between 15 April and 15 June, according to hydrometeorological conditions.

In 1958 the close period shall be from 15 April to 15 May. Thereafter the dates of the close period shall be determined by the Mixed Commission.

The Contracting Parties may by common agreement stagger the close period by sectors of the Danube, provided that such period is of thirty days' duration and falls between 15 April and 15 June.

The close period for the taking of *acipenseridae* and herring shall be as prescribed in article 2 below.

Article 2

For the *acipenseridae* the close period, sector by sector, shall be as follows:

— In the sector from the Black Sea to the mouth of the Prut: 15 March to 15 April;

— In the sector from the mouth of the Prut to the mouth of the Timok: 15 April to 15 May;

— In the sector from the mouth of the Timok up to Kladovo: 15 May to 15 June.

For the taking of Danube herring the close period, sector by sector, shall be as follows:

— In the sector from the Black Sea to Ceatalul Ismail: five consecutive days in the period between 15 March and 1 May;

— In the sector from Ceatalul Ismail to Vadul Oii: twenty consecutive days in the period between 1 April and 15 May;

— In the sector from Vadul Oii to the mouth of the Timok: thirty consecutive days in the period between 15 April and 1 July.

The date of each close period shall be recommended by the Fishery Research Institute of the Romanian People's Republic and shall be communicated to the Parties not later than ten days before the start of the close period.

Article 3

In order to safeguard the passage of Danube herring and *acipenseridae* in breeding condition into the Danube and the escape of the young of these species to the sea, fishing shall be prohibited throughout the year in the waters adjoining the mouth, in corridors extending laterally one kilometre on either side of the axis of each branch of the river and a distance of five kilometres out to sea.

Annex No. 12

(Without appendices)

Commission of the European Communities, Czech and Slovak Federal Republic Republic, of Hungary:

Working Group of Independent Experts on Variant "C" of the Gabčíkovo-Nagymaros Project

Working Group report of 23 November 1992

COMMISSION OF THE EUROPEAN COMMUNITIES
CZECH AND SLOVAK FEDERATIVE REPUBLIC
REPUBLIC OF HUNGARY

WORKING GROUP OF INDEPENDENT EXPERTS ON VARIANT C OF THE GABCIKOVO-NAGYMAROS PROJECT

WORKING GROUP REPORT

Budapest
November 23, 1992

EXECUTIVE SUMMARY

As a follow-up to the London Meeting on October 28 between the European Commission (CEC), the Czech and Slovak Federative Republic (CSFR) and Hungary on Variant C of the Gabcikovo-Nagymaros project a Working Group of six independent experts was established. The Working Group consisted of four experts (from Denmark, The Netherlands, Germany and Austria) nominated by CEC, one expert from CSFR and one expert from Hungary. The group carried out its work during the period November 9 - 23, 1992, the first week in Bratislava and the second week in Budapest.

Comprehensive construction activities have been carried out on the Variant C structures until November 21, 1992. On November 22 the ongoing work was:

* removal of a submerged barge in front of the by-pass weir, and

* fortification of the spillway of the by-pass weir

which according to the Working Group are considered as necessary. In addition work was going on for:

* preparing the downstream channel and spillway of the floodplain weir.

In accordance with recommendations of the Working Group it was decided to stop this activity.

The status of the construction work as on today can be summarized as follows:

* The Variant C structures are now completed so that they can resist a design winter flood (6000 m^3/s) with some damage.

* Some work will still be required in order to enable the structures to resist a design summer flood (10600 m^3/s).

* The structures are at the moment only able to pass about 300 m^3/s to the Danube on continuous basis. Further work scheduled to about six week are required before it will be technically possible to redirect the main part (95% in average) of the discharge to Danube.

* There are at present serious technical problems with the river bottom protection at the spillway just downstream the by-pass weir. The Working Group is of the opinion, that the time schedule for this work is very uncertain. However, after about six weeks further work, it will be possible to pass more than 4000 m3/s through the floodplain weir on a continous basis.

The **hydrological and ecological** regime in the area is subject to a **long term trend** of river bed erosion, decreasing water levels and associated ecological changes. This is caused by a variety of reasons, above all the large river regulation works, which implied deliberate and natural cutting off and bundling of river branches into one main, straighened and heavily fortified channel for navigation. In spite of this basically negative trend the floodplain area with its alluvial forests and the associated ecosystems still represents a very unique landscape of outstanding importance.

The closure of the Danube and the subsequent separation of the flow into two parts resulting in smaller discharge in the Danube has had significant **immediate, negative environmental impacts** with regard to river water levels, ground water tables, and floodplain ecology. The major part of this damage can be restored if the main part of the discharge is restored before the beginning of the growing season.

In theory, all the **structures** of Variant C could be **removed**. However, in practise this will cause some environmental problems. The cost of removing the structures are roughly estimated to at least 30 % of the construction costs. None of the scenarios (including D) proposes this.

Five possible scenarios are described in the report. On the basis of different sets of objectives the technical and water management aspects, environmental impacts, impacts on navigation etc. have been described. The five scenarios are:

A: **95% of average discharge to the Danube downstream the dam**

This scenario maintains the present (pre-dam) conditions with regard to floodplain ecology and ground water conditions to the maximum possible extent.

Scenario A will be technically possible from January

1, 1993.

B: **Main part of water to Gabcikovo**

This scenario maximizes hydropower generation, given a constraint of a minimum discharge to the Danube and the Mosoni Danube.

This scenario is possible with the existing structures.

C: **Management of Variant C as planned by the Slovak Commission for Environment**

The objectives to be achieved in this scenario are to optimize the relation between hydropower generation and discharge to the Danube. Approximately a 50 % : 50 % split between the power canal and the Danube.

It is expected that the first remedial measures can be completed by spring 1993.

D: **Danube redirected to the former river bed**

The objectives to be achieved in this scenario are to redirect the Danube into its former bed and to maintain surface and ground water quality as well as the environmental conditions prior to the closure of the Danube.

The measures required to redirect the Danube to the old river bed can be implemented within 12 months.

E: **Step by step solution**

The objectives to be achieved in this scenario are to maintain the water levels as well as the dynamics of both the surface water and the groundwater regimes downstream the dam according to the conditions prior to the closure of the Danube, to maintain the ground water quality and to maintain almost the same water quality in the reservoir as it was previously in the Danube. For the long term solution studies and monitoring are foreseen.

Phase 1 of this scenario can be implemented in July 1993.

The recommendations of the Working Group are as follows:

Four of the scenarios all assume the continuous existence of the hydraulic structures and the use of the artificial canal for navigation with damming in Slovakia. One of the five elaborated scenarios, scenario D, is based on the reversibility of the situation to a status equivalent to the status before closing the Danube, by removal of some of the Variant C hydraulic structures.

The choice between these two fundamentally different appoaches cannot be made by the Working Group, which just has pointed out the various consequences of adopting alternative objectives.

However, independently of the above choice, the Working Group has the recommendations described in the following in case Scenario D should not have been chosen.

In the past, the measures taken for the navigation constrained the possibilities for the development of the Danube and the floodplain area. Assuming the navigation will no longer use the main river over a length of 40 km a unique situation has arisen. Supported by technical measures the river and the floodplain can develop more naturally.

However, realizing that considerable uncertainties are associated to prediction of impacts of such major manipulations of natural ecosystems and that many of the impacts may easily become irreversible, the Working Group recommends a cautious and experimental approach, where new developments be taken in several steps on the basis of preceding and simultaneous comprehensive monitoring and studies.

On this basis the four EC members of the Working Group recommend:

(a) To base the water management for the coming months on Scenario A. This operation, which require competion of the by-pass weir and the inundation weir, should be started as soon as possible, but not later than January 1993.

(b) From April 1993 the water management should gradually shift towards the one described in Scenario E. In this context it will be necessary to construct some under-water weirs in the Danube main channel for experimental operation during the 1993 summer.

(c) A combination of studies, monitoring and mathematical modelling should be initiated immediately as support to the water management during the 1993 summer.

(d) A comprehensive programme of hzdrographic, hzdrological and ecological studies, monitoring and mathematical modelling should be carried out during the coming 2-3 years in order to obtain the necessary decision support base for a long term solution.

(e) A Joint Danube-Gabcikovo Committee comprised of representatives from Hungary, Slovakia and EC should be established. This committee should have the authority to carry out tasks with regard to control of the water management operation and formulation of management decisions.

The Hungarian and Czecho-Slovakian members of the Working Group have signed the main report (except the recommendations in Chapter 9) and have in addition prepared seperate statements, enclosed as Appendices L and M.

TABLE OF CONTENTS

1. INTRODUCTION

At a meeting held in London on 28th October, 1992 between the European Commission (CEC), the Czech and Slovak Federative Republic (CSFR) and the Republic of Hungary an agreement was reached regarding the Gabcikovo/Nagymaros Project, cf. Appendix A. In accordance with the Agreed Minutes from this meeting a Fact Finding Mission composed of one expert from each side (EC, CSFR and Hungary) submitted a report on October 31, 1992, /Ref 1/ and the present Working Group was formed.

The Terms of References for the Working Group are given in Appendix B. The Working Group has after consultation with Mr. Pablo Benevides, Director DGI, Commission of the European Communities made the following clarifications of the Scope of Work in the Terms of References:

* An assessment of the need for the CSFR to make the closure of the Danube after October 22 lies outside the Scope of Work. However, the issue is partly dealt with in Section 3.1 of the report.

* Assessment of earth quake risk and potential damage lies outside the Terms of References.

* The term "existing (pre-dam) conditions" refers to the situation before starting to operate Variant C (October 22, 1992) as far as point (iii) in the Scope of Work is concerned, whereas it refers to the situation before construction of the Gabcikovo works as far as point (iv) in the Scope of Work is concerned.

The Working Group is composed of the following six experts:

CEC:

Mr. Jens Christian Refsgaard, Chief Hydrologist, Danish Hydraulic Institute, Denmark (Team Leader).

Mr. Jan M. Van Geest, Director, DHV Environment and Infrastructure, The Netherlands.

Mr. Johann Schreiner, Director, Norddeutsche Naturschutzakademie, Germany.

Professor, Dr. Heinz Löffler, Head of Zoological Department, University of Vienna, Austria.

* CSFR: Professor, Dr. Igor Mucha, Faculty of Natural Science, Comenius University, Bratislava.

* Hungary Professor, Dr. Gabor Vida, Head of Department of Genetics, Eötvös L. University, Budapest.

Professor Löffler joined the group on November 15, while the other five members were present throughout the period. The six experts were assisted by colleagues as listed in Appendix C. The Working Group had its first formal meeting on November 9, 1992 in Bratislava. Field inspections were carried out on November 9, 10 and 22 both in Czecho-Slovakia and in Hungary. During the period November 9 - 14 the Working Group worked in Bratislava and during the period November 15 - 23 in Budapest.

The Working Group has obtained all relevant data and information requested from the two Governments. The report is based on this information.

2. VARIANT C STRUCTURES AND STATUS OF ONGOING WORK

The Fact Finding Mission (FFM), cf Ref. /1/, carried out an on-site inspection of the ongoing work on

(a) October 30, 1992

The Working Group (WG) visited the site of the construction twice, namely on

(b) November 9, 1992

(c) November 22, 1992, i.e. one day after the deadline decided by the EC for stopping the construction.

In addition, data has been obtained from reports, designers, constructors and from meetings with the person in charge of the construction work (Mr. J. Binder). A statement from Mr. Binder on the status of work as per November 21, 1992 is enclosed as Appendix D. The status of the work including the facts observed on the three visits are summarised in this chapter.

In both countries the original structures for the Gabcikovo scheme are completed except for the closure of the Danube river at Dunakiliti and the

(1) Completion of the hydropower station (installation and testing of turbines) at Gabcikovo.

Variant C consists of a complex of structures, located in Czecho-Slovakia within the area of the original Variant A. The construction of these are planned for two phases. The structures include (see the sketch in Appendix E):

(2) By-pass weir controlling the flow into the river Danube.
(3) Dam closing the Danubian river bed.
(4) Floodplain weir (weir in the inundation).
(5) Intake structure for the Mosoni Danube.
(6) Intake structure in the power canal.
(7) Earth barrages/dikes connecting structures

(8) Ship lock for smaller ships (15 m x 80 m).
(9) Spillway weir.
(10) Hydropower station.

The construction of the structures 1 - 7 are included in Phase 1, while the remaining 8 - 10 are a part of Phase 2 scheduled for construction 1993-95.

The status of the work was as follows:

(1) Hydropower station (HEP) and ship locks at Gabcikovo

The HEP is designed for peak power production. The planned 8 turbines have a nominal capacity of 4,000 m^3/s. At present five turbines and generators are being installed, the remaining three turbines are not planned for completion in the near future. By high head the maximun capacity is approximately 610 m^3/s per turbine. At the designed operational water level of 131.1 m asl. (reference Baltic msl) the design head is approximately 22 m.

All turbines need a period, depending of the discharge in the channel, for operational testing, because the whole equipment is a prototype.

The two ship locks (each 34 m wide and 275 m long) has a total hydraulic capacity of 1970 m^3/s when open. With five turbines operationally installed the total combined hydraulic capacity of the turbines and locks are thus:

$$5 \times 610\ m^3/s + 1970\ m^3/s \Rightarrow 5020\ m^3/s.$$

If more turbines are installed the capacity of the canal of approximately 5200 m^3/s will be the flood discharge limited by the velocity in the power canal.

(a) FFM visit on October 30:

- Turbine no 7 was being tested at half capacity producing 40 MW power with a discharge around 200 m^3/s. Turbine no 8 had been tested hydraulically but not yet electrically. The remaining three turbines were undergoing a hydraulic testing programme. The testing programme allows for discharges to be between 80 and 120 m^3/s.

(b) WG visit on November 9:

- The head varied between 14.9 and 17.6 m, and the upstream water level varied between 127.17 m and 128.14 m.

- One of the ship locks were opened for traffic while the other one was being repaired after having been damaged by some debris.

The status on November 12, according to information from Mr. J. Binder, director Water Economy Construction, was that turbines No. 4 & 7 were being electrically tested at about 2/3 capacity (61 MW each). Turbine No. 8 was undergoing hydraulic testing at a discharge of 80 m^3/s. Turbines No. 6 & 5 are scheduled to be ready for electrical testing by the end of November and hydraulically tested by the end of December 1992.

(c) WG visit on November 22:

- One of the shiplocks was operating while the other one was being tested after a period of repair. Two of the turbines were operated with a discharge of 500 and 100 m^3/s respectively. Bottom protection downstream of the power plant was being carried out. The water levels varied between 127.98 and 128.37 m asl. upstream and 113.08 and 112.28 m asl. downstream of the power plant from 7 to 13 hours.

- Although it is not a part of Variant C but has an effect on its operation it is mentioned that at the outlet of the downstream canal (at 1811 rkm on the Danube) the closing dam was being removed. About 2/3 of it had been removed and according to the judgement of the Working Group it may take about two months more to remove the dam completely.

<u>(2) Closure of the Danube</u>

The closure of the Danube river bed started on October 23 and was completed on October 27. One week earlier the discharge was at a low of about 850 m^3/s, while it increased from 1400 to 1860 m^3/s during the period of closure.

(a) FFM visit on October 30:

- The crest level of the dam was approximately 131 m asl. The dam was not yet fully tightened leaking water approx 150 m^3/s. The water level in the reservoir varied between 128.8 and 129.0 m asl.

(b) WG visit on November 9:

- The crest level of the closure had been raised to 133,8 m asl. The width of the crest was about 40 m. There was very little leakage through the closure. The structure was being prepared for tightening and leakage control by a vertical impermeable wall and stony wave protection.

- The water level in the reservoir was between 128.65 and 128.80 m asl.

(c) WG visit on November 22:

- There was about 5-10 m^3/s leakage through the right third of the closure. It is much more than the leakage seen on November 9. On the left-downstream side of the closure an about 30-40 m wide gravel dam was built - to prevent leakage - which covered 2/3 of the dam width.

According to information from Mr. J. Binder (November 12) the remaining work except the stony wave protection is scheduled to be completed by January 1, 1993, but will be delayed if freezing occurs before then.

(3) By-pass weir controlling the flow into the river Danube

The flow into the river Danube from the reservoir is lead via this weir.

The weir consists of four tainter gates each 18 m wide with sill level at 126.5 m asl. The maximum hydraulic capacity of the weir at the reservoir water level 131.0 m asl. is 1460 m^3/s, whereas the capacity is approximately 650 m^3/s at a water level of 129.0 m asl.

Due to unexpectedly difficult geological conditions large erosion problems have been experienced at the bottom and river sides downstream the weir. Therefore, additional fortification is being carried out, and the full operation of the weir with maximum possible discharges have been delayed.

(a) FFM visit on October 30:

- To repair the bottom protection and river sides the weir was closed totally on Oct. 29 - 30.

(b) WG visit on November 9:

- Fortification of the downstream bed protection was carried out while discharging about 300 m^3/s into the Danube.

According to information from Mr. J. Binder (November 12) the protection works are gradually progressing, so that the structure is expected to enable a flow of about 600 m^3/s under daily circumstances on November 21 and about 800 m^3/s on November 25, 1992 (if work continues). The work is scheduled to be completed by January 1, 1993, so that a maximum discharge of 1460 m3/s, depending on the reservoir water level, can pass.

(c) WG visit on November 22:

- A barge of about 50 m length sank in front of the by-pass weir closing two and a half of the openings. The water was spilling over the barge providing some water for the two fully blocked openings while in the third opening the water was both spilling over the barge and running besides it. The fourth gate - which was not blocked by the barge - was completely closed.

- Protection work was going on - similarly to the situation experienced during the previous visits - on the spillway of the by-pass weir. According to Mr. Binder the works would be finished within the next two days.

The four tainter gates are expected to be fully operational by the end of December 1992, but can until then be operated by temporary measures.

(4) Flood plain weir (weir in the inundation)

The weir consists of 20 tainter gates each 24 m wide with sill level at 128.0 m asl. When finalized each of the gates has a hydraulic capacity of 230 m^3/s (total capacity if the weir is 4600 m^3/s) at the maximum water level of 131.1 m asl. The capacity at a water level of 129.0 m asl is estimated to be 60 m^3/s per gate.

In front of the gates a temporary non-fortified protective dike has been established. When the dike is eroded or removed in case of high water level, the weir has a discharge capacity ranging from 2500 to 4000 m^3/s corresponding to a water level of 131.1 m asl, depending on the actual ground level downstream the weir.

The floodplain weir and the bottom protection were originally designed for use only in flood situations (few days per year). This design has been modified as a result of the London Meeting to allow daily use. Along the Danube right bank a spillway is under construction and the downstream bed will be protected with additional 100,000 m^3 stone. This work is scheduled to be completed by January 1, 1993.

(a) FFM visit on October 30:

- None of the gates could be operated and only four gates had the full hydraulic capacity. Due to the level of the terrain downstream the weir, 16 gates had a reduced capacity. A small part of the concrete works were not yet finished.

(b) WG visit on November 9:

- 10 gates were being prepared for opening. Upstream bed protection was completed; downstream bed protection was not yet completed and the tail water channel was being dug out and protected.

- The crest level of the temporary dike in front of the gates was at 130.5 m asl.

According to information from Mr. J. Binder (November 12) the tail water channel would be ready by January 1, 1993, whereupon all the 20 gates can be opened for daily use. According to schedule the entire temporary dike will be abolished by January 15, 1993.

(c) WG visit on November 22:

- 15 of the tainter gates were mounted, but the concrete work was not done. Five of the tainter gates were lying behind the openings on the ground.

- 10 of the openings had an about 10 m wide bed protection on the downstream side. It was to be elongated to have 50 m width. The rest of the gates had no tail-water protection.

- The road on top of the structure was ready, covered with asphalt.

- The protective earth dam upstream the structure was widened and heightened to about 131 m asl.

<u>(5)</u> <u>Intake structure at entrance to the Mosoni Danube</u>

In the intake structure for the Mosoni Danube a small hydropower station with two turbines has been constructed with a bypass capacity of 25 m^3/s corresponding to a water level of 131.1 m asl and 20 m^3/s at 129 m asl. The concrete works at the construction are not completed but a by-pass consisting of two pipes is used operationally. Installation of the turbines will not be completed for a longer period. A supply canal on Slovak territory is connected to the Mosoni Danube on Hungarian territory.

Discharge to the Mosoni Danube started on October 30, 1992 with about 10 m^3/s. After lining of the supply canal (scheduled for completion by November 1) the discharge can be increased to 20 m^3/s. The entire structure, except the power station, is scheduled for completion by March 1993.

(6) Intake structure in power canal.

The intake structure located in the power canal allowing for a maximum discharge of 234 m^3/s to be supplied to a river arm in the left bank of the floodplain downstream the Dunakiliti weir close to Dobrohost is completed. Sill level of the structure is at 128.5 m asl.

A channel connecting the structure and the downstream river arm on the Slovak side was being dug (November 9). As a temporary measure two pipes of 1.2 m diameter were used to provide about 7 m^3/s discharge.

The entire work is scheduled to be completed by April 1, 1993.

(7) Earth dams/dikes connecting structures

The connecting dike between the downstream part of the reservoir and the left hand side of the Danube is currently not fully fortified.

(b) WG visit on November 9:

- There remains still 10 % of the dike to be strengthened to withstand waves. The connecting dams between the weirs are not yet finished and need to be fortified several places. Completion of the work on the dams and dike is planned to be finished by mid of November.

(c) WG visit on November 22:

- The wave protection of the left bank dike had been completed except at two places, where a few tens of meter protection was missing.

The road on top of the dams will be completed by January 1, 1993.

The wave protection of the protective dike upstream of the future structures (No. 8,9 and 10) and the earth barrages on the left and right hand side of the intake structure for the Mosoni Danube are not planned to be protected against wave actions as yet.

The wawe protection of the future structures No 8, 9 and 10 had been raised to about 130 m asl. (November 22).

<u>(8)</u> <u>Ship lock</u>
<u>(9)</u> <u>Spillway weir</u>
<u>(10)</u> <u>Hydropower station (HPS)</u>

Between the by-pass weir and the floodplain weir a temporary dike has been established and fortified with geo-textiles and rock boulders up to the level 130.0 m asl. Fortification up to 131.1 m asl. is scheduled to be completed by December 15, 1992. The crest level of the dike is at 133.8 m asl.

From the Mosoni intake structure to the Danubian dam closure the front is protected against seepage with a 30 m deep sheet piling.

These works are a part of Phase two and are projected to be ready for use ultimo 1995. At maximum water level the hydraulic capacity of the ship lock and spillway weir will be 5000 m^3/s and the capacity of the HPS is 1300 m^3/s. The sill level of the spillway weir is at 120.5 m asl., which is the same as in the existing river bed.

3. ASSESSMENT OF THE NEED AND URGENCY OF THE STRUCTURES IN FLOOD SITUATIONS AND WATER MANAGEMENT POSSIBILITIES IN DAILY OPERATION

In this chapter an assessment is made of the need and urgency of the structures in the light of the potential flooding risk, including the risk of causing damage to already constructed parts. Furthermore, the water management possibilities in daily operation of the structures are described.

3.1 Flood discharge capacities of structures

The design flood discharge for the project variant C (including phase 1 and 2) is based on a 10000 year flood event, i.e. a risk of 0.01% to occur within a year.

For the construction period usually a larger risk than 0.01% is accepted. Assuming a 1% risk per year as acceptable during the construction period (100 year flood event) the corresponding design flood discharge depending on the period of the year is:

- Full year : 10600 m^3/s
- Summer season (March - October) : 10600 m^3/s
- Winter season (October - March) : 6000 m^3/s

Hence, the flooding risk of stopping the work depends on the period during which the work will be stopped. For example stopping the works for some period during the winter season requires one (lower) level of finalization of the present structures before it is possible to stop the work, while stopping the work for more than a year (e.g. while international arbitration and further studies take place) requires another (higher) level of finalization.

The flood discharge capacities of the Variant C structures and the Gabcikovo complex are summarized in the table in Appendix F for different stages with regard to degree of finalization of the structures and water level in the reservoir. The key figures are as follows:

Date	Flood discharge capacity (m^3/s)
1991	10500
20-10-92	7000

30-10-92	2800
22-11-92	7900 - 9400
01-01-93	11500
31-12-95	19400

From a comparison of the above table and the design flood discharges of 6000 and 10600 m^3/s for winter and summer seasons, respectively, it appears that the situation by January 1, 1993 is expected to be equivalent to the pre-dam (1991) situation. However, it is also noticed that the flood discharge capacity on October 20, 1992 was insufficient to pass a summer design flood. If a flood larger than the discharge capacity should occur, it will cause damage to structures and may in addition cause a threat to areas outside the main existing dikes due to backwater effects from the structures.

In the period until January 1993 the water level in the reservoir is planned to be operated between 128 and 130 m asl, allowing for navigation. In case of a flood in this period the water level could rise up to the water level 131.1 m asl. After this period the water level is planned to be operated close to the desired 131.1 m asl.

In a possible flood situation some of the not yet finished structures might be damaged depending of the peak and duration of the flood.

Should a flood occur now before the remaining 10 % of the dike between the downstream part of the reservoir and the left hand side of the Danube is protected against waves the dike could be damaged from erosion. The unprotected dams at Cunovo connecting the structures could likewise be damaged due to erosion. Protection of the floodplain behind the floodplain weir is not yet carried out and during a flood it will erode. The stability of the weir will however not be in immediate danger. Parts of the side-protection of the by-pass weir could suffer as well, this construction is however being fortified at the moment so this risk is only eminent for a few days from this date.

The protection of the floodplain behind the floodplain weir was being carried out during the second field visit (November 9) and it is scheduled for completion by January 1, 1993.

After completion of the dike and the by-pass weir the winter 100 years flood can pass the structures.

When the dike, by-pass weir and floodplain weir is finished (end of 1992) the hydraulic capacity of variant C equals $Q_{1\%, year}$. To meet the design criterion $Q_{0.01\%, year}$ Phase 2 has to be completed.

As concerning the flooding risk in general it is not likely that a flood occurring after January 1, 1993 would give rise to an extraordinary flooding hazard in areas outside the main existing dikes.

Although not directly related to the works of Variant C the most flood endangered reach of the Danube in the area of interest is the left hand side between Palkovicovo (milage km 1811) and Medvedov (milage km 1806) due to extensive siltation and lack of dredging.

3.2 Water management possibilities

The Gabcikovo complex can regulate the discharge between 80 m^3/s (necessary for shiplocks) and 5200 m^3/s (maximum admissible discharge in the power channel).

Upon completion the weirs of the Phase 1 of Variant C (Mosoni Danube weir, floodplain weir, and by-pass weir) can regulate a discharge between 0 and 6100 m^3/s depending on the water level in the reservoir as follows:

Water table in reservoir (m asl.)	Maximum discharge capacity (m^3/s)
128.0	300
129.0	1450
130.0	3400
131.1	6100

The intake structure in the power channel can regulate a discharge between 0 and 234 m^3/s at a water level of 131.1 m asl. (from April 1993).

4. REVERSIBILITY OF ONGOING ACTIVITIES AND COSTS OF RESTORING PRE-DAM STATUS QUO

In principle, the ongoing activities with Variant C could be reversed. The structures, excluding some of the underground parts like sheet piling and injections, could in theory be removed. The cost of removing the structures are roughly estimated to at least 30 % of the construction costs. There will be some negative environmental effects during the demolition of the structures and the deposition of the waste materials.

It is therefore relevant to evaluate under which circumstances the Variant C structures could have only insignificant and very local hydraulic effects if they are not fully removed. Such "functional reversibility" is possible for a scenario like:

* If the Dunakiliti weir on Hungarian territory are being operated according to the original plans the gates in the Variant C structures can be kept fully open and will not have any significant effect.

* If the Danube closure is removed and the "whole" discharge is routed back to the Danube.

The technical possibilities to remove the Danube closure or to give the Danube a new by-pass weir are described in Section 8.4

5. OUTLINE OF STATE AND PRESENT TRENDS IN THE AREA

In general, large monitoring programmes are carried out and large data bases exist for both the Slovakian and Hungarian areas with regard to most of the key parameters. An overview map showing some of the key locations referred to in this chapter is provided in Appendix E-1.

5.1 River and discharge regime

The river regime and the local climate determine water levels and therefore inundation, groundwater and soil moisture regimes (together with the geology). The river regime also determines flow velocity and hence sediment regime and the dynamics of substrate and river channel morphology.

Before the 18th century the Danube split downstream of Bratislava into two almost identical arms. Near Bratislava it was partly a braided river with many small islands as a result of progressive sedimentation where the Danube entered into the plain. Both arms were however meandering river systems and the Small Danube still is.

Large changes occurred in the 19th century, when the first regulation works started. Within several decades of instability and retrogressive erosion of other meanders, the system changed into a braided river. Some of the older meanders are still present in the landscape.

Before the multiple impoundments in the upper Danube catchment areas and the embankment and endikement in Austria, Slovakia and Hungary the Danube was still a free-flowing braided river with a wide floodplain that extended far beyond the present dikes. The floodplain absorbed much of the peak floods, which consequently were slowly rising and long-lasting in most years. Also flow velocities may have been lower than today.

With the past endikements, especially during the last century, flood peaks became steeper and higher, flooding more frequent but in general with a shorter duration. The original zonation in vegetation towards higher grounds and associated forests was largely 'diked' out of the system. Most of the higher, no longer flooded soils, were converted into agricultural lands. Although some remnants of these woods are still existing, especially on the Hungarian side the lands in between the dikes were consequently flooded more often and the river arms flushed and scoured, more intensively.

These river regulation works let to deliberate and natural cutting off and bundling of river branches into one main, straightened and heavily fortified channel for navigation. This remaining channel is characterized by rapid water level fluctuations and very large stream velocities (1.3 - 2.3 m/s at medium and 0.8 - 1.8 m/s at low flow situations). The cut off branches are only activated at higher discharges.

Within the river branches many small weirs and dams were built, so most of them behave like cascade systems at low discharge. Some of them are continuously overflowing, while others may have dry and stagnant sections depending upon groundwater seepage and infiltration.

Key figures illustrating the discharge regime of the Danube are given in the table below based on the 1901-50 discharge time series at Bratislava, ref /11/:

Discharge characteristic	Discharge value (m^3/s)
Average	2025
Month with min. average flow Month with max. average flow	1441 (December) 2785 (Juni)
Typical low flow (average of annual minimums)	848
Typical high flow (average of annual maximums)	5316

The discharge regime at Bratislava is characterized by the duration curve shown in Appendix G-2. The relation between discharge and water level in the floodplain is shown for the site Dunaremete in Appendix G-3. Some key figures of importance for the floodplain are shown in the following table:

Characteristic flow situation	Discharge 1980-conditions (m^3/s)	Water level at Dunaremete (m)	Flow velocity in main channel at Dunaremete (m/s)	Average duration (days/year)	Frequency (events/year)
Flow largely confined to area within groynes in main channel	< 1000	2.3	1000 m^3/s => 1.4 m/s	< 1000 m^3/s: 33 days	Several times per year
Flow in main channel and permanent branches	< 1500	3.7	1500 m^3/s => 1.5 m/s	1000 - 1500 m^3/s: 42 days	Several times per year

Flow in a few river arms	1800 - 2500	3.7 - 4.5	1.8 - 2.0 m/s	1800 - 2500 m^3/s: 122 days	Several times per year
Flow in some river arms	2500 - 3500	4.5 - 5.2	2.0 - 2.2 m/s	2500 - 3500 m^3/s: 78 days	Several times per year
Flow in almost all river arms	3500 - 4500	5.2 - 5.6	2.2 - 2.3 m/s	3500 - 4500 m^3/s: 17 days	Several times per year
Complete inundation of floodplain	> 4500	5.6	4500 m^3/s => 2.3 m/s	> 4500 m3/s: 4 days	Once per year
Deep inundation of floodplain	6000	6.2	6000 m^3/s => 2.4 m/s	> 6000 m^3/s: < 1 day	Once per 3-4 years

A factor of particular importance for both the floodplain ecology and the groundwater regime is the river dynamics, which can be characterized by some key parameters given in the following two tables:

Parameter characterizing water level fluctuations	Water level variation calculated for Dunaremete 1980-89
Range of variation within the 10 years	1.9 - 6.6 m
Annual sum of water level fluctuations based on daily measurements	50 m
Annual sum of water level fluctuations based on 5-daily measurements	23 m
Annual sum of water level fluctuations based on 10-daily measurements	14 m

Water table fluctuation within a day at Dunaremete	Average number of days per year
0 - 10 cm	172
10 - 20 cm	119
20 - 30 cm	41
30 - 40 cm	14
40 - 50 cm	8
50 - 60 cm	3
60 - 70 cm	2
> 70 cm	6

The Mosoni Danube is presently not receiving water from the main Danube for 2-3 months per year.

5.2 Erosion and sedimentation in river system

The main channel has been significantly lowered due to erosion caused by a combination of several factors:

- dam construction in Austria in the last decades resulting in a sediment deficit;
- excavation of gravel downstream of Bratislava;
- natural erosion due to the very high velocities in the straightened and narrowed navigation channel; and
- prevention of bank erosion due to fortification of river banks.

Today, erosion takes place between Bratislava and Sap/Palkovicovo, downstream from where the eroded material sediments (and has to be dredged).

In some places the river bed has been lowered more than two meters, leading to lower groundwater levels, occasional drying out of river branches (e.g. downstream of Bratislava) and less flushing of most river branches. The lowering of the riverbed during the past 30 years has been particularly large between Bratislava and Rajka. It is estimated to be about 0.8 meter at Gabcikovo and near Bratislava about 1.5 meter.

According to Hungarian measurements the quantity and concentrations of suspended load on the Danube reach between Rajka and Medve show a decreasing trend, see the figure in Appendix G-4.

5.3 Surface water quality

The Danube water quality can according to Hungarian classification be categorized as 1st class regarding the majority of the components, as 2nd class regarding pH, orthophosphate, nitrite, BOD and 3rd class with regard to bacteria and some heavily degradable substances such as e.g. hydrocarbons.

The parameters for oxygen content and organic carbon shows a slightly improving trend, while deteriorating trends exist for nitrate and heavily degradable materials.

Due to high oxygen content, low organic carbon contents and the very small quantities of fine grained sediments the surface water quality is generally well suited for river bank infiltration, which is the major source of water supply along the Danube between Bratislava and Budapest.

The water quality of the side branches differs from that of the main Danube channel due to the much lower velocities and periods and places with stagnant water. In drier years a negative trend has been observed with high pH, high organic matter and low oxygen contents.

The major sources of water pollution are Morava and Bratislava.

5.4 Ground water regime

The ground water regime is to a large extent determined by the permeability of the main river channel and the variations in river water table. On the reach between Bratislava and Komarno an estimated 10 - 20 m^3/s infiltrates to gravel aquifers on the Slovakian side and 8 - 9 m^3/s between Rajka and Medve on the Hungarian side. This constitutes one of the largest ground water resources in Central Europe. Due to the very large permeabilities in the gravel aquifer the groundwater flow rates are very high (1 - 3 m/day).

The depth of the groundwater table is shown in Appendix G-5. It generally shows a depth of more than 5 meters close to Bratislava decreasing to around 1 m at Medve. The trend over the past 30 years has been a decrease in ground water tables ranging from about 2 meters around Bratislava to about zero at Komarno, see figure in Appendix G-6. This decrease is due to erosion of the river bed.

A very important feature of the ground water regime is the large ground water level fluctuations generated by the dynamics of the river water table. This is illustrated by the figures in Appendix G-7, where the influence of the river is evident for distances up to 10 km. Ground water level fluctuations are important as a mechanism for providing oxygen transfer through the soil horizons into the ground water.

5.5 Ground water quality

The ground water quality in the area dominated by the infiltration from the Danube is in general in a good state. Thus, the quality of the groundwater abstracted from the water works located close to the Danube is generally excellent.

For the areas farther away from the river, where the groundwater recharge partly originate from infiltration in agricultural and industrial areas, there are some problems with ground water pollution from point sources (e.g. from Slovnaft oil refinery starting in the 1960's, landfills and dumping sites) and from agrochemicals.

5.6 Fauna, flora and habitats in floodplain

The determining and sustaining factor of the biota of the floodplain between Bratislava and Palkovicovo is the natural and periodic water fluctuation of the Danube. The ongoing (pre-dam) trend with lowering of the Danube water level, changes in the character of the flood peaks, endikements, cutting off the side branches upstream and fortification of the main channel has stressed the biotic communities substantially during the last decades.

As a result of past groundwater decrease some areas of soft alluvial forests have been turned into hard alluvial forest. The latter were often cultivated with poplar and white willow. Furthermore, it is estimated that approximately 500 ha of the originally more than 2000 ha are not alluvial forest any longer. In addition, forestry has replaced many natural forests by plantations, where alien, introduced cultivars of poplar have been used.

The main characteristics of floodplain ecosystems is their mosaic structure and their dynamics depending on natural water fluctuation. Due to anthropogene effects this structure and dynamics was considerably disturbed and made the invasion of Solidago, Aster and Impatiens species possible.

Compared to other reaches of the Danube human impacts, including those mentioned above, have until now not been as large as elsewhere. Thus, quite original habitats with their typical fauna and flora could survive between and outside the dikes. Besides a huge variety of aquatic, semiaquatic and terrestrial associations the principal character of the landscape is given by the soft- and hardwood alluvial forests covering large parts of the land. The alluvial forests of the Szigetköz (2400 ha) are unique because of their peculiar species composition owing to its submontane features. Several hundreds of endangered and/or protected species here find suitable living conditions maintained by the high diversity of habitats.

As this type of alluvial forest almost completely disappeared from Europe, the significance of Szigetkoz from the point of view of conserving Europe's natural heritage is of outstanding importance.

5.7 Hydrological conditions for agriculture and forestry

The annual rainfall and evaporation amounts are of the same order of magnitude; however with significant different seasonal variations. Thus it is required with some additional water supply to the vegetation during the summer season. This extra water supply has traditionally been possible throughout the area by vertically upwards flow in the capillary zone from the groundwater table to the root zone. The necessary conditions for this are that the groundwater table is not too deep and that no (capillary breaking) gravel layer is located in between.

However, partly due to the decrease in groundwater tables during the past decades it has been necessary to make artificial irrigation for the agriculture. Thus, on the Slovakian side a comprehensive network of surface water channels has been developed for irrigation purposes. However, artificial irrigation has its disadvantages as compared to the natural situation, because the downwards water flux causes a considerable leakage of nitrates and pesticides.

The forestry conditions are also changing due to the gradually decrease in ground water tables. In some forest areas a transition from dominantly wet soft inundation forest to less wet hard inundation forest has occurred. This is especially the case in areas close to Bratislava. All these changes reflect anthropogene impacts.

In Szigetköz the flood plain poplar stands represent the highest productivity in Hungary (30-40 m^3/ha/year)

5.8 Navigation

According to the Danube Commission the following minimum parameters are required in areas, which are not influenced by backwater effects from weirs:

- width 180 m
- depth 2.5 m
- radius 1000 m

During the 1992 autumn low flow conditions the main navigation obstacles between Bratislava and Palkovocovo were:

* Five shallows with insufficient depth between Bratislava and the site of the Variant C structures

(Cunovo).

* Further four rough sections between Cunovo and Palkovicovo

The navigation conditions have been deteriorating in the area around Bratislava during the past years as illustrated in the following table:

Year (Source: Ceskoslovenska Plavba Dunajska)	Percentage of days with full navigation possibilities at Bratislava (water depth > 2.5 m)	Index ("100" corresponds to 1980 condition)
1980	64	100
1981	88	137
1982	73	112
1983	61	95
1984	51	79
1985	65	101
1986	54	85
1987	66	103
1988	62	96
1989	50	77
1990	46	72
1991	40	63

Between Dunakiliti and Asványráró six ports are situated. 35 - 40 ships are loaded or unloaded each year in these ports.

6. OBSERVED IMMEDIATE IMPACTS OF THE GABCIKOVO VARIANT C

Studying the impacts of Variant C is complicated by the fact that a distinguishing of its effects from those of the original project (Variant A) cannot be done clearly in all respects. The realization of Variant C took place in the area where the Variant A was planned and completed (with the exception of closing the Danube at Dunakiliti). Thus, the pre-dam (= pre-impact) conditions are characterized by already built dikes and already removed soils and vegetation. In addition to this, the construction of hydraulic structures of Variant C has been mostly completed.

6.1 River and discharge regime

After the closure of the Danube on October 25, 1992 the major part of the discharge has been diverted to Gabcikovo and only a minor part to the Danube downstream the closure. According to Slovakian project plans it was planned to put 600 m^3/s into Danube. However, due to technical problems at the construction site the Danube discharge has in periods been less than 300 m^3/s, which is about 20% of the average November discharge or 35% of the average of the annual minimum discharge. Discharge measurements carried out by Hungary downstream the closure are shown in Appendix H-1.

The reduced discharges have led to significant decreases in river water tables, typically by 2 - 3 meters as can be seen from the Hungarian measurements displayed in Appendix H-2. Most of the river arms had virtually no flows at the time just before the closure of the dam due to the low flow season. However, many of them are open at their downstream connection to the main river channel and had therefore (stagnant) water due to backwater effects from the main channel. In all cases the water levels of the river arms has been negatively affected.

The discharge in the Mosoni Danube has increased, see the hydrograph in Appendix H-3.

6.2 Erosion and sedimentation in river system

No specific observations have been made for investigation of this issue. However, the impacts on erosion and sedimentation are expected to take place gradually and with significant effects over periods of years.

6.3 Surface water quality

No specific observations have been made for investigation of this issue. However, the impacts on surface water quality are expected to occur mainly after the winter season.

6.4 Ground water regime

The following three factors have had some immediate impacts on the ground water regime:

* Higher surface water levels in the reservoir have caused an increase in ground water in areas near the reservoir.

* Lower water tables in the river downstream the closure have resulted in decrease of ground water levels in this area.

* Higher discharges and water levels in the Mosoni Danube have caused an increase in ground water tables in nearby areas.

These effects are spreading to larger areas with time, and in some areas the effects of more of the above factors are superimposed and to some degree counterbalancing each other. This is illustrated by the ground water level observations shown in Appendix H-4.

In some villages in Hungary the water supply is based on dug wells with limited depth. In some of these the drop in ground water table has resulted in drying out of the wells. In the areas where the ground water abstraction is done from deeper wells, including the bank filtration schemes, no immediate effects on ground water availability have occurred.

6.5 Ground water quality

Analyses of ground water quality have so far not indicated any impact. However, this could not be expected either within this short time period.

6.6 Fauna, flora and habitats

During the works on realizing the Variant A most of the valuable habitats in the floodplain upstream Dunakiliti, except the Danube (>5000 ha) were destroyed by digging off or heaping up. This is in particular the case for the alluvial forests between the new dikes.

In addition, the operation of Variant C has influenced the Danube seriously. There is a reduction of the discharge for a reach of about 40 km downstream the dam to an extreme low level, which is considerably lower than the ever recorded minimum. In connection with this flow velocities and water depths decreased to unnatural values and most side branches (about 100 km) dried out.

This causes a huge immediate damage to all water organisms especially those living in the side branches, e.g. fish and benthic organisms (mainly the mussels). The remaining shallow waters fail as spawning grounds. If the situation as described above will continue until the beginning of the vegetation period most of the fauna and flora depending on floodplain ecosystem conditions will be heavily damaged and may have resulted in the loss of essential portions of populations and thus in reduction of genetic diversity and thus adaptibility. This especially concerns the four areas that are already protected or are proposed to be protected as nature reserves.

Immediate effects on flora especially water flora cannot be excluded.

Upstream the dam the river changes to an impounded lake for a length of 10 km with significantly smaller flow velocities. Thus, the river system will on this reach change its character. This causes a loss of many habitats for rheophil organisms.

Constructing the dam interrupted migration of fish and many species of water insects so they cannot reach their reproduction zones upstream.

6.7 Hydrological conditions for agriculture and forestry

As a result of the changed ground water levels the hydrological conditions for agriculture and forestry have changed. However, except for fisheries this is presumeably not having any effect until the beginning of the growing season.

6.8 Navigation

The navigation route in the Danube main channel was closed on October 23, 1992. Instead the new navigation channel with the locks at Gabcikovo has been opened. One of the two locks has been in routine operation since November 9, while the second was being tested on November 22, 1992. The Working Group has not been able to obtain specific data on the number of ships, which have passed the locks during the past two weeks.

The new channel and locks represent an improvement of the navigation conditions with respect to the following factors:

* No problems with shallow water depths any longer between Bratislava and Sap/Palkovicovo.

* Shorter travel times for barges between Bratislava and Komarno t/r.

* Saving of energy.

In the Danube downstream the dam, on the other hand, navigation has become virtually impossible. Thus, ships cannot reach the harbours of Ásványráró, Dunaremete and Dunakiliti because of insufficient water depth. Thus Hungary has lost 40 km international navigation route.

6.9 Other factors

With the filling of the navigation canal the previously used road connection between three villages on the Slovakian side and Bratislava has been cut off. Thus today, Bratislava can be reached via Gabcikovo dam, a detour of in one case 35 km. Instead a road on top of the Variant C structures, providing a 8 km shorter connection to Bratislava, has been prepared.

During the works on Variant A the topsoil was removed from an area of 5300 ha upstream Dunakiliti. This area will be flooded for the reservoir. Valuable types of soils specific of the floodplains were lost.

Compared to the former wetlands the new reservoir will have some influence on micro- and mesoclimate. According to a study carried out by the Slovak Hydrometeorological Institute (SHMU) the effects are estimated as small. However, there is a considerable uncertainty on this issue.

The character of the scenery upstream the dam has been completely changed by the measures preparing Variant A. Variant C created changes in landscape character upstream the dam as well as downstream. Upstream the dam the typical and highly structured floodplain scenery has been lost. Downstream the desiccated river branches and the remaining extent of the Danube are obvious symptoms of the destruction of the landscape. To some extent and in contrast to the upstream situation the character of the former floodplain could be restored by enough water discharge in the Danube and remedial measures. As a substitute the lake (reservoir) has been created as a new element in the landscape.

7. OUTLINE OF POSSIBLE REMEDIAL MEASURES ON NEGATIVE ENVIRONMENTAL IMPACTS

The construction of Variant C causes large impacts on the environment. In this chapter some possible measures to avoid, remediate or compensate the negative impacts on the environment are outlined. It should be emphasized that the measures described in the following do not necessarily constitute recommendations of the Working Group. It is rather a list of measures ranging from substantial changes of Variant C design to small additional measures. The specific combinations of these measures are presented in the various scenarios in Chapter 8 and in the recommendations given in Chapter 9.

7.1 Restoring the floodplain ecosystems in the reservoir area

Between the left and right side dikes floodplain ecosystems could be restored to a great extent between Bratislava and Rajka by removing the closure of the Danube. In addition, suitable measures can be taken to allow navigation through the navigation canal and to stop bed erosion in the Danube. If these restoration measures are not implemented only single problems downstream the dam could be handled as described below. These, however, would not result in an overall environmental improvement.

7.2 Possible remedial measures for floodplain ecosystems downstream the Variant C dam

<u>7.2.1</u> <u>Objectives for creating a water regime according to natural conditions</u>

It has to be the aim of remedial measures in the floodplains between Cunovo and Palkovicovo to restore the dynamics of water and substrate to the greatest possible extent resembling the natural conditions. This implies the splitting of the Danube discharge to the navigation canal and to the downstream Danube. The latter could be restored in that way that the typical water level hydrograph with flood periods and periods with low water level is achieved (perhaps in average at a slightly lower level).

<u>7.2.2</u> <u>Technical help for starting natural processes.</u>

During the last decades the channel system was changed to a quite unnatural stage. A Danube discharge nearly as high as in pre-dam conditions would not be sufficient to improve the ecological situation compared to October 1992. Measures could be taken to reduce sole erosion and to start natural processes.

Shallow under-water weirs in the main channel situated in front of river branches could increase the water level and ensure that the groundwater table will not be lowered.

Removing the thresholds between the main channel and the side branches will then enable splitting up the discharge so that the flow velocity and the pulling power will reduce.

Removing the fortifications from the banks of the main channel will allow the river to saturate its bed load deficiency by lateral erosion.

All these measures together will initiate natural processes that guarantee a sufficient ground water recharge, a high diversity of ecosystems and a reduction of sole erosion.

7.2.3 Supply methods for the side branch system

If the priorities are not given to starting natural processes but rather to guarantee sufficient ground water levels and/or continuous water supply to the side branches a technical supply method could be pointed out.

There is a possibility to make small inlets/outlets in the weirs (between the main channel and the side branches) with a sill level just above the lowest navigation level.

7.2.4 Adding dredged gravel

To avoid bed erosion directly downstream the dam dredged gravel from the reservoir or the navigation canal can be added into the Danube downstream the weir. After completion of Phase 2 the spillway weir with the sill level at 120.5 asl. (the same as in the existing river bed) can help to manage erosion/sedimentation problems.

7.2.5 Further measures on reducing sole erosion

If the priorities are not given to start natural processes but rather to reduce sole erosion, besides adding of gravel two technical methods could be pointed out.

A possibility is to build belts of concrete in the sole of the main channel at right angles to the flow direction.

A further possibility exists in the fortification of the river bed in reaches where sole erosion is observed.

7.3 Other remedial measures

7.3.1 Fish pass

To enable fish migration a fish pass can be constructed in combination with the bypass weir or the spillway weir.

7.3.2 Shape measures in the reservoir

To compensate the loss of floodplain ecosystems in the reservoir shape measures can be taken especially in the farthest upstream part of the reservoir and in the area near Bratislava, which is inundated only one or a few times per year. These measures should enlarge the inundation area and the area with shallow water as much as possible. Islands and peninsulas should be established within the reservoir.

7.3.3 Optimizing floodplain habitats outside the area concerned

To compensate the loss of floodplain specific habitats in the area of the reservoir measures could be taken to optimize damaged floodplain habitats in the area between Rajka and Dunakiliti, outside the reach between Bratislava and Palkovicovo and by including some of the forests near the left dike downstream Bratislava into the inundation area.

7.3.4 Preventing negative impacts on infiltration water of the reservoir

It is widely accepted that by low velocities and because of the high nutrient contents the water quality in the reservoir is threatening especially at Samorin water works and the neighbouring area. This threat is associated to stagnant water and subsequent eutrophication and saprobic conditions in the downstream part of the reservoir.

In order to increase the velocity the navigation canal can be narrowed so that the velocity will be high enough to avoid sedimentation of dead algae material. In addition to this it might be necessary to seal the ground of the reservoir or the canal on places with too less velocity. Increasing of the flow velocity can be achieved by lowering the water table too.

8. ASSESSMENT OF IMPACTS FOR VARIOUS WATER MANAGEMENT SCENARIOS

In this chapter impact assessments are outlined for various scenarios of water management. Each scenario is prepared on the basis of a set of specified objectives. In the selection of objectives no constraints have been imposed by previous plans or agreements. It is emphasized that the members of the Working Group not necessarily agree to these objectives; however the Working Group agrees to the subsequent descriptions of technical possibilities, environmental impacts, etc. For each scenario the following aspects are described:

* Objectives and priorities
* Technical and water management aspects
* Possible time schedule for implementation
* Impacts on discharges
* Impacts on erosion/sedimentation
* Impacts on surface water quality
* Impacts on ground water regime and quality
* Impacts on fauna, flora and habitats
* Impacts on agriculture and forestry
* Impacts on navigation
* Other aspects

Some statistics describing the river water levels and their fluctuations in the floodplain are presented in Appendix H, where also a summary table indicating impacts for the various scenarios are presented.

8.1 Scenario A: 95% of average discharge to the Danube downstream the dam

In this scenario no remedial measures are considered.

8.1.1 Objectives and priorities

The objective to be achieved in this scenario is to maintain the present (pre-dam) conditions with regard to floodplain ecology and ground water conditions side to the maximum possible extent, and only to give higher priorities to the following:

- safety of existing hydraulic structures against flood damages;
- navigation; and
- discharge to the Mosoni Danube.

8.1.2 Technical and water management aspects

Technically, the main part of the Danube discharge can be directed into the existing river bed and the floodplain through the following three structures:

* By-pass weir. When the necessary protection work of the downstream river bed is completed (scheduled for January 1, 1993) a discharge of 1460 m^3/s can pass at a reservoir water level of 131.1 m asl. Until then less discharge can pass.

* Floodplain weir. When this structure is fully operational for daily use, including the necessary downstream bed protection work, a discharge of 4600 m^3/s can pass here corresponding to a reservoir water level of 131.1 m asl. This work is planned to be completed by January 1, 1993. By Nov. 21, 1992 it can only be used for emergency in case of floods (which have short durations), but not for daily operation.

* Water intake in dike. Through this structure a discharge of 234 m^3/s can pass at a water level of 131.1 m asl. The water through this structure reaches the left side of the floodplain just downstream of Dunakiliti. At the moment this intake can be used provisionally. The intake can be fully used by April 1, 1993.

In addition, a discharge of 6300 m^3/s will be able to pass the planned Phase 2 structures, which are scheduled for operation from 1996. These structures are necessary in order to be able to resist a permanent (10,000 year event) design discharge.

The discharge capacity to the Danube and the floodplain is summarized in the table below:

Discharge capacity of Variant C structures (m^3/s)	November 21 1992	January 1, 1993	Completion of Phase 2 (1995)
Flood event	6310	6310	12600
Daily operation	600[1]	6310	12600

Note [1]: From November 25 about 800 m^3/s

The discharge at Bratislava (excluding the infiltration to the aquifers) which is not directed into the Danube consists of the following parts:

* Some discharge is required for operating the navigational locks at Gabcikovo. 175,000 m^3 is required to fill one ship lock. With the projected 40 passages per day, this corresponds to 81 m^3/s.

* Some additional discharge will be required for the coming months for testing turbines and generators at Gabcikovo. It is required that these are ready for use in case of large floods. The Working Group has not been able to obtain specific information on exactly how much water will be required for this purpose.

* 25 m^3/s is required for Mosoni Danube.

* Between 10 and 50 m3/s is usually diverted to Maly Danube at Bratislava with generally higher flows during summer season for irrigation purposes.

* There will be seepage from the reservoir and the canal to the seepage canals. This is estimated to be about 40 m^3/s initially decreasing to about 20 m^3/s after some time. Some of this seepage (estimated to 5 m^3/s) is diverted into the Mosoni Danube, and it is possible to divert the remaining to the side branches in the floodplain close to Dobrohorst.

In summary, in the pre-dam conditions the discharge at a point just upstream the weir at Cunovo corresponds to the Bratislava discharge minus in average 30 m^3/s. Out of this discharge today about 100 m^3/s is not directed into the Danube + the Mosoni Danube.

8.1.3 Possible time schedule for implementation

According to the informed project plans Scenario A will be technically possible from January 1, 1993.

8.1.4 Impacts on discharges and water levels

The discharge required for testing the turbines during the coming months is not known exactly. The percentage of the discharge, which when testing of turbines is completed is directed to the Danube appears in the table below for different flow conditions.

Characteristic discharge	Discharge value based on 1901 - 50 Bratislava record (m^3/s)	Discharge to Danube + Mosoni Danube in % of pre-dam discharge at Cunovo
Typical low flow (average of annual minimums)	848	88 %
Month with minimum flow (December - average)	1441	93 %
Summer month with minimum flow (September - average)	1954	95 %
Typical high flow (average of annual maximums)	5316	98 %
Average annual discharge	2025	95 %

With the existing structures it will be possible to carry out this water management after January 1, 1993 for discharges up to the maximum of 6400 m^3/s. During the 90 year period 1901-90 a flood of 6400 m^3/s or higher was experienced in 16 of the years (approximately " 5 year event"). The discharge is higher than 6400 m^3/s in average for less than 1 day per year.

The situation for the Mosoni Danube is improved as compared to the present (pre-dam) conditions because permanent discharge throughout the year is now ensured.

According to results from calculations for a 10-year period shown in Appendix H the reduction of the Danube discharge will result in a reduction of the river water table by 19 cm in average. The range of water table variations for the 10-year period changes from 1.90 m - 6.56 m in the pre-dam conditions to 1.60 m - 6.51 m in Scenario A. The dynamics of the discharge and water level regime with the characteristic fluctuations is preserved.

However, it is noted that the water tables will be further reduced in the coming years due to erosion of the river bed downstream the dam (see Subsection 8.1.6 below). These effects will be largest just downstream the closure and will gradually decrease towards zero at the downstream confluence with the navigation canal.

8.1.5 Impacts on erosion/sedimentation

As an effect of the reservoir and the associated backwater effects, the flow velocities at and just downstream of Bratislava will decrease. Therefore, the ongoing bed erosion will decrease and maybe even be turned into sedimentation. This is a positive effect.

Some of the suspended sediment load and all the bed load will sediment in the reservoir.

At the Danube downstream the dam erosion will increase, because the sediment concentrations in the water passing the structures will be significantly reduced and the velocities in the Danube will be almost the same. This erosion will result in decreases in river and ground water tables. This is a negative effect.

8.1.6 Surface water quality

The surface water quality of the reservoir will be influenced by eutrophication and sedimentation. In this regard the reservoir conditions will be significantly different in the upstream part, where all the discharge passes and the downstream part, where only a few percentages of the discharge occur.

Due to the throughflow in the upstream reservoir, the eutrophication will be limited here, and will as compared to the inflowing flux of organic matter not add a significant contribution. On the other hand due to the sedimentation of suspended sediments containing organic material, the net change in organic material flowing through the structures into the downstream part of Danube may as well be a reduction. Thus, the impact on the surface water quality in the downstream Danube is uncertain.

Directing only about 4% of the discharge through the downstrea, part of the reservoir will, on the other hand result in almost stagnant water, algae growth and sedimentation of organic material.

8.1.7 Ground water regime and quality

The ground water table close to the reservoir will rise both at the Hungarian and at the Slovakian side, while the amplitudes of the ground water table fluctuations will be reduced. The higher ground water tables represent a positive effect, and if it is possible to maintain the dynamics of fluctuations (to some extent possible through management of water tables in seepage canals just outside the reservoir) the ground water conditions will generally be improved in these areas.

Due to the decrease in the river water table in the downstream floodplain area the ground water levels will decrease correspondingly. However, the dynamics of the ground water system with the characteristic fluctuations will be maintained. Thus, the groundwater quality will in general not be influenced.

However, due to eutrophication in the downstream part of the reservoir the groundwater quality is most likely to be threatened at the Samorin Water Works, which produces about 40 % of the water supply for Bratislava. This threat is associated to sedimentation of organic material due to stagnant water and algae growth in the downstream part of the reservoir. A layer of organic material at the reservoir bed, from where the infiltration to the aquifer takes place, may result in anoxic groundwater conditions. Hence, this effect may be serious starting with the growth season during the 1993 summer.

8.1.8 Impacts on fauna, flora and habitats

Upstream the dam habitats influenced by the dynamics of the river change to those characterized by more or less stagnant conditions. This causes damages to flora and fauna characteristic for floodplains. Aggradation processes will cause new wetland habitats.

Downstream the dam biocenoses, especially the aquatic, are influenced by water released from the reservoir. There will be changes of the physical and chemical parameters of the river water caused by the reduction of flow velocities and the larger water surface in the reservoir. The sizes of these changes determine the damages in fauna and flora typical for floodplain conditions. According to changes of the average water level there will be a shifting of the biocenoses.

Sensitive species of the fish fauna of the floodplain have disappeared during the low water period in November 1992. Restoration of the fish communities by natural processes will last a long time, perhaps they cannot reestablish themselves.

8.1.9 Impacts on agriculture and forestry

The potential impacts on agriculture and forestry takes place through changes in ground water tables. In both cases a ground water table at the bottom of the root zone (or so close to the root zone, that there is no gravel layer in between) is important. Deeper ground water tables may cause water shortage/need for irrigation, while higher ground water tables may cause water logging.

For the agriculture the increase in groundwater tables around the reservoir is positive, because the ground water table here has dropped several meters to a level for which irrigation is required. The decrease in the areas downstream the dam part is generally negative, although the influence on the Slovakian side may be counterbalanced through operation of the water tables in the seepage canal north of the power canal.

For the forestry, the impacts of the decrease in ground water tables depend on the depth of the gravel layer. In some areas it may have some negative impact, while in the major part of the area the effect will be negligible. For some areas close to Mosoni Danube or the reservoir the increase in ground water tables may have positive impact.

8.1.10 Impacts on navigation

The navigation can be ensured through Gabcikovo. However, two problems will occur on the reach between Gabcikovo and the downstream confluence point at Sap/Palkovicovo, due to the small discharge in the navigation canal:

* The manoeuvrability for ships are more difficult when passing from almost stagnant water to fast flowing water. This may require special remedial measures.

* Dredging will be required.

Navigation on the Danube downstream the dam between Conovo and Sap is possible locally. When Phase 2 of Variant C is constructed (1996), there is only a limitation for composite barges.

8.1.11 Other aspects

The hydropower plant at Gabcikovo cannot be utilized.

8.2 Scenario B: Main part of water to Gabcikovo

No remedial measures are considered in this scenario.

8.2.1 Objectives and priorities

The objective to be achieved in this scenario is to maximize hydropower generation, given a constraint of a minimum discharge to the Danube and the Mosoni Danube. The minimum discharge to the Danube is defined as 350 m^3/s, which is the order of magnitude of discharge recorded in the Danube since the closure of the Danube.

8.2.2 Technical and water management aspects

This scenario is possible with the existing structures.

8.2.3 Possible time schedule for implementation

Splitting of the water with 350 m^3/s to Danube is possible from today: However, the full hydropower generation is not expected to be possible until January 1, 1993.

8.2.4 Impacts on discharges and water levels

This operation will result in a continuation of the immediate negative impacts on discharges and river water levels experienced in the floodplain area, see Chapter 6. According to the calculations for a 10-year period shown in Appendix H the average water level will decrease by more than 3 m and the dynamics with the characteristic fluctuations will almost disappear.

The situation for the Mosoni Danube is improved as compared to the present (pre-dam) conditions, because permanent discharge throughout the year is now ensured.

8.2.5 Impacts on sedimentation/erosion

As an effect of the reservoir and the associated backwater effects, the present erosion at and just downstream of Bratislava will decrease and maybe even be turned into sedimentation. This is a positive effect.

Some of the suspended sediment load and all the bed load will sediment in the reservoir.

At the Danube downstream the dam erosion will decrease due to the decrease in velocities.

8.2.6 Impacts on surface water quality

Due to the throughflow in the reservoir (both the upstream and the downstream ones), the eutrophication will be smaller as compared to Scenario A, and will as compared to the inflowing flux of organic matter not add a significant contribution. On the other hand due to the sedimentation of suspended sediments containing organic material, the net change in organic material flowing through the structures into the downstream part of Danube may as well be a reduction. The net impact of the reservoir on the surface water quality in the downstream Danube is expected to be negative for the first couple of years and uncertain in the long term.

On the other hand the smaller velocities and much smaller depths in the Danube downstream the dam will result in significantly different (generally negatively) water quality conditions with regard to selfpurification, oxygen conditions, eutrophication, etc.

8.2.7 Impacts on ground water regime and quality

The ground water table close to the reservoir will rise both at the Hungarian and at the Slovakian side, while the amplitudes of the ground water table fluctuations will be reduced. The higher ground water tables represent a positive effect, and if it is possible to maintain the dynamics of fluctuations (to some extent possible through management of water tables in seepage canals just outside the reservoir) the ground water conditions will generally be improved in these areas.

With regard to the conditions in the floodplain and associated areas on both sides this operation will result in a continuation of the immediate negative impacts experienced during the past weeks. In the longer term, the change in dynamics with much smaller fluctuations may in addition influence the groundwater quality in a negative direction.

Directing a main part of the discharge to Gabcikovo will most likely ensure the groundwater quality at Samorin, and hence the water supply for Bratislava.

8.2.8 Impacts on fauna, flora and habitats

This scenario will have large impacts on fauna, flora and habitats.

Upstream the dam there will be no remarkable difference to the immediate impacts as described in Chapter 6.

Downstream the dam the alluvial forests and meadows depending on the Danube regime will completely change to mesophilic habitat types or disappear. The dynamic character of the river and the corresponding biota will also cease. From the present vascular flora most of the species specific to floodplains will be lost. There will be a rapid loss of the original diversity of aquatic invertebrates. Sensitive and rare species of the fish fauna will disappear or have already disappeared as an immediate effect. In the terrestrial insect fauna displacement of the species typical for the more humid biotopes will happen. Higher trophic levels will be influenced in a negative way.

8.2.9 Impacts on agriculture and forestry

For the agriculture the increase in groundwater tables around the reservoir is positive, because the ground water table here has dropped several meters to a level for which irrigation is required. The decrease in the areas downstream the dam part is generally negative, although the influence on the Slovakian side may be counterbalanced through operation of the water tables in the seepage canal north of the power canal.

For the forestry, the impacts of the decrease in ground water tables depend mainly on the depth of the gravel layer. For ground water table reductions of this order of magnitude (1-3 m) it will generally have a negative impact. The average annual wood production is estimated to decrease with 70 - 80 %. Outside the dikes a very slow transition process will take place. For some areas close to Mosoni Danube or the reservoir the increase in ground water tables may have positive impact.

8.2.10 Impact on navigation

The navigation will be ensured through Gabcikovo.

Navigation on the Danube will be limited or lost.

8.2.11 Other aspects

Hydropower production at Gabcikovo is possible.

8.3 Scenario C: Management of Variant C as planned by the Slovak Commission for Environment

Remedial measures are considered in this scenario.

8.3.1 Objectives and priorities

The objectives to be achieved in this scenario are to optimize the relation between hydropower generation and discharge to the Danube and Mosoni Danube. The minimum discharge into Danube is defined as 600 m^3/s in the winter and 1300 to 1500 m^3/s in summer period, which is approximately a 50 % : 50 % split between the power canal and the Danube.

8.3.2 Technical and water management aspects

Technical aspects:

This scenario can be initiated by use of the existing Variant C structures. However, the full management possibilities require the construction of the spillway weir, hydropower station and ship lock at Cunovo, scheduled under Phase 2.

Management aspects:

The general ecological requirements in the inundation area are prescribed by the Slovak Environmental Commission as follows:

- To secure communication between the dead-branch system and the Danube in both ways and to enable the flow through the branches from Dobrohost to Palkovicovo. Periodical inundation with river water according to the natural regime of flows.
- To secure the supply of water into Mosoni Danube according to conditions agreed by Czecho-Slovakia and Hungary in 1948, on the base of Paris Peace treaty.
- To secure the natural physiological processes of the actual flora of the old bed of the Danube during the vegetation period (mainly from March to September),
- To secure such a flow in the old river bed, which would enable the ground water level to touch the soil horizon and which would thus prevent the drainage effect of the river bed.
- To secure a minimal flow in river Danube of 600 m^3/s.

Proposal:

The main goal is to propose measures that the environment will be optimized by hydrological means. The remedy measures should treat the immediate impacts and improve the long-term pre-dam processes, e.g. stoping the ground water level decrease, stoping errosion in Bratislava, optimizing the ground water level depth and fluctuation and maintaining acceptable conditions in Danube.

Variant C - Phase 1

In previous model investigations a solution has been prepared for the reach between rkm 1811 and 1842 of the Danube river bed, according to which the parallel section of the river bed in the ford sections is to be stabilized by building of under water weirs (rock bottom thresholds). These weirs have maximum height of 1.0 - 1.3 m above the existing river bed bottom.

The same solution is possible from rkm 1842 to rkm 1851.75. In this part of Danube, between Rajka and Dunakiliti, it is possible to use Dunakiliti weir to optimize water and ground water levels.

Items of Phase 1:

- Water table in the reservoir between 128.5 and 130 m asl.
- Construction of underwater weirs.
- Fortification of the tail of inundation weir.
- Adding dredged gravel.
- Using Dunakiliti for water level management.

Variant C - Phase 2:

Phase 2 consists of:
- Completion of spillway weir, hydropower station and ship lock.
- Opening of connections between the main Danube canal and the side branches.
- Removal of part of the fortifications of the banks in the main Danube canal.
- Monitoring, interpretation of data and further optimization.
- Optimization of the division of the discharge.

The first and the second phase requires comprehensive monitoring of the effects of the remedial measures, mathematical modelling and further field work and simulation studies.

8.3.3 Time schedule for implementation.

Phase 1

The fortification work and the construction of the underwater weirs can be carried out in three months. It is expected that the remedial measures can be completed by spring 1993.

Phase 2

Further technical work, monitoring, field work, modelling and studies should be done until the full operational capacity of all structures is achieved. At this time definitive operational directives, monitoring and interpretation tools should be elaborated. It is expected that this phase will be completed by 1995.

8.3.4 Impacts on discharges and water levels.

The influence of underwater weirs on water levels and velocities according to discharge is similar to those outlined for Scenario E in Subsection 8.5.4. The height of the under water weirs should be optimised according to height of the opening of river branches and possibilities of adding the dredged gravel. A longitudinal section of the Danube with and without underwater weirs for stone underwater weirs are shown in Appendix I. Velocities over and between weirs are also included in Appendix I.

Generally, the height of weirs is proposed from 1 to 2 meters. Expected velocities are in the range from 0.5 to 2.7 m/s between weirs and from 0.9 to 2.6 m/s on top of the weirs.

8.3.5 Impacts on erosion and sedimentation

By operation of the reservoir during Phase 1 the erosion at Bratislava will not be stopped. A considerable part of the coarse sand and gravel will sediment in the upper part of reservoir. This can be dredged and put into the Danube just downstream the Cunovo weir.

During Phase 2 the present erosion at and just downstream of Bratislava will decrease and may be even be turned into sedimentation. This is a positive effect.

Some of the suspended load will sediment in the lower part of reservoir. For the Danube between Cunovo and Dunaremete, where the pre-dam condition was river bed erosion, erosion will be smaller. Adding gravel under Cunovo will improve the situation. Removal of river bank fortifications will increase lateral erosion and will together with underwater weirs result in increases of the river bottom. This will give more regularly distributed velocities along the Danube.

For the Danube between Sap and Komarno slight erosion is expected, which is a positive effect both for navigation and for flood protection of the downstream section of Danube.

Sedimentation process in the reservoir should be improved by optimizing dis- -rge and hydraulic structures inside the reservoir.

8.3.6 Surface water quality

The surface water quality will be influenced by the eutrophication and the sedimentation mainly in the downstream part of the reservoir. Changing discharges between Danube and power canal can improve the situation. Additional research is needed on this issue. Due to the sedimentation the change of the water quality downstream from Gabcikovo is expected to be negligible. Surface water quality could improve also because of opening the river branch system and thus higher self purification capacities.

8.3.7 Ground water regime and quality

The ground water table close to the reservoir will rise both at Hungarian and Slovakian side. This will generally improve the ground water depth conditions in these areas.

Downstream the Cunovo Dam the river water table maintained to the previous conditions by the under water weirs and nearly the same ground water level fluctuation will generally ensure that the ground water quality close to the river Danube will not be influenced.

Assuming eutrophication in the downstream part of the reservoir will not be serious and flow velocity will be influenced by hydraulic structures, ground water quality will not be influenced. To ensure ground water quality for long term period, monitoring and additional studies are needed.

8.3.8 Impacts on fauna, flora and habitats

If it is possible to carry out the optimization with the results outlined above, the impacts on fauna, flora and habitats will be similar to those described in scenario E, cf. Subsection 8.5.8. Otherwise, the impacts may be larger.

8.3.9 Impacts on agriculture and forestry

If it is possible to carry out the optimization with the results outlined above, the impacts on agriculture and forestry will be similar to those described in scenario E, cf Subsection 8.5.9. Otherwise the impacts may be larger.

8.3.10 Impacts on navigation

Navigation will be ensured through Gabcikovo. There will be improvements with regard to:

- time saving.
- saving of energy.
- improvement of depth in Bratislava harbour.
- increment of turnover.

The completion of the ship lock (Phase 2) will enable navigation in the old Danube river, when discharge in the Danube will be higher than 2000 m3/s. A Minimum discharge into the Danube of 600 m^3/s enables navigation continuously for ships with dip of about 1 - 1.4 meters.

8.3.11 Other aspects

The hydropower plant at Gabcikovo will generate hydroelectric energy at reduced capacity.

8.4 Scenario D: Danube redirected to the former river bed

This scenario describes the reversibility. Various remedial measures are considered.

8.4.1 Objectives and priorities

The objectives to be achieved in this scenario are to redirect the Danube into its former bed, hence maintain - as much as it is possible both for low flow and for the higher discharges - the conditions prior to the closure of the Danube (i.e. before 20 Oct. 1992) with regard to the floodplain ecology, ground water conditions on both the Slovakian and Hungarian side and navigability of the Danube between Bratislava-Szap (Sap or Palkovicovo).

In addition it is an objective to improve the floodplain ecology by opening of side branches.

This scenario gives higher priority only to:
- nature and environmental protection,
- discharge to the Mosoni Danube and the Small Danube (Maly Dunaj),
- safety of all existing structures (except the closure of the Danube or other earth barrages/dykes of the system).

8.4.2 Technical and water management aspects

The existing structures of Variant C do not always allow the redirection of the 95% of the discharge into the Danube.

Technically it is possible to redirect the Danube to the former river bed. Two principally different approaches exist, namely by removing the closure in the old bed or by making a new river bed over some distance bypassing the closure. Some proposals prepared by Hungary are enclosed in Appendix J.

All of the proposed interventions would require additional measures - like reinstatement of the water supply of the Mosoni Danube, bed protection etc.

All of the measures can direct a discharge of about 11000 m^3/s back into the Danube. The split of it between the different structures and the new bed can be characterized:

* By-pass weir. After having finished the protection

work of the downstream energy dissipation basin it can pass 1460 m^3/s discharge at a reservoir level of 131.1 m asl.

* Floodplain weir. When this structure will be operational it can take about 4600 m^3/s at 131.1 m. asl.

* The main (reopened) bed of the Danube can - at about 2 m higher water level than the banks - take about 5000 m^3/s.

In summary the structures of Variant C plus the reopened Danube bed can pass a design flood during a temporary construction period ($Q_{1\%,year}$ = 10600 m^3/s). However, for passing a final design flood ($Q_{0.01\%,year}$ = 15000 m^3/s) it will be required either to construct the spillway weir, planned for Phase 2 of the Variant C or to utilize the power canal and the Gabcikovo complex as an additional flood spillway weir.

The fresh water supply of the side branches can be solved by reopening the upstream ends of the branches at or above the navigational low flow. The correct sizing of these openings would provide enough water for the revitalization of the side branches without disturbing the navigation and altering significantly the sediment and ice carrying capacity of the Danube.

The discharges which cannot be directed into the Danube are

- the discharge to the Mosoni Danube and
- the discharge to the Small Danube (Maly Dunaj).

8.4.3 Possible time schedule for implementation

The measures required to redirect the Danube to the old river bed can be implemented within 12 months.

8.4.4 Impacts on discharges and water levels

This scenario will assure the pre-closure conditions (except for discharges higher than 11000 m^3/s; i.e. for discharges up to a 100 year flood). The impact of this change will have no apparent effect on the hydrology, morphology and consequently on the water levels of this stretch.

The discharge to the Mosoni-Danube should be provided by traditional means, i.e. by dredging a connection canal to the Danube.

As the discharge conditions in the Danube will be the same as before the closure the ground water table will also return to pre-dam conditions in both the Slovakian and the Hungarian side. The dynamics of the discharge and ground water regime will be maintained.

8.4.5 Impacts on erosion/sedimentation

Erosion/sedimentation will return to pre-closure conditions both in the area of the Cunovo reservoir and downstream to it. It raises the question of degradation of the main bed of the Danube and as consequence the water supply of the side branches. This problem should be solved.

8.4.6 Surface water quality

Surface water quality of the pre-closure conditions will be preserved. The improved flow through the side branches will improve the water quality of the side branches too.

As the downstream part of the reservoir is still connected to the upstream part it will receive water at higher water levels. However, some of this water will not be able to flow back and will cause stagnant water conditions. The possible effects of this should be studied.

8.4.7 Ground water regime and quality

The ground water levels will return to pre-dam conditions. It will raise questions in the region between Bratislava and Dunaremete, where the trend was unfavourable for the last 30 years.

8.4.8 Impacts on fauna, flora and habitats

This scenario allows the restoration of floodplain habitats in most of the reservoir area.

Downstream the dam pre-dam conditions for fauna, flora and habitat can be restored. Navigation will prevent developing the floodplain conditions nearer to nature. Even the dynamics of substrate as an important factor cannot be restored at the presence of navigation.

Reopening the side branches will bring better conditions for fauna and flora than in the pre-dam situation. Because of the completely restored facilities for fish migration this scenario gives the best possibilities for restoration of the fish communities by natural processes.

To maintain these better conditions for fauna, flora and habitats sole erosion of the Danube must be brought to tolerable values.

8.4.9 Impacts on agriculture and forestry

The supposed positive impacts of the higher ground water levels near the reservoir will disappear but life will return to the pre-dam conditions. The better fresh water supply of the side branches will improve the productivity of the fringe forests.

8.4.10 Impacts on navigation

In connection with the final phase of the construction works required for redirecting the Danube to its former bed, navigation will be stopped for a period of about one month.

Afterwards the pre-dam conditions would prevail. It means that the navigation problems of the stretch between Bratislava and Budapest should be solved by traditional methods.

8.4.11 Other aspects

The hydropower plant and the ship locks at Gabcikovo cannot be used.

The "power" canal, which will be used as spillway canal for flood situations in average a couple of days per century, will still require maintenance.

8.5 Scenario E: Step by step solution

This scenario includes remedial measures, which are proposed for implementation in two phases.

8.5.1 Objectives and priorities

The objectives to be achieved in this scenario are to maintain the water levels as well as the dynamics of both the surface water and the groundwater regimes downstream the dam according to the conditions prior to the closure of the Danube, to maintain the ground water quality and to maintain almost the same water quality in the reservoir as it was previously in the Danube.

Higher priorities are given to:

- maintaining the function of the Variant C structures,
- discharge to the Mosoni Danube,
- navigation.

8.5.2 Technical and water management aspects

The existing structures of variant C and the structures of the Gabcikovo complex can manage the water supply for this scenario. In order to achieve the objectives remedial measures are necessary. As well upstream in the reservoir and the navigation channel as in the Danube. The remedial measures are proposed to be implemented in two phases as follows:

Phase 1:

- Lowering of the water table in the reservoir to an operational level between 128.5 and 129 m asl.
- Construction of a fish-pass near the by-pass weir
- Construction of under-water weirs.
- Strengthening of the tail protection of the inundation weir (in execution).
- Adding dredged gravel to the Danube downstream the Cunovo weir.

Phase 2:

- Narrowing the navigation channel in the reservoir
- Sealing the bottom of the reservoir under areas with stagnant water.
- Opening of connections between the main Danube

channel and the side branches.

- Removing the fortifications of the banks of the main Danube channel.
- Optimizing floodplain habitats outside the areas concerned.
- Shape measures in the reservoir.

The discharge which is not directed into the downstream Danube consists of the following parts:

Phase 1:

(a) A discharge required for the water quality in the downstream part of the reservoir and for avoiding ground water quality problems for the Samorin water works. The key parameter in this regard is the velocity in the main canal in the downstream part of the reservoir. Assuming 0.35 m/s to be sufficient, the necessary discharge can be estimated to 400 - 600 m^3/s with larger values during the summer season. A part of this discharge will be lost by seepage. The remaining part can be used for locking of ships and for hydropower generation.

(b) By discharges in Bratislava higher than 2500 m^3/s about 60 % will a few times during the summer season be directed to the power canal in order to flush the reservoir.

(c) During flood situations in the summer season the 400 - 600 m^3/s will a few times be cut down to the discharge needed for the locking of ships in order to enable higher flood peaks to pass the floodplain.

A minimum discharge to the Danube of approximately 600 m^3/s (depending on the water level regime) should be guaranteed.

When switching to/from higher discharges as outlined under (b) and (c) above it must be ensured that the daily water level fluctuations in the Danube stays within the natural (pre-dam) regime.

Phase 2:

The division of the discharge has to be optimized. This requires comprehensive monitoring of effects of the remedial measures, mathematical modelling and further studies. As a result of the optimization it may be specified that a further part of the Danube discharge can be directed to the power canal, if it is proven not to be essential for the dynamics of the water regime in the flood plain after the completion of the Phase 2 remedial measures.

8.5.3 Possible time schedule for implementation

The construction of the under-water weirs will take about five months. The starting date depends on decision date and the time required for obtaining the necessary legal permissions. Thus, technically it would be possible to complete all the remedial measures of Phase 1 by June 1993.

The content of Phase 2 depends on the results of necessary monitoring, modelling and studies to be carried out during Phase 1.

8.5.4 Impacts on discharges and water levels

For investigating the impacts of under-water weirs on the water levels and velocities mathematical modelling has been carried out. A model already established for the river, cf. ref /3/, was used taking eight under-water weirs with a height of 2 - 2.5 m into account.

On the basis of the model calculations a modified rating curve for Dunaremete has been prepared, see Appendix K. The velocities vary between 0.6 - 2.1 m/s in between the weirs and 1.2 - 3.1 m/s on top of the weirs as compared to 1.4 - 2.4 m/s in the pre-dam conditions. The water level variations for a calculated 10-year period, Appendix H, indicate that the effect of the particularly chosen design is a reduction in average water levels of 7 cm, and a preservation of the fluctuation pattern.

The results show that the desired effect of increasing the water levels without reducing the the velocities too much and of preserving the dynamics with the characteristic fluctuations is possible. However, an optimization of the design will be required.

The situation for the Mosoni Danube is improved as compared to the present (pre-dam) conditions, because permanent discharge throughout the year is now ensured.

8.5.5 Impacts on erosion/sedimentation

By operating the reservoir at water levels between usually 128 and 129 m asl. the erosion at Bratislava will not be stopped.

Some of the suspended sediment load and all the bed load will sediment in the reservoir.

For the Danube downstream the reservoir between Cunovo and Dunaremete, where the pre-dam condition was river bed erosion, it is not certain what the effects will be. On the one hand the sediment concentrations of the inflowing water will decrease (=> erosion). On the other hand, the velocities in the main channel will decrease (=> sedimentation). However, when the bank fortifications be removed as part of Phase 2, bank erosion will take place and the river bed sedimentation may be expected. This is a positive effect.

For the Danube between Dunaremete and Komarno, the present sedimentation conditions are expected to be changed to erosion, because the incoming flow carries less sediment concentrations. This is a positive effect.

8.5.6 Surface water quality

The surface water quality will be influenced by the eutrophication and the sedimentation which will occur in the reservoir. In this regard the reservoir conditions will be significantly different in the upstream part, where all the discharge passes and the downstream part, where only about 25% of the discharge occur.

Due to the throughflow in the upstream reservoir, the eutrophication will be limited here, and will as compared to the inflowing flux of organic matter not add a significant contribution. On the other hand due to the sedimentation of suspended sediments containing organic material, the net change in organic material flowing through the structures into the downstream part of Danube may as well be a reduction. Thus, the impact on the surface water quality in the downstream Danube is expected to be negligible.

Directing about 75% of the discharge to the Danube will, on the other hand result in smaller velocities. With e.g. 600 m^3/s (Phase 1) during summer periods the velocities will with a reservoir water level around 129 m asl. be in the order of 0.35 m/s in the main canal. This velocity is at the critically low side in order to avoid sedimentation of fine material. Furthermore, almost stagnant water may occur in the part of the reservoir outside the main canal, and flushing a couple of times during a summer may not be sufficient to avoid a considerable eutrophication. These issues have to be monitored and studied closer.

8.5.7 Groundwater regime and quality

The groundwater table close to the reservoir will rise both at the Hungarian and at the Slovakian side. This will generally improve the groundwater conditions in these areas.

Downstream the dam the river water table included the fluctuations will be very close to the conditions prior to the closure of the Danube. Thus, the groundwater quality will in general not be influenced.

Assuming eutrophication in the downstream part of the reservoir will not be serious, the groundwater quality will not be influenced. However, this will need a close monitoring and study.

8.5.8 Impacts on fauna, flora and habitats

Upstream the dam will be no remarkable difference to the immediate impacts as described in Chapter 6. Aggradation processes will cause new habitats.

Downstream the dam biocenoses, especially the aquatic, are influenced by water released from the reservoir. There will be changes of the physical and chemical parameters of the river water caused by the reduction of the flow velocity and the larger surface of the reservoir. The sizes of these changes determine the damages in fauna and flora depending on floodplain conditions. When considering an optimization process under Phase 2, it should be emphasized that the slower the possible changes happen, and the smaller these changes are, the minor the impacts can be expected.

8.5.9 Impacts on agriculture and forestry

For the agriculture the increase in ground water tables around the reservoir and close to the Mosoni Danube is positive, because the ground water table in some of this area has dropped several meters to a level for which irrigation is required.

Because the ground water regime will be basically unchanged in the area downstream the dam only insignificant influences on agriculture and forestry can be expected here.

8.5.10 Impacts on navigation

The navigation can be ensured through Gabcikovo. If the discharge through the shipping channel is 400 m^3/sec or more, problems with navigation are not expected.

Navigation on the Danube downstream the dam is possible locally.

By high discharge the under-water weirs can be passed by ships.

8.5.11 Other aspects

The hydropower plant has a reduced production.

Budapest, November 23, 1992

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9. RECOMMENDATIONS

9.1 The question of reversibility

Four scenarios all assume the continuous existence of the hydraulic structures and the use of the artificial canal for navigation with damming in Slovakia.

One of the five elaborated scenarios, scenario D, is based on the reversibility of the situation to a status equivalent to the status before closing the Danube, by removal of some of the Variant C hydraulic structures.

The choice between these two fundamentally different appoaches cannot be made by the Working Group, which just has pointed out the various consequences of adopting alternative objectives.

9.2 Recommendations in case it is decided not at this stage to redirect the Danube to its former river bed

9.2.1 Approach and priorities

However, independently of the above choice, the Working Group has the recommendations described in the following in case Scenario D should not have been chosen.

In the past, the measures taken for the navigation constrained the possibilities for the development of the Danube and the floodplain area. Assuming the navigation will no longer use the main river over a length of 40 km a unique situation has arisen. Initiated by technical measures the river and the floodplain can develop more naturally.

However, realizing that considerable uncertainties are associated to prediction of impacts of such major manipulations of natural ecosystems and that many of the impacts may easily become irreversible, the Working Group recommends a cautious and experimental approach, where new developments be taken in several steps on the basis of preceding and simultaneous comprehensive monitoring and studies.

In this process the Working Group recommends to give the highest priority to maintain or improve:

* the hydrological and ecological regime in the whole affected area, especially in the downstream

floodplain area;
* the ground water quality; and
* the navigation,

and to give a lower priority to:

* the production of hydropower, and
* the water quality in the downstream part of the reservoir.

9.2.2 Water management for the coming months

Scenario A (95% of the average discharge to the Danube using the existing structures) should be followed as soon as possible, but not later than January 1, 1993. From April 1993 the water management should gradually shift to the one described below.

9.2.3 Water management for the coming year(s)

By recommending the water management for the period from April 1993 and the following year(s) the following two aspects are emphasized:

* The exact content of the water management cannot be described with the present knowledge.

* The coming year(s) should be considered as a temporary period until a long term solution can be reached and the measures necessary to undertake in this period should not prejudge possible final solutions. As basis for deciding on the long term solution, in addition to legal and economic aspects, comprehensive monitoring, mathematical modelling and studies will be required. They are outlined in Subsection 9.2.5 below.

The following actions are recommended:

(a) A combination of monitoring, mathematical modelling and studies, as described in Subsection 9.2.4, should be initiated immediately.

(b) A Joint Danube-Gabcikovo Committee comprised of representatives from Hungary, Slovakia and EC should be established. This committee should have the authority to carry out the following tasks:

   * Technical supervision of the existing

structures with regard to safety functioning.

* Preparation of a detailed operation manual prescribing how the water management should be carried out.

* Control that the actual water operation is carried out in accordance with prescriptions given in the operation manual.

* Reporting of any deviations from the agreed water management operation.

* Reviewing the results of the monitoring, modelling and studies carried out and making the necessary adjustments to the water management taking the specified objectives into account.

(c) In the beginning of February, 1993 the details of the remedial measures and the water management for the 1993 summer season should be decided. This should be done on the basis of the results from the monitoring, modelling and study programme undertaken in the mean time, see Subsection 9.2.4.

(d) Under-water weirs in the Danube main channel should be constructed for some of the reach between Cunovo and Sap by April 1993. The detailed design will be decided upon as described under (c). It is considered important to start with implementation of some of the under-water weirs as experimental sites and monitore their effects in order to more precisely evaluate their design and function. It is emphasized that under-water weirs are reversible measures, because they can be removed without too big problems, if it is later on decided to redirect the Danube (and the international navigation) to the former river bed (Scenario D).

(e) After April 1993 the water management should shift towards the one described under Phase 1 of Scenario E. The exact content of this water management policy will be decided as described under (c). Tentatively, this is expected to imply that in the order of 25 % of the discharge (in average) be directed towards Gabcikovo. This is considered necessary in order to ensure the ground water quality for the Samorin Water Works. However, in order to do this and at the same time minimize the possible damages for the floodplain ecosystems it will be required to have constructed at least some of the under-water weirs in the Danube main channel.

(f) On the basis of the results from the monitoring, modelling and study programmes carried out during the summer season of 1993 the water management for the coming year should be reconsidered in November 1993. Depending on the results this may result in decisions regarding more or less water to the Danube, implementation of further remedial measures and modifications to existing ones, need for modifications to the monitoring, modelling and study programme.

9.2.4. Studies, monitoring and mathematical modelling required as basis for water management in 1993

The following programme is recommended to be initiated immediately:

(a) Monitoring of the effects of the present situation, which is likely to continue until the end of December, with regard to:

* Ground water quantity and quality. Many key parameters are already today being monitored. However, a supplementation with especially geochemical parameters from wells close to (or within) the reservoir is required.
* Sedimentation in the reservoir.
* Analyses of river and reservoir sediments with regard to organic pollutants and heavy metals.
* Surface water quality including hydrobiological aspects.
* Impact on fauna, flora and habitats in the affected area. This should include a quantititive evaluation of loss of biomass, especially of mussels.

(b) Optimization of the designs of the under-water weirs by use of mathematical modelling. The optimization should aim at preserving the pre-dam dynamic regime with respect to water level regime and should ensure that the velocities in the main channel are so large that the river bed continue to consist of coarse material.

(c) Assessment of the risk to the ground water quality, in particular between the reservoir and the Samorin Water Works. This has previously been studied but should be reconsidered taking the new data into account.

9.2.5 Studies, monitoring and mathematical modelling required for the long term

The following programme is recommended to be carried out within the coming 2-3 year period:

(a) Study aiming at establishment of a set of ecological objectives for the Danube floodplain landscape. This study must be carried out in close interaction with decision makers in the two countries.

(b) Establishment of a comprehensive mathematical modelling system coupled with the necessary data bases. This system should be fully tested and applied to some of the most urgent water management problems in a dialogue with the decision makers. The modelling system should cover the following aspects:
- groundwater, including geochemistry,
- unsaturated zone, including agricultural aspects,
- river hydraulics, including sedimentation/erosion and water quality,
- reservoir flow, sedimentation and water quality, and
- fauna, flora and habitats in floodplain.

with basically the same specifications as under the ongoing PHARE project "Danubian Lowland - Ground Water Model" except for more emphasis to floodplain ecological aspects and for equal coverage of the two countries.

(c) Establishment of a comprehensive monitoring programme, specifically tailored to provide the necessary data for the problems associated with the proposed water management. This programme will be a supplement to already existing general programmes within the following fields:

* ground water quality;
* reservoir conditions;
* sedimentation and erosion; and
* floodplain fauna, flora and habitat.

(d) Studies of the effects of under-water weirs and other remedial measures.

(e) Collection of more information about the reservoir, e.g. the extent of bituminous layers and the possible contamination with benzpyrenes is necesssary.

(f) Study of water quality of the navigation channel should be carried out for the estimation of organic loading.

(g) Economical assessment.

(h) Integration of the above in a decision support study.

Budapest, November 23, 1992

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10. REFERENCES

The Working Group has made use of a large number of reports. The key references comprise the following:

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/3/ Report prepared by VITUKI Hungary on the Changes of Water Management of Szigetköz. 1992

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Annex 13

Data on conversion of Czechoslovak and Slovak currency figures into US dollars

The methodology used for conversion of financial sums in Czechoslovak/Slovak currency into US$.

This Memorial refers at several points to figures in Czechoslovak/Slovak currency. In order to assist the Court, an approximate conversion into US$ is provided.

Czechoslovak Koruna (crowns) and Slovak Koruna (crowns) have not been convertible currencies for very long. In earlier years, there were - apart from an official exchange rate (used mainly for statistical purposes) - several kinds of exchange rates used for different transactions, such as commercial and non-commercial payments, tourist exchange rates etc. These rates differed considerably. Thus, it is not easy to convert the values from crowns into US$.

All calculations in this Memorial have been based on the official exchange rates of the Czechoslovak State Bank (years 1953-1992) or of the National Bank of Slovakia (1993 onwards).

Whenever the total sum referred to covers more than one year, the conversion into US$ has been calculated separately on a yearly basis, using the exchange rates valid in respective years and then amalgamating them together.

It follows from the above that all sums in US$ are approximate. Furthermore, this method of conversion does not take into consideration the differences in international and world prices, thus reducing considerably the real value of property, costs or damage in question.

Table of official exchange rates of Czechoslovak Crowns(CSK) or Slovak Crowns (SK) /* into US$

YEAR	Official Exchange Rate **
1953 - 1968	7.20 CSK
1969	7.20 CSK
1970	7.20 CSK
1971	7.20
1972	6.61
1973	5.86
1974	5.86
1975	5.58
1976	5.77
1977	5.67
1978	5.43
1979	5.32
1980	5.38
1981	5.89
1982	6.10
1983	6.29
1984	6.64
1985	6.85
1986	6.00
1987	5.47
1988	5.32
1989	9.25
1990	17.95
1991	29.49
1992	29.50
1993 average	31.00 SK

**** - equivalent of 1 US$**

* Since February 10, 1993 as a consequence of the dissolution of Czechoslovakia, the Czechoslovak currency was replaced by independent currencies, the Czech Crown and the Slovak Crown (SK).

Annex 14

Recommandations Relatives à l'Etablissement des Gabarits du Chenal, des Ouvrages Hydrotechniques et Autres sur le Danube, Budapest, 1988

РЕКОМЕНДАЦИИ

ПО УСТАНОВЛЕНИЮ ГАБАРИТОВ ФАРВАТЕРА, ГИДРОТЕХНИЧЕСКИХ И ДРУГИХ СООРУЖЕНИЙ НА ДУНАЕ

RECOMMANDATIONS

RELATIVES A L'ETABLISSEMENT DES GABARITS DU CHENAL, DES OUVRAGES HYDROTECHNIQUES ET AUTRES SUR LE DANUBE

ДУНАЙСКАЯ КОМИССИЯ
БУДАПЕШТ

1988

COMMISSION DU DANUBE
BUDAPEST

1. INTRODUCTION

Les Recommandations relatives à l'établissement des gabarits du chenal, des ouvrages hydrotechniques et autres sur le Danube ont été élaborées par étapes et adoptées par décisions des sessions de la Commission du Danube (XVIII[e], XX[e], XXI[e], XXXIII[e], XXXVII[e] et XLV sessions).

La Commission recommande aux Etats danubiens et aux Administrations fluviales spéciales de se baser sur ces Recommandations lors de l'élaboration des plans des travaux d'amélioration des conditions de la navigation et des projets de construction d'ouvrages hydrotechniques et autres sur le Danube.

La XVIII[e] session de la Commission du Danube a pris note de la déclaration de la délégation yougoslave qui, de son côté, a proposé d'adopter pour le secteur yougoslave du Danube la valeur de 9 m pour la hauteur minima des passes navigables des ponts, considérant que la valeur de 9,5 m devrait être encore étudiée.

Les présentes Recommandations comprennent les Compléments (doc. CD/SES 37/15, CD/SES 44/21 et CD/SES 45/13) établis sur la base des propositions des pays danubiens.

2. DESIGNATION DU CARACTERE DES SECTIONS TRAITEES DANS LES PRESENTES RECOMMANDATIONS ET TERMES EMPLOYES

2.1 - Désignation des sections

a) Sections à lit à terrain meuble

b) Sections à lit à seuils rocheux

c) Sections à navigation en sens unique

d) Sections à navigation dans les deux sens

e) Sections de seuils à terrain meuble

f) Sections défavorables par leurs conditions géomorphologiques

2.2 - Termes employés

Chenal navigable - partie de fleuve aménagée et balisée afin de garantir la sécurité de la navigation.

En général, la navigabilité du chenal est déterminée par son gabarit minimum (largeur, profondeur, rayon de courbure) rapporté à l'étiage navigable et de régularisation (ENR), et par la hauteur libre des passes navigables des ponts et des câbles aériens, rapportée au haut niveau navigable (HNN).

Etiage navigable et de régularisation (ENR) - niveau d'une durée de 94%, établi pour tout le parcours navigable, de Kelheim (km 2411,60) à Sulina (km 0,00), sur la base des débits observés au cours d'une période de 40 ans (1944-1983), abstraction faite des périodes avec présence de glaces (Annexe N° 1).

Haut-niveau navigable (HNN) - niveau d'une durée de 1% établi pour tout le parcours navigable de Regensburg (km 2379,00) à Sulina (km 0,00) sur la base des débits observés au cours d'une période de 40 ans (1924-1963), abstraction faite des périodes avec présence de glaces (Annexe N° 2).

Profondeur minima du chenal - profondeur de chenal assurée auprès de l'ENR ou du niveau de retenue minimum, dans les limites de la largeur minima du chenal (Annexe N° 3).

Largeur minima du chenal - largeur à l'ENR, ou au niveau de retenue minimum, qui correspond à la profondeur minima du chenal (Annexe N° 3).

Rayon de courbure minimum - rayon de courbure de la courbe à l'axe du chenal, auprès de l'ENR (Annexe N° 3).

Hauteur libre d'une passe navigable - distance verticale entre le HNN ou le niveau de retenue maximum et la partie inférieure de la voûte du pont, dans les limites de la largeur du chenal dans la passe du pont (Annexe N° 4).

Largeur libre d'une passe navigable - distance horizontale mesurée perpendiculairement à l'axe du chenal entre les deux extrémités saillantes de la passe ou auprès de la profondeur minima du chenal dans les limites de la hauteur libre (Annexe N° 4).

Longueur utile d'une écluse - distance entre la corde du mur de chute de la porte amont et l'enclave de la porte aval (Annexe N° 4).

Largeur utile d'une écluse - distance minima entre les deux bajoyers (Annexe N° 4).

Avant-port - surface d'eau de la voie navigable protégée, qui forme prolongation directe du sas de l'écluse et sert à faciliter les conditions de passage par l'écluse et, dans certaines écluses, au stationnement et à l'attente de l'éclusage (Annexe N^os^ 5 et 6).

Hauteur libre des câbles aériens traversant le fleuve - distance verticale entre le point le plus bas du câble et le HNN ou le niveau de retenue maximum, mesurée auprès de températures d'air maxima ou minima, compte tenu du gel (Annexe N° 7).

Niveau de retenue minimum - niveau le plus bas dans le bief amont, qui s'étend sur la section comprise entre le barrage et la région de rencontre du niveau de retenue et du niveau en courant libre à l'ENR. La limite entre le niveau de *retenue minimum* et l'ENR est déterminée par la profondeur minima recommandée pour les sections de retenue (Annexe N° 7).

Niveau de retenue maximum - niveau le plus haut dans le bief amont du barrage auprès de la cote maxima d'exploitation, qui s'étend depuis le barrage jusqu'à la région en courant libre au HNN ou jusqu'au point d'intersection du HNN. La limite entre le niveau de retenue maximum et le HNN se trouve au point où le niveau de retenue maximum dépasse de 10 cm le HNN (Annexe N° 7).

Section de retenue - section de fleuve se trouvant sous l'influence de la retenue formée en résultat de la construction d'une centrale hydraulique.

Chaîne de retenues - section de fleuve constituée d'une série de sections de retenue qui se suivent sans interruption.

3. GABARITS DU CHENAL, DES OUVRAGES HYDROTECHNIQUES ET AUTRES SUR LE DANUBE

Généralités

Les présentes Recommandations tiennent compte des perspectives du développement du trafic sur le Danube et de la flotte danubienne.

La construction d'une chaîne de cascades de navigation est le moyen le plus efficace pour créer ou améliorer les conditions de la navigation sur une voie d'eau. Lors de la conception des projets et de la construction de chaînes de retenues sur le Danube, il est nécessaire d'implanter les centrales hydrauliques de manière qu'avec des travaux de régularisation supplémentaires soient assurés, à l'intérieur de la chaîne, les gabarits de chenal recommandés pour les sections de retenue.

Tenant compte de ce que la navigation sur le secteur du Danube de Kelheim à Regensburg commencera après qu'une retenue y sera créée, les données pour ce secteur, qui figurent dans les présentes Recommandations, sont indiquées au regard des conditions pour les sections de retenue seulement.

3.1 - Tous les éléments figurant dans les présentes Recommandations et concernant les profondeurs, largeurs et rayons de courbure du chenal, ainsi que les gabarits des ouvrages hydrotechniques et autres sur le Danube, à l'exception des hauteurs libres des ponts, des câbles aériens et des câbles de bac traversant le fleuve, se rapportent:

3.1.1 - <u>Sur les sections à courant libre</u>:

- à l'étiage navigable et de régularisation (ENR) établi pour tout le parcours navigable de Regensburg à Sulina et qui est le niveau d'une durée de 94%, calculé sur la base des débits observés au cours d'une période de 40 ans (1924-1963) (Annexe N° 1).

3.1.2 - <u>Sur les sections de retenue</u>:

- au niveau de retenue minimum dans le bief amont du barrage (Annexe N° 7).

3.2 - Les hauteurs libres des passes navigables des ponts des câbles aériens et câbles de bac traversant le fleuve, sont rapportées:

3.2.1 - <u>Sur les sections à courant libre</u>:

- au haut niveau navigable (HNN) calculé sur la base du débit d'eau d'une durée de 1% pour la période établie comme base de calcul de l'ENR (Annexe N° 2).

3.2.2 - <u>Sur les sections de retenue</u>:

- au niveau de retenue maximum du bief amont du barrage (Annexe N° 7).

Les schémas des gabarits sont présentés dans les Annexes N^os 8/a-e.

4. GABARITS DU CHENAL

4.1 - <u>Profondeur minima</u>

4.1.1 - <u>Sur le secteur Kelheim - Regensburg (km 2411,60-2379,00)</u>

- Sur les sections de retenue:
  - a) sur les sections à lit à terrain meuble .... au moins 27 dm
  - b) sur les sections à lit et à seuils rocheux .... au moins 28 dm

4.1.2 - <u>Sur le secteur Regensburg - Kachlet (km 2379,00-2230,72)</u>

- Sur les sections à courant libre:
  - a)* sur les sections à lit à terrain meuble .... au moins 18,5 dm
  - b) sur les sections à lit et à seuils rocheux .... au moins 19,5 dm
- Sur les sections de retenue:
  - a) sur les sections à lit à terrain meuble .... au moins 27 dm
  - b) sur les sections à lit et à seuils rocheux .... au moins 28 dm

4.1.3 - <u>Sur le secteur Kachlet - Vienne (km 2230,72-1920,30)</u>

- Sur les sections à courant libre:
  - a) sur les sections à lit à terrain meuble .... au moins 20 dm
  - b) sur les sections à lit et à seuils rocheux .... au moins 21 dm
- Sur les sections de retenue:
  - a) sur les sections à lit à terrain meuble .... au moins 27 dm
  - b) sur les sections à lit et à seuils rocheux .... au moins 28 dm

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* *Les litt. a), b), c), etc. désignent les sections énumérées sous* 2.I.

4.1.4 - <u>Sur le secteur Vienne - Brăila (km 1920,30-170,00)</u>

- Sur les sections à courant libre, au moins 25 dm
- Sur les sections de retenue .... au moins 35 dm

4.1.5 - <u>Sur le secteur Brăila - Sulina (km 170,00-0,00)</u> .... au moins 24 pieds (73 dm)

2 - <u>Largeur minima</u>

4.2.1 - <u>Sur le secteur Kelheim - Regensburg (km 2411,60-2379,00)</u>

- Sur les sections de retenue .... au moins 50 m

4.2.2 - <u>Sur le secteur Regensburg - confluent de l'Inn (km 2379,00 - 2225,32)</u>

- Sur les sections à courant libre:
  - c) sur les sections à navigation en sens unique (avec élargissement approprié dans les courbes) .... au moins 40 m
  - d) sur les sections à navigation dans les deux sens (avec élargissement approprié dans les courbes) .... au moins 70 m
- Sur les sections de retenue:
  - a) sur les sections à lit à terrain meuble .... au moins 100 m
  - b) sur les sections à lit et à seuils rocheux .... au moins 75 m

4.2.3 - <u>Sur le secteur confluent de l'Inn - Vienne (km 2225,32-1920,30)</u>

- Sur les sections à courant libre:
  - e) dans les sections de seuils à terrain meuble .... au moins 120 m
- Sur les sections de retenue .... au moins 150 m

4.2.4 - <u>Sur le secteur Vienne - Devin (km 1920,30-1880,26)</u>

- Sur les sections à courant libre:
  - b) sur les sections à lit et à seuils rocheux .... au moins 75 m
  - e) sur les sections de seuils à terrain meuble .... au moins 120 m
- Sur les sections de retenue .... au moins 150 m

4.2.5 - <u>Sur le secteur Devin - Gönyü (km 1880,26-1791,00)</u>

- Sur les sections à courant libre:
  - a) sur les sections à lit à terrain meuble ....au moins 150 m
  - b) sur les sections à lit et à seuils rocheux .... au moins 100 m
  - e) sur les sections de seuils à terrain meuble .... au moins 120 m
- Sur les sections de retenue .... au moins 150 m

4.2.6 - <u>Sur le secteur Gönyü - Tchatal de St-Georges (km 1791,00-62,97)</u>

- Sur les sections à courant libre:
  - a) sur les sections à lit à terrain meuble .... au moins 180 m
  - b) sur les sections à lit ou à seuils rocheux .... au moins 100 m
  - a) sur les sections de seuils à terrain meuble .... au moins 150 m
- Sur les sections de retenue .... au moins 180 m avec augmentation jusqu'à 200 m dans les courbes de ce secteur.

4.2.7 - <u>Dans le canal de Sulina, sur le secteur Tchatal de St-Georges - Sulina</u> (km 62,97-0,00)

- Secteur maritime du Danube ..... au moins 60 m

4.2.8 - Dans les canaux latéraux, auprès d'une profondeur de 3,5 m ... au moins 150 m

3 - Rayon de courbure minimum (à l'axe du chenal)

4.3.1 - Sur le secteur Kelheim - Regensburg (km 2411,60-2379,00)

- Sur les sections de retenue ... au moins 600 m

4.3.2 - Sur le secteur Regensburg - Jochenstein (km 2379,00-2203,33)

c) Sur les sections à navigation en sens unique .... au moins 300 m
d) Sur les sections à navigation dans les deux sens .... au moins 500 m

4.3.3 - Sur le secteur Jochenstein - Krems (km 2203,33-2001,00)

- Sur les sections à courant libre au moins 350 m
- Sur les sections de retenue .. au moins 350 m

4.3.4 - Sur le secteur Krems - Vienne (km 2001,00-1920,30)

- Sur les sections à courant libre au moins 800 m
- Sur les sections de retenue .. au moins 900 m

4.3.5 - Sur le secteur Vienne - Devin (km 1920,30-1880,26)

- Sur les sections à courant libre au moins 800 m
- Sur les sections de retenue .. au moins 1000 m

4.3.6 - Sur le secteur Devin - Sulina (km 1880,26-0,00) .... au moins 1000 m

f) Sur les sections défavorables par leurs conditions géomorphologiques on peut exceptionnellement admettre....... au moins 750 m

5. GABARITS DES ECLUSES ET EQUIPEMENTS

Lors de l'établissement des projets de construction d'écluses sur le secteur en aval de Kelheim, il est recommandé de prévoir des gabarits qui correspondent tant aux exigences actuelles de la navigation qu'aux perspectives de son développement (types et dimensions des bâtiments et des convois, volume du trafic-marchandises). En général, il est désirable de prévoir pour les écluses des gabarits qui permettent l'éclusage simultané à travers un sas de l'ensemble d'un convoi avec son remorqueur ou son pousseur.

Il est également recommandé que les projets de construction d'écluses en aval de Regensburg prévoient des écluses avec deux sas accolés aux dimensions ci-dessous indiquées, afin de permettre l'éclusage des convois simultanément dans les deux sens.

5.1 - Dimensions minima des écluses

5.1.1 - Sur le secteur Kelheim - Regensburg (km 2411,60-2379,00)

Longueur utile	au moins 190 m
Largeur utile	au moins 12 m
Profondeur au seuil	au moins 4,0 m

5.1.2 - Sur le secteur Regensburg - Vienne (km 2379,00-1920,30)

Longueur utile	au moins 230 m
Largeur utile	au moins 24 m
Profondeur au seuil	au moins 4,0 m
Dans des cas exceptionnels, la profondeur au seuil sur ce secteur peut être réduite à	3,5 m

5.1.3 - Sur le secteur Vienne - Gönyü (km 1920,30-1791,00)

Longueur utile	au moins 230 m
Largeur utile	au moins 24 m
Profondeur au seuil	au moins 4,5 m

5.1.4 - Sur le secteur Gönyü - Budapest (km 1791,00-1646,50)

Longueur utile .... au moins 260-310 m
Largeur utile .... au moins 34 m
Profondeur au seuil .... au moins 4,5 m

5.1.5 - Sur le secteur Budapest - Brăila (km 1646,50-170,00)

Longueur utile .... au moins 310 m
Largeur utile .... au moins 34 m
Profondeur au seuil .... au moins 4,5 m

En cas d'établissement de portes intermédiaires pour l'éclusage des bâtiments isolés, il est recommandé de partager le sas de manière telle que sa plus petite moitié ait une longueur utile d'au moins 100 m.

5.2 - Hauteur minimum des murs de quai dans l'écluse à partir du niveau d'eau maximum

- Sur tous les secteurs du Danube .. au moins 1,5 m

5.3 - Pente du mur de quai dans l'écluse

- Sur tous les secteurs du Danube, les murs de quai des écluses doivent être verticaux; l'écart maximum admis par rapport à la verticale est de 100 : 1

5.4 - Espace de sécurité entre les bâtiments et les têtes de l'écluse

- L'espace de sécurité dans le sas de l'écluse entre les bâtiments et les têtes amont et aval de l'écluse doit être de 2 à 5 m, en fonction des dimensions du sas.

5.5 - Bollards aménagés dans les écluses

- Dans le sas des écluses où la hauteur de chute est d'au moins 5 m, il est recommandé que tous les bollards, ou au moins les bollards de chaque troisième rangée, soient flottants.

5.5.1 - Distance entre les bollards aménagés le long des sas des écluses

- Sur le secteur en amont de Passau 15 m
- Sur le secteur en aval de Passau 25 - 30 m

5.5.2 - Distance entre les bollards fixes aménagés verticalement dans les sas des écluses

- Les bollards fixes doivent être installés verticalement à des distances de .... 1,5 à 1,8 m

5.5.3 - Hauteur des bollards flottants à partir du niveau d'eau

- pour les bollards flottants simples, environ 1,5 m
- pour les bollards flottants doubles la hauteur de l'un des bollards doit être d'environ 1,5 m et celle de l'autre, d'environ 3,0 m au-dessus du niveau de l'eau.

5.6 - Distance entre les échelles encastrées dans les bajoyers des écluses

- Il est recommandé que les échelles encastrées soient aménagées dans les bajoyers des écluses, dans la région de tous les deuxièmes ou troisièmes groupes verticaux de bollards flottants ou fixes.

5.7 - Intensité de l'éclairage dans les écluses

- Dans tous les endroits du sas de l'écluse, au niveau d'eau minimum l'intensité de l'éclairage doit être d'au moins 5 lux. Il est recommandé, en outre, que la couleur de la lumière diffusée par les filtres soit jaune-orange.

5.8 - Installations auxiliaires des écluses

5.8.1 - Liaison radiotéléphonique

- Il est recommandé d'établir une liaison radiotéléphonique sur la voie désignée à cet effet pour l'écluse donnée.

5.8.2 - Autres installations auxiliaires des écluses

- Les postes de commande des écluses doivent être équipés de moyens modernes de signalisation, d'automatisation des manoeuvres d'éclusage, d'appareil radar et de télévision.

6. GABARITS DES AVANT-PORTS ET EQUIPEMENTS

Il est recommandé que, lors de l'établissement du rapport entre les dimensions des écluses et des avant-ports indiqué ci-après, il soit tenu compte des conditions hydrauliques et hydrométéorologiques au point de vue de la garantie de la sécurité de la navigation dans la région de la centrale hydraulique.

6.1 - Rapport entre les dimensions des écluses et des avant-ports

Lors du choix des gabarits optima des avant-ports, il faut tenir compte, en dehors des rapports indiqués ci-après, des éléments suivants:

- La configuration du lit du fleuve dans la région des écluses, qui peuvent être aménagées dans le lit principal, dans un bras ou dans des canaux de dérivation.
- La disposition générale du noeud hydroénergétique, la position des écluses par rapport à la centrale hydroélectrique et aux barrages déversoirs.
- Le système de remplissage et de vidange de l'écluse.
- Le nombre des bâtiments qui traversent l'écluse.

Lors de l'établissement de la longueur et de la largeur minima des avant-ports, les symboles utilisés ont les significations et valeurs suivantes:

B_o - largeur minimum de l'avant-port

L_o - longueur minimum de l'avant-port

B - largeur utile de l'écluse

L - longueur utile de l'écluse

e - distance entre l'écluse et la courbe du mur de guidage incliné; $e = B$

b - distance de sécurité; b = au moins 0,4 B

ℓ - longueur de freinage; $\ell = 0{,}3\ L$

B' - largeur de l'espace entre les sas de l'écluse

R - rayon de courbure du mur à la jonction du mur de guidage incliné et du mur de l'avant-port; $R = 0{,}5\ L$

R_1 - rayon du mur de l'avant-port d'une écluse à sas accolés; $R_1 \cong 3000$ m

x - distance variable en fonction du rayon R_1.

Les schémas des gabarits des avant-ports sont présentés dans les Annexes N^{os} 5 et 6.

6.1.1 - Longueur et largeur minima des avant-ports symétriques d'une écluse simple

$$L_o = e + 4(B+b) + L + \ell$$

$$B_o = 3B + 2b$$

6.1.2 - Longueur et largeur minima des avant-ports asymétriques d'une écluse simple

$$L_o = e + 4(B+b) + L + \ell$$

$$B_o = 2B + b$$

Une pente inférieure à 1 : 4 (jusqu'à 1 : 1,5 au maximum) est également admise pour le mur de guidage, toutefois dans ce cas la largeur minimum des avant-ports doit être de $B_o = 2(B+b)$.

6.1.3 - Longueur et largeur minima des avant-ports symétriques d'une écluse à sas accolés

$$L_o = e + 4(B+b) + L + \ell$$

$$B_o = 2(2B+b) + B'$$

6.1.4 - Longueur et largeur minima des avant-ports asymétriques d'une écluse à sas accolés

L_o = e + 4(B+b) + L + ℓ

B_o = 3B + B' + b + x

6.1.5 - Longueur et largeur minima des avant-ports asymétriques d'une écluse à sas accolés, non destinés au stationnement des bâtiments (secteur autrichien)

L_o = 260 - 320 m

B_o = 2B + B' + b + x

.2 - Hauteur minimum des murs de quai dans les avant-ports à partir du niveau d'eau maximum

- Sur tous les secteurs du Danube ... au moins 1,5 m

3 - Pente du mur de quai dans les avant-ports

- Sur tous les secteurs du Danube les murs de quai dans les avant-ports doivent être verticaux; la pente maximum admise par rapport au plan vertical est de 10 : 1.

4 - Distance entre les bollards dans les avant-ports

- La distance entre les bollards fixes aménagés dans les avant-ports, quand ceux-ci sont destinés à servir au stationnement des bâtiments, doit être de 30 m.

5 - Longueur minimum du mur rectiligne de l'avant-port

- Pour les avant-ports asymétriques des écluses à sas accolés et des écluses simples, la longueur minimum de l'un des murs de l'avant-port formant prolongation du bajoyer de l'écluse doit être égale à la longueur utile de l'écluse, augmentée de la longueur de freinage.

- Pour les avant-ports symétriques des écluses à sas accolés, la longueur du mur rectiligne de l'avant-port formant également prolongation du bajoyer de

l'écluse, doit être égale à au moins la moitié de la longueur utile de l'écluse.

6.6 - Intensité de l'éclairage dans les avant-ports

- A l'entrée des avant-ports l'intensité de l'éclairage doit être d'au moins 0,5 lux, avec une augmentation croissant jusqu'à au moins 5 lux dans la direction du sas de l'écluse; par ailleurs, il est recommandé que la couleur de la lumière diffusée par les filtres soit jaune-orange.

6.7 - Téléphone dans les avant-ports

- Sur les murs de quai des avant-ports il convient d'installer des postes téléphoniques en liaison avec les postes de commande.

6.8 - Gabarits minima du chenal aux abords des avant-ports

- Aux abords des avant-ports d'une écluse, les gabarits du chenal doivent correspondre à ceux établis dans lesdites Recommandations (Chapitre 4).

7. GABARITS ET EQUIPEMENTS DES LIEUX DE STATIONNEMENT POUR LES BATIMENTS QUI ATTENDENT L'ECLUSAGE

A proximité des avant-ports, en dehors du chenal, il doit y avoir des lieux appropriés désignés pour le stationnement des bâtiments qui attendent l'éclusage, ainsi que des lieux destinés à l'assemblage des convois pour l'éclusage. Ces lieux doivent être, dans la mesure du possible, équipés de dispositifs d'amarrage appropriés. L'intensité de l'éclairage dans la région de ces lieux doit être d'au moins 0,5 lux; par ailleurs, il est recommandé que la couleur de la lumière diffusée par les filtres soit jaune-orange.

OUVRAGES DANS LES BASSINS DE RETENUE

Sur les secteurs de retenue à berges abruptes et à gran-
profondeurs, il est recommandé d'aménager près de la ri-
les haut-fonds pour l'échouage des bâtiments qui se trou-
en danger. La longueur de ces lieux doit être de 150 m
es profondeurs de 1,5 m, 2,5 m et 3,5 m. Ces lieux doi-
être aussi équipés de dispositifs d'amarrage.

ABARITS DES PASSES NAVIGABLES DES PONTS

- Largeur libre

9.1.1 - Sur le secteur Kelheim - Regensburg (km 2411,60-2379,00) .... au moins 50 m

9.1.2 - Sur le secteur Regensburg - confluent de la Drava (km 2379,00-1382,50).. au moins 100 m

Lors de la construction de ponts en arc, largeur libre admise d'après la corde de l'arche (sans diminution de la distance entre les piles) .... au moins 80 m

9.1.3 - Sur le secteur confluent de la Drava - Brăila (km 1382,50-170,00) .... au moins 150 m

Lors de la construction de ponts en arc, largeur libre admise d'après la corde de l'arche (sans diminution de la distance entre les piles) .... au moins 120 m

9.1.4 - Sur le secteur Brăila - Sulina (km 170,00-0,00) .... au moins 180 m

Lors de la construction de ponts en arc, largeur libre admise d'après la corde de l'arche (sans diminution de la distance entre les piles) .... au moins 120 m

9.2 - Hauteur libre

9.2.1 - Sur le secteur Kelheim - Regensburg (km 2411,60-2376,80)

- Sur les sections de retenue au moins 6,4 m

9.2.2 - Dans la région de la ville de Regensburg (km 2379,00-2376,80)

- Sur les sections à courant libre .... au moins 6,4 m

9.2.3 - Sur le secteur Regensburg - Kachlet (km 2376,80-2230,72)

- Sur les sections à courant libre .... au moins 7,5 m
- Sur les sections de retenue au moins 8,0 m

9.2.4 Sur le secteur Kachlet - Vienne (km 2230,72-1920,30)

- Sur les sections à courant libre .... au moins 8,0 m
- Sur les sections de retenue au moins 8,0 m

9.2.5 - Sur le secteur Vienne - Devin (km 1920,30-1880,26)

- Sur les sections à courant libre .... au moins 10,0 m
- Sur les sections de retenue au moins 10,0 m

9.2.6 - Sur le secteur Devin - Brăila (km 1880,26-170,00)

- Sur les sections à courant libre .... au moins 9,5 m
- Sur les sections de retenue au moins 10,0 m

9.2.7 - Sur le secteur Brăila - Sulina (km 170,00-0,00)

- Sur les sections à courant libre .... au moins 38,0 m
- Sur les sections de retenue au moins 39,0 m

HAUTEUR LIBRE DES CABLES AERIENS TRAVERSANT LE FLEUVE

.1 - <u>Sur le secteur Kelheim - Regensburg (km 2411,60-2379,00)</u>

10.1.1 - Pour les câbles téléphoniques et autres à basse tension, ainsi que pour les câbles qui ne sont pas sous tension électrique .... au moins 15,5 m

10.1.2 - Pour les câbles à haute tension, jusqu'à 110 kV .... au moins 17,0 m

10.1.3 - Pour les câbles à haute tension de plus de 110 kV, la hauteur libre visée sous point 10.1.2 sera augmentée de 1 cm par kV supplémentaire.

- <u>Sur le secteur Regensburg - Brăila (km 2379,00-170,00)</u>

10.2.1 - Pour les câbles téléphoniques, télégraphiques et autres à basse tension, ainsi que pour les câbles de bac et autres câbles qui ne sont pas sous tension électrique au moins 16,5 m

10.2.2 - Pour les câbles à haute tension, jusqu'à 110 kV .... au moins 19,0 m

10.2.3 - Pour les câbles à haute tension de plus de 110 kV la hauteur libre visée sous 7.2.2 sera augmentée de 1 cm par kV supplémentaire.

- <u>Sur le secteur Brăila - Sulina (km 170,00-0,00)</u>

10.3.1 - Pour les câbles téléphoniques, télégraphiques et autres à basse tension .... au moins 45 m

10.3.2 - Pour les câbles à haute tension, jusqu'à 110 kV .... au moins 48 m

10.3.3 - Pour les câbles à haute tension de plus de 110 kV, la hauteur libre visée sous point 10.3.2 sera augmentée de 1 cm par kV supplémentaire.

Sur le secteur en aval de Devin, il est recommandé d'éviter, pour autant que possible, l'installation de câbles aériens en travers du fleuve et de poser les câbles au fond du lit.

ОТМЕТКИ НСРУ ПО ОСНОВНЫМ И ПРОМЕЖУТОЧНЫМ ВОДОМЕРНЫМ ПОСТАМ НА ДУНАЕ

Annexe N° 1

COTES ENR DES STATIONS HYDROMETRIQUES PRINCIPALES ET DES STATIONS HYDROMETRIQUES INTERMEDIAIRES SUR LE DANUBE

№ п/п N° d'ordre	Наименование водомерного поста Station hydrométrique	Расстояние от Сулины Distance de Sulina	Расход воды, отвечающий новому НСРУ Débit d'eau correspondant au nouvel ENR	Абсолютная отметка "0" в/п над уровнем моря Cote absolue du "0" de la station hydrométrique au-dessus du niveau de la mer				Отметка НСРУ над "0" в/п до 1985 г. Cote de l'ENR au-dessus du "0" de la st. h. avant 1985	Отметка нового НСРУ над "0" в/п с 1985 г. Cote du nouvel ENR au-dessus du "0" de la st.h. à partir de 1985
				Северного моря Mer du Nord	Адриатического моря Mer Adriatique	Балтийского моря Mer Baltique	Черного моря Mer Noire		
		км km	м³/с m³/s	м m				см cm	см cm
1	2	3	4	5	6	7	8	9	10
1	КЕЛЬХЕЙМ KELHEIM 1/	2414,84	142	337,10				-	242
2	ОБЕРНДОРФ OBERNDORF	2397,40	157	331,15				-	170
3	Регенсбург-Эйзернбрюкке Regensburg-Eiserne-Brücke	2379,27		325,50				-	90
4	РЕГЕНСБУРГ-ШВАБЕЛЬВЕЙС REGENSBURG-SCHWABELWEIS	2376,50	186	324,49				82	75

1/ Основные водомерные посты здесь и далее написаны большими буквами.
En majuscules sont indiquées les stations hydrométriques principales.

1	2	3	4	5	6	7	8	9	10
5	Донауштауф Donaustauf	2369,63		323,28				65	60
6	Фрисгейм Friesheim	2363,74		321,34				103	105
7	Френкхофен Frengkofen	2360,78		320,60				108	115
8	Гейслинг Geisling	2353,40		318,50				111	100
9	Пфаттер Pfatter	2350,40		317,02				186	188
10	Ирлинг Irling	2345,58		316,68				120	130
11	Пондорф Pondorf	2340,43		315,64				96	102
12	Обермотцинг Obermotzing	2335,00		314,58				89	90
13	Унтерцейтльдорн Unterzeitldorn	2328,21		313,34				87	94
14	Штраубинг Straubing	2321,25		311,45				124	130
15	Рейберсдорф Reibersdorf	2315,29		310,76				104	115

1	2	3	4	5	6	7	8	9	10
16	Германсдорф Hermannsdorf	2308,94		310,09				110	120
17	ПФЕЛЛИНГ PFELLING	2305,53	190	308,16				278	284
18	Клейншварцах Kleinschwarzach	2292,63		308,46				99	112
19	Деггендорф Deggendorf	2284,44		307,00				194	205
20	Халбмейле Halbmeile	2280,29		307,23				106	110
21	Нидеральтейх Niederalteich	2276,22		304,81				209	225
22	Мюльхам Mühlham	2270,30		303,70				122	130
23	Лоо Loh	2263,15		301,03				194	200
24	ХОФКИРХЕН HOFKIRCHEN	2256,86	299	299,60				199	199
25	Фильсхофен-Донау Vilshofen-Donau	2249,47		297,07				292	292
26	Кахлет Kachlet	2230,32		290,00					86

1	2	3	4	5	6	7	8	9	10
27	Пассау-Донау Passau-Donau	2226,70		286,46					406
28	Пассау-Ильцштадт Passau-Ilzstadt	2225,25		286,23					422
29	АХЛЕЙТЕН ACHLEITEN	2223,05	650	287,70	288,04				258
30	Эрлау Erlau	2214,51		282,66					740
31	Йохенштейн - верхний бьеф Jochenstein - bief amont	2203,36			0,34				29000
32	Йохенштейн - нижний бьеф Jochenstein - bief aval	2203,24			0,34				27963
33	Дандлбахмюндунг Dandlbachmündung	2201,83		274,97					460
34	Энгельхартсцелль Engelhartszell	2200,66			276,99				289
35	Шлёген Schlögen	2186,80			0,00				27973
36	Ашах - верхний бьеф Aschach - bief amont	2163,08			0,00				27970

1	2	3	4	5	6	7	8	9	10
37	Ашах - нижний бьеф Aschach - bief aval	2161,96			0,00				26382
38	Ашах - Штромбаулейтунг Aschach-Strom - bauleitung	2161,27			261,28				253
39	Ашах-Агентство Aschach-Agentie	2159,73			0,00				26379
40	Христл Christl	2156,00			0,00				26372
41	Оттенсгейм- верхний бьеф Ottensheim - bief amont	2147,21			0,00				26370
42	Оттенсгейм - нижний бьеф Ottensheim - bief aval	2146,48			0,00				25167
43	Вильхеринг Wilhering	2144,31			249,12				240
44	ЛИНЦ LINZ	2135,17	680		247,74				316
45	Линц- Хандельсхафен Linz-Handelshafen	2130,60			0,00				25079

1	2	3	4	5	6	7	8	9	10
46	Абвинден-Астен верхний бьеф Abwinden-Asten - bief amont	2119,53			0,00				25976
47	Абвинден-Астен нижний бьеф Abwinden-Asten - bief aval	2119,20			0,00				24040
48	Маутхаузен Mauthausen	2110,98			0,00				23976
49	А у Au	2106,85			0,00				23975
50	Вальзе - верхний бьеф Wallsee - bief amont	2096,02			0,00				23970
51	Вальзе - нижний бьеф Wallsee - bief aval	2094,21			0,00				22749
52	Дорнах Dornach	2084,36			222,08				414
53	Грейн Grein	2079,10			219,43				667
54	Зармингштейн Sarmingstein	2072,71			216,77				926
55	Ибс-Перзенбейг верхний бьеф Ybbs-Persenbeug - bief amont	2060,67			0,00				22600

1	2	3	4	5	6	7	8	9	10
56	Ибс-Перзенбейг - нижний бьеф Ybbs-Persenbeug - bief aval	2060,20			0,00				21416
57	Ибс Ybbs	2058,79			212,22				190
58	Круммнусбаум Krummnussbaum	2049,60			0,00				21373
59	Мельк - верхний бьеф Melk - bief amont	2038,26			0,00				21370
60	Мельк - нижний бьеф Melk - bief aval	2037,86			0,00				20256
61	Мельк Melk	2035,98			199,97				236
62	Кинשток Kienstock	2015,21			194,00				186
63	Лойбен Loiben	2006,02			0,00				19356
64	ШТЕЙН-КРЕМС STEIN-KREMS	2002,70	870		0,00				19332

1	2	3	4	5	6	7	8	9	10*
65	Таллерн Thallern	1998,00			0,00				19325
66	Холленбург Hollenburg	1994,32			0,00				19323
67	Альтенвёрт - верхний бьеф Altenwörth - bief amont	1980,80			0,00				19320
68	Альтенвёрт - нижний бьеф Altenwörth - bief aval	1979,58			0,00				17719
69	Берндорф Berndorf	1975,97			1.74,00				304
70	Тульн Tulln	1963,09			0,00				17672
71	Грейфенштейн - верхний бьеф Greifenstein - bief amont	1949,57			0,00				17670
72	Грейфенштейн - нижний бьеф Greifenstein - bief aval	1948,88			0,00				16265
73	Грейфенштейн Greifenstein	1947,71			0,00				16250

1	2	3	4	5	6	7	8	9	10
74	Вена-Нусдорф Wien-Nussdorf	1934,05			156,48				90
75	ВЕНА-РЕЙХСБРЮККЕ WIEN-REICHSBRUCKE	1929,09	830*		154,05				95
76	Фишаменд Fischamend	1907,90			143,92				260
77	Орт Orth	1901,83			143,30				111
78	Дейч-Альтенбург Deutsch-Altenburg	1887,10			137,24				102
79	Хайнбург Hainburg	1883,92			135,25				158
80	Девин Devín	1879,83				132,84		201	158
81	Девинская Каменоломня Devín-Kamenolom	1876,90				132,33		130	92
82	Вольфсталь Wolfsthal	1874,84			130,21				248
83	БРАТИСЛАВА BRATISLAVA	1868,75	930			128,43		188	162

1	2	3	4	5	6	7	8	9	10
84	Русовце Rusovce	1855,9				124,37		168	110
85	Райка Rajka	1848,33				122,58		100	89
86	Грушов Hrušov	1841,54				119,83		139	130
87	Дунаремете Dunaremete	1825,49				113,24		254	251
88	Габчиково Gabčikovo	1819,87				111,00		286	282
89	Палковичово Palkovičovo	1809,97				107,77		304	285
90	Медведёв Medved'ov	1805,43				108,42		122	97
91	Надьбайч Nagybajcs	1802,37				107,62		153	123
92	Клижска Нема Kližska Nema	1792,37				106,24		144	107
93	Гёнью Gönyü	1791,30				106,20		137	99
94	Злaтна-на-Острове Zlatna-na-Ostrove	1779,20				103,90		187	146

1	2	3	4	5	6	7	8	9	10
95	Комаром Komårom	1768,34				103,88		125	83
96	КОМАРНО KOMARNO	1767,05	1040			103,69		138	98
97	Ижа Iža	1763,96				103,67		131	91
98	Альмашфюзитё Almåsfüzitö	1758,33				103,42		130	93
99	Дунаальмаш Dunaalmås	1751,80				103,14		130	97
100	Радвань Radvaň	1748,25				102,88		141	109
101	Лабатлан Låbatlan	1737,70				102,12		132	101
102	Штурово Šturovo	1718,60				100,83		148	120
103	Эстергом Esztergom	1718,52				100,96		134	106
104	Соб Szob	1706,60				99,85		135	120
105	НАДЬМАРОШ NAGYMAROS	1694,60	1035			99,38		110	101

1	2	3	4	5	6	7	8	9	10
106	Вац Vác	1679,50				98,12		55	40
107	Фельшёгёд Felsögöd	1671,70				97,57		57	41
108	БУДАПЕШТ BUDAPEST	1646,50	1030			94,98		147	135
109	Эрчи Ercsi	1613,20				92,73		101	92
110	Адонь Adony	1597,80				91,68		109	96
111	ДУНАУЙВАРОШ DUNAUJVAROS	1580,60	1020			90,28		118	104
112	Дунафёльдвар Dunaföldvår	1560,60				88,90		73	63
113	Пакш Paks	1530,30				85,38		117	100
114	Домбори Dombori	1506,70				83,52		88	85
115	Байя Baja	1478,70				80,96		191	182
116	Дунасекчё Dunaszekcsö	1460,00				79,92		200	192

1	2	3	4	5	6	7	8	9	10
117	МОХАЧ MOHÁCS	1446,80	1118		79,20			217	211
118	БЕЗДАН BEZDAN	1425,50	1170		80,64			52	51
119	Апатин Apatin	1401,40	1170		78,84				105
120	БОГОЕВО BOGOJEVO	1367,30	1520		77,46			110	98
121	Вуковар Vukovar	1333,10	1520		76,19				73
122	Илок Ilok	1298,80	1520		73,97				96
123	Нови Сад Novi Sad	1255,10	1520		71,73				80
124	Земун' Zemun	1173,00			67,76				
125	Белград Beograd	1169,82			68,23				
126	Панчево Pančevo	1154			67,27				
127	Смедерево Smederevo	1116,27			65,36				

1	2	3	4	5	6	7	8	9	10
128	Базиаш Baziaş	1072,50			63,683		64,172***		
129	Велико Градиште Veliko Gradište	1059,00					62,170		
130	Молдова-Веке Moldova-Veche	1048,00			62,527		63,016***		
131	Дренкова Drencova	1016,18			59,619		60,103***		
132	Свиница Sviniţa	995,00					61,044***		
133	Тишовица Tişoviţa	982,50					62,448***		
134	Турну-Северин Turnu-Severin	931,00	2352		33,641		34,130***	56	56
135	Груя Gruia	851,00					29,146***	34	34
136	НОВО СЕЛО NOVO SELO	833,60	1460				27,00 **	118	120
137	Четате Cetatea	811,00					27,786***	60	60
138	Калафат Calafat	795,00	2500				26,683***	50	50

1	2	3	4	5	6	7	8	9	10
139	Видин Vidin	790,20					24,81**	159	163
140	Арчар Artchar	770,60					24,00**	176	182
141	ЛОМ LOM	743,30	2500				22,89**	166	174
142	Бистрец Bistreț	725,00					23,875***	59	59
143	Долни Цибар Dolni Tzibar	717,60					22,50**	126	130
144	Козлодуй Kozlodui	703,50					22,00**	132	134
145	Бекет Bechet	679,00	2550				22,083***	42	42
146	ОРЯХОВО ORIAHOVO	678,00	2550				21,56**	48	46
147	Горни Вадин Gorni Vadin	653,60					20,00**	123	123
148	Байкал Baikal	640,80					20,00**	78	81
149	Корабия Corabia	630,00	2552				20,123***	23	23

1	2	3	4	5	6	7	8	9	10
150	Сомовит Somovit	607,70					17,86**	130	136
151	Никопол Nikopol	597,50					17,23**	158	165
152	Турну-Мэгуреле Turnu Măgurele	593,10					19,125 ***	34	34
153	СВИШТОВ SVISTOV	554,30	2590				15,10 **	81	88
154	Зимнича Zimnicea	553,65	2590				16,218 ***	57	57
155	РУСЕ ROUSSÉ	495,60	2610				11,99**	113	107
156	Джурджу Giurgiu	493,00					13,060***	44	44
157	Тутракан Toutrakan	433,00					8,89 **	134	128
158	ОЛТЕНИЦА OLTENITA	430,00	2600				10,01 ***	25	9
159	СИЛИСТРА SILISTRA	375,50	2700				6,50 **	73	86
160	Кэлэраши Călăraşi	370,50					7,306***		

1	2	3	4	5	6	7	8	9	10
161	ЧЕРНАВОДА CERNAVODA	300,00	850 ****				4,866***	- 19	- 35
162	Хыршова Hirşova	253,00					3,080***	19	19
163	Браила Brăila	170,00					1,076***	46	46
164	Галац Galaţi	150,00					0,861***	52	52
165	Рени Réni	127,232	2580				0,28	17	24
166	ТУЛЬЧА TULCEA	72,00					0,559***	34	28

* Исключая расход воды в Донау-канале(около 70 $м^3$/сек.)

** Абсолютная отметка "0" в/п над уровнем Черного моря(Варна)

*** Абсолютная отметка "0" в/п над уровнем Черного моря(Сулина)

**** В гидрометрическом створе в/п Чернавода только часть расхода воды проходит по основному руслу, а большая часть проходит по рукаву Борча.

* Sans le débit du Donau-Kanal (environ 70 m^3/s)

** Cote absolue du "0" de la st. h. au-dessus du niveau de la mer Noire (Varna)

*** Cote absolue du "0" de la st. h. au-dessus du niveau de la mer Noire (Sulina)

**** Dans le profil de jauge de la station hydrométrique Cernavoda seule une partie du débit s'écoule par le lit principal, la majeure partie s'écoule à travers le Bras Borcea.

Приложение № 2

Отметки высокого судоходного и максимального уровней воды по основным водомерным постам на судоходной части Дуная от Регенсбурга до Сулины

Наименование водомерного поста	Расстояние от Сулины	Расход воды, отвечающий высокому судоходному уровню воды	Отметка уровня воды над "0" в/п: высокого судоходного уровня воды	Отметка уровня воды над "0" в/п: максимального (без ледовых явлений)	Разница между максимальным уровнем (без ледовых явлений) и ВСУ
	км	$м^3$/сек	см	см	см
1. Швабельвейс	2376,10	1 378	519	656	137
2. Хофкирхен	2256,90	1 815	508	698	190
3. Линц	2135,20	3 691	556	962	406
4. Штейн-Кремс	2002,69	4 820	595	896	301
5. Вена-Рейхсбрюкке	1929,10	5 167	618	861	243
6. Братислава	1868,80	5 470	693	984	291
7. Комарно	1767,05	5 880	597	782	185
8. Надьмарош	1694,60	5 736	494	682	188
9. Будапешт	1646,50	5 882	660	845	185
10. Дунайварош	1580,60	5 673	548	731	183
11. Мохач	1446,80	5 152	739	984	245
12. Бездан	1425,50	5 364	596	776	180
13. Богоево	1367,30	6 202	635	817	182
14. Ново Село	833,60	12 623	784	826	42
15. Лом	743,30	12 045	795	842	47
16. Оряхово	678,00	12 491	"	713	"
17. Сомовит	607,70	12 850	744	796	52
18. Свиштов	554,30	13 551	782	814	32
19. Русе	495,60	13 826	783	820	37
20. Олтеница	429,75	13 593	690	784	94
21. Силистра	375,50	13 711	717	742	25
22. Чернавода	300,00	6 266*	588	697	109
23. Рени	126,00	12 571	465	490	25
24. Тульча	71,30	10 898	335	477	142
25. Килия **	44,20	7 057	463	491	28

* В створе в/п Чернавода основным руслом проходит только часть расходов воды, большая часть проходит рукавом Борча.

** В/п Килия расположен в Килийском гирле, километраж указан по Килийскому гирлу.

Cotes du haut-niveau navigable et du niveau d'eau maximum d'après les principales stations hydrométriques situées sur le parcours navigable du Danube de Regensburg à Sulina

N° d'ordre	Station hydrométrique	Distance de Sulina	Débit d'eau correspondant au haut-niveau navigable	Cote du niveau d'eau au-dessus du "0" de la station hydrométrique		Différence entre le niveau maximum (sans glace) et le haut-niveau navigable
				Haut-niveau navigable	maximum (sans glace)	
		km	m^3/s	cm	cm	cm
1.	Schwabelweis	2376,10	1.378	519	656	137
2.	Hofkirchen	2256,90	1.815	508	698	190
3.	Linz	2135,20	3.691	556	962	406
4.	Stein-Krems	2002,69	4.820	595	896	301
5.	Wien-Reichsbrücke	1929,10	5.167	618	861	243
6.	Bratislava	1868,80	5.470	693	984	291
7.	Komàrno	1767,05	5.880	597	782	185
8.	Nagymaros	1694,60	5.736	494	682	188
9.	Budapest	1646,50	5.882	660	845	185
10.	Dunaujvàros	1580,60	5.673	548	731	183
11.	Mohàcs	1446,80	5.152	739	984	245
12.	Bezdan	1425,50	5.364	596	776	180
13.	Bogojevo	1367,30	6.202	635	817	182
14.	Novo Selo	833,60	12.623	784	826	42
15.	Lom	743,30	12.045	795	842	47
16.	Oriahovo	678,00	12.491	..	713	..
17.	Somovit	607,70	12.850	744	796	52
18.	Svistov	554,30	13.551	782	814	32
19.	Roussé	495,60	13.826	783	820	37
20.	Olteniţa	429,75	13.593	690	784	94
21.	Silistra	375,50	13.711	717	742	25
22.	Cernavoda	300,00	6.266*	588	697	109
23.	Réni	126,00	12.571	465	490	25
24.	Tulcea	71,30	10.898	335	477	142
25.	Kilia**	44,20	7.057	463	491	28

* Dans la section de jauge de la station hydrométrique Cernavoda, seule une partie du débit s'écoule par le lit principal, la majeure partie s'écoule à travers le bras Borcea.

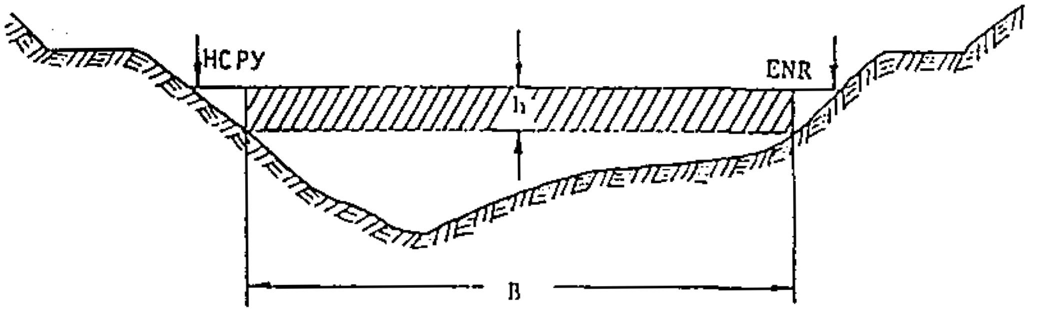
** La station hydrométrique Kilia est située dans le bras de Kilia; le kilomètre indiqué est celui du bras de Kilia.

Приложение № 3

Annexe N° 3

ПОПЕРЕЧНЫЙ ПРОФИЛЬ РУСЛА РЕКИ

PROFIL TRANSVERSAL DU LIT

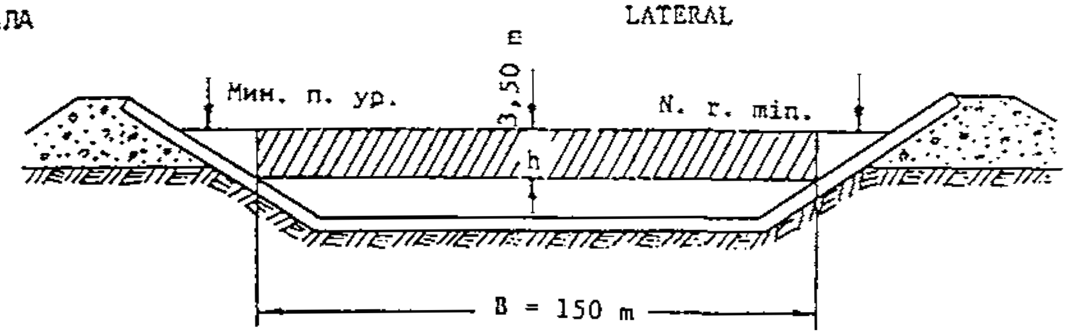


h - Минимальная глубина фарватера
B - Минимальная ширина фарватера

h - Profondeur minima du chenal
B - Largeur minima du chenal

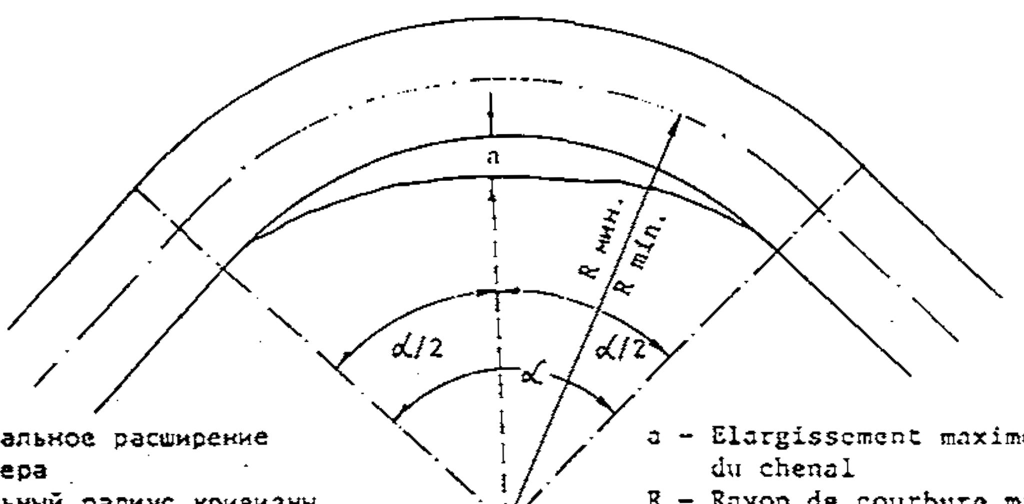
ПОПЕРЕЧНЫЙ ПРОФИЛЬ ЛАТЕРАЛЬНОГО КАНАЛА

PROFIL TRANSVERSAL DU CANAL LATERAL



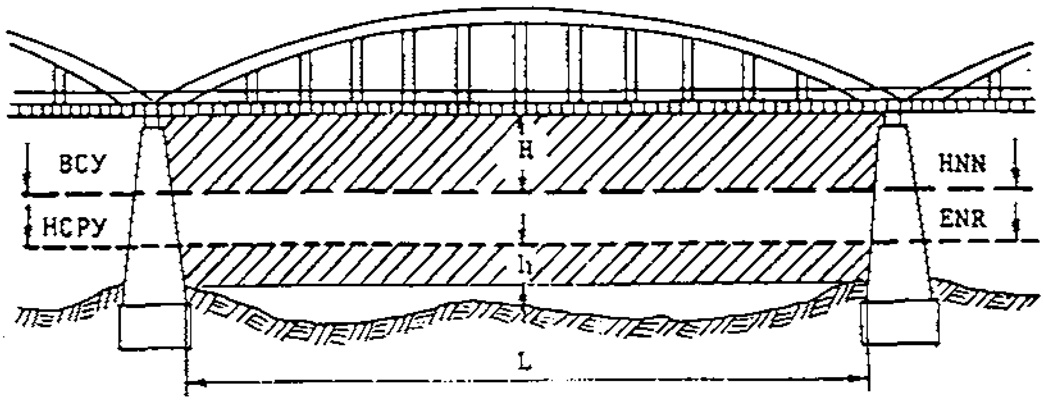
h - Минимальная глубина фарватера
B - Минимальная ширина фарватера

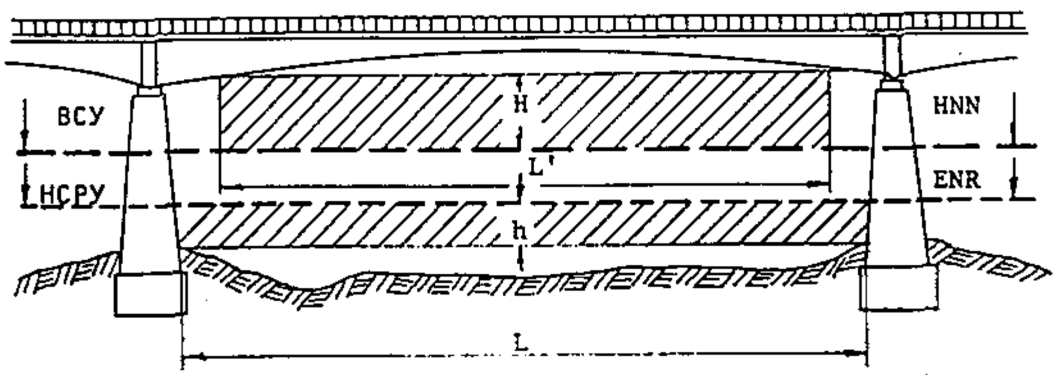
h - Profondeur minima du chenal
B - Largeur minima du chenal



a - Максимальное расширение фарватера
R - Минимальный радиус кривизны
α - Центральный угол

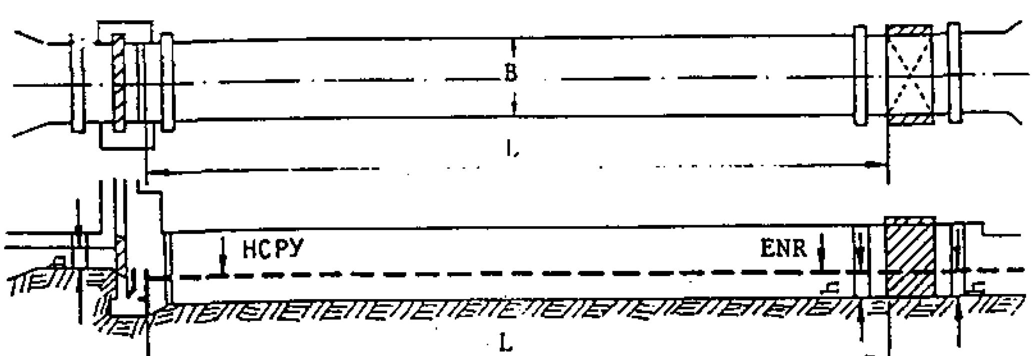
a - Elargissement maximum du chenal
R - Rayon de courbure mini
α - Angle au centre





L - Полезная ширина судоходного пролета моста
H - Полезная высота судоходного пролета моста
h - Минимальная глубина фарватера
L' - Полезная ширина судоходного пролета моста по хорде арки

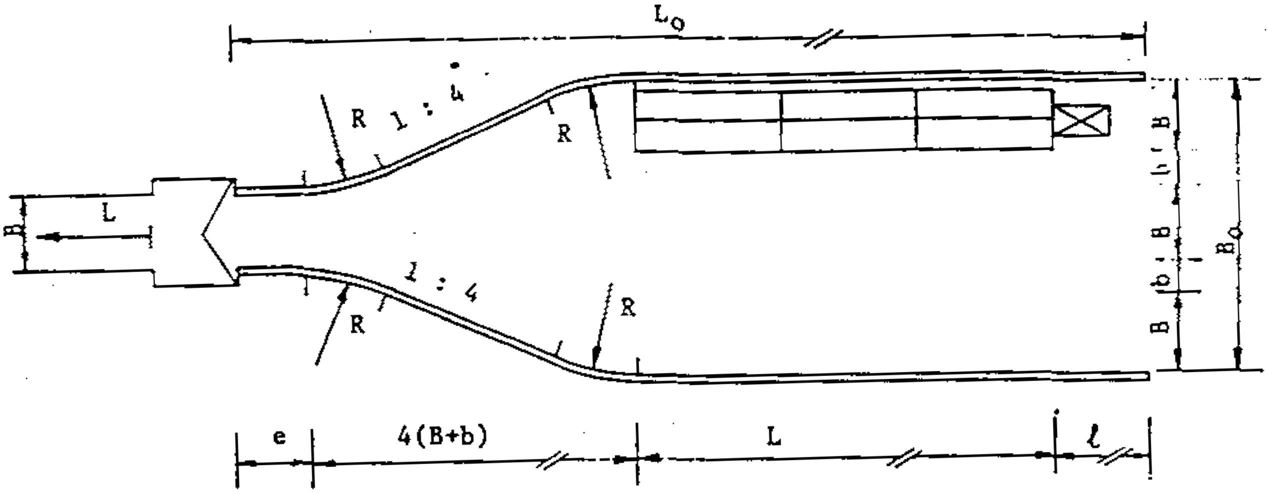
L - Largeur libre de la passe navigable
H - Hauteur libre de la passe navigable
h - Profondeur minima du chenal
L' - Largeur libre de la passe navigable d'après la corde de l'arche



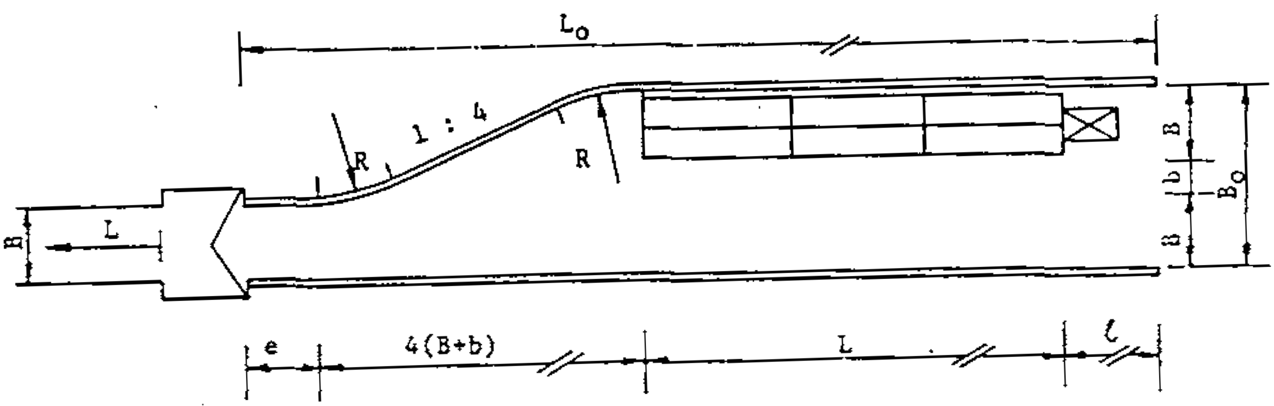
L - Полезная длина шлюза
B - Полезная ширина шлюза
h - Глубина на пороге шлюза

L - Longueur utile de l'écluse
B - Largeur utile de l'écluse
h - Profondeur au seuil de l'écluse

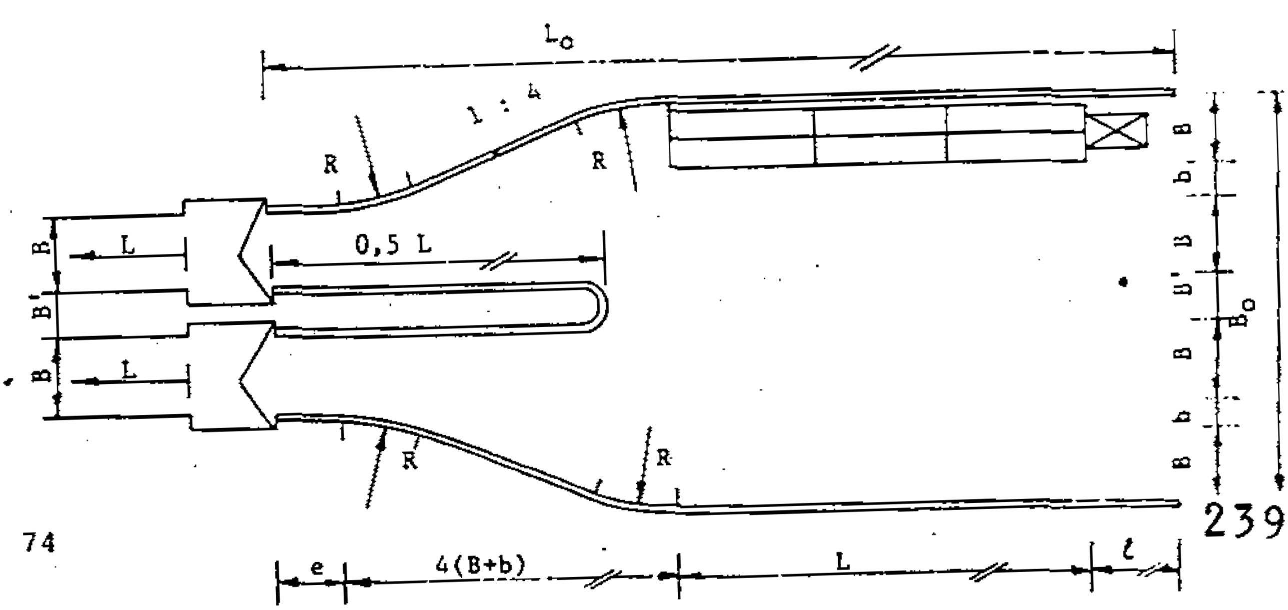
6.1.1. Симметричный аванпорт однониточного шлюза
Avant-port symétrique d'une écluse simple



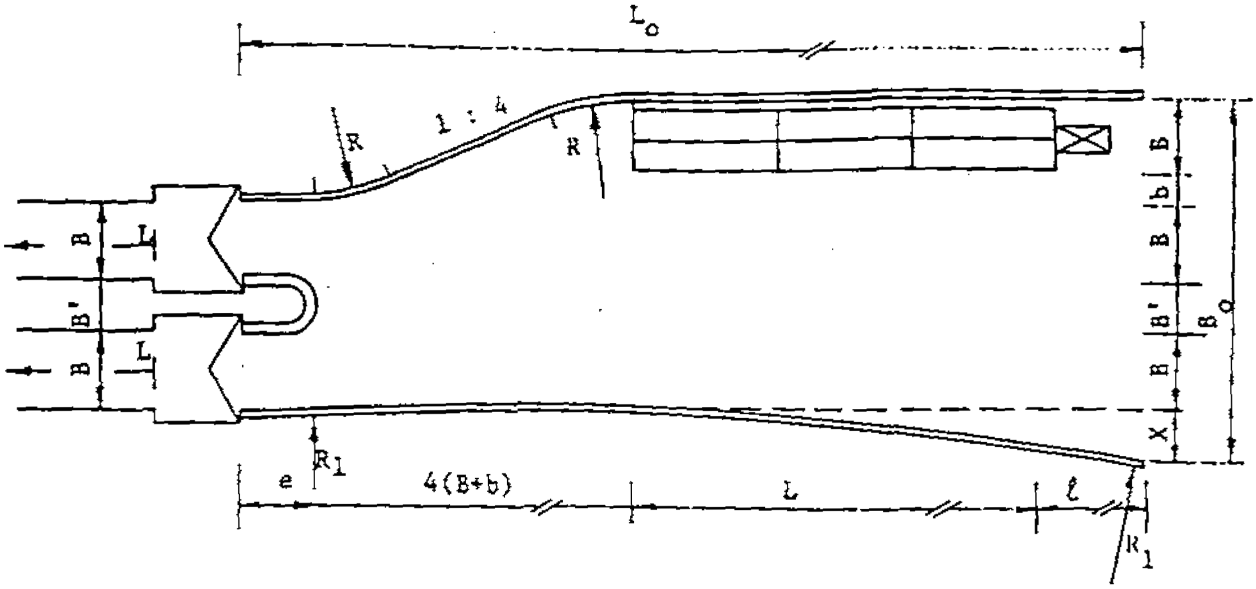
6.1.2. Несимметричный аванпорт однониточного шлюза
Avant-port asymétrique d'une écluse simple



6.1.3. Симметричный аванпорт двухниточного шлюза
Avant-port symétrique d'une écluse à sas accolés

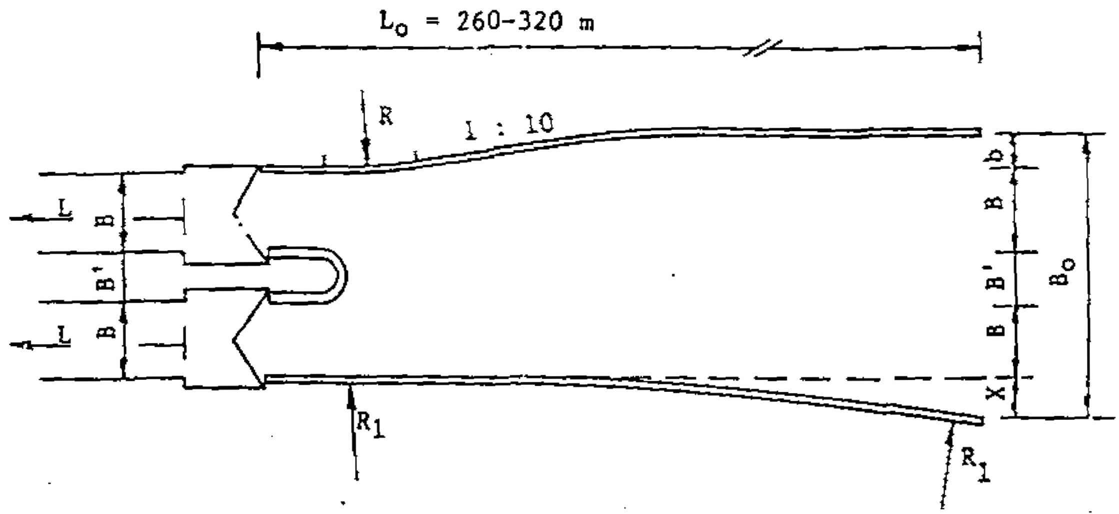


6.1.4. Несимметричный аванпорт двухниточного шлюза
Avant-port asymétrique d'une écluse à sas accolés

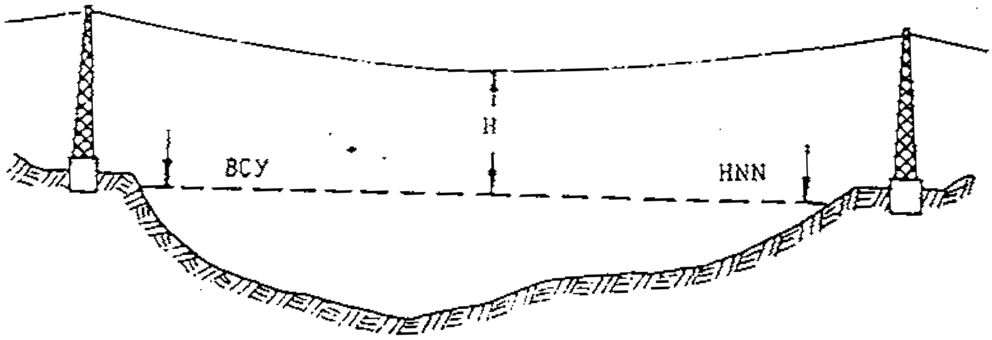


6.1.5. Несимметричный аванпорт двухниточного шлюза, не предназначенный для стоянки судов (австрийский участок)

Avant-port asymétrique d'une écluse à sas accolés, non destiné au stationnement des bâtiments (secteur autrichien)

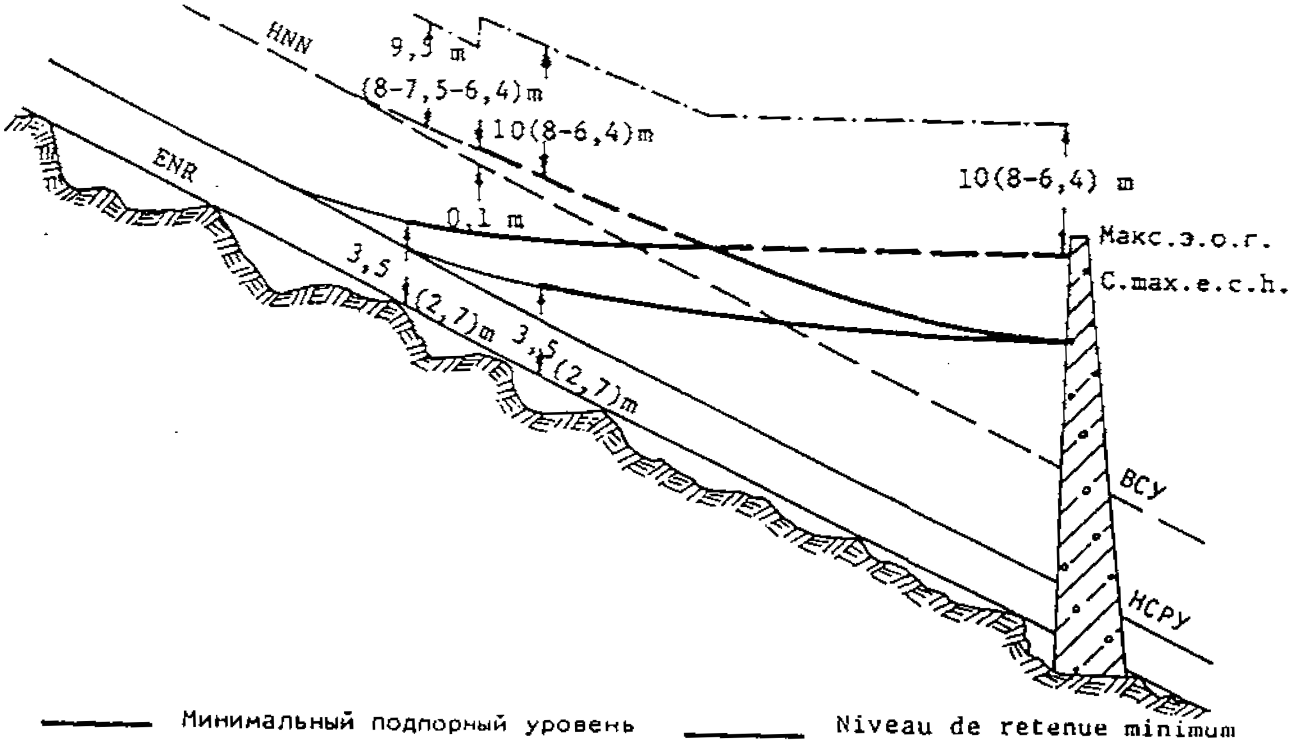


Приложение № 7 Annexe N° 7



H - Полезная высота воздушных линий H - Hauteur libre des câbles aériens

ПОДПОРНЫЕ УРОВНИ NIVEAU DE RETENUE



————	Минимальный подпорный уровень	————	Niveau de retenue minimum
— — —	Максимальный подпорный уровень	— — —	Niveau de retenue maximum
НСРУ	Низкий судоходный и регуляционный уровень	ENR	Etiage navigable et de régularisation
ВСУ	Высокий судоходный уровень	HNN	Haut niveau navigable
—·—·—	Минимальная высота судоходного пролета моста	—·—·—	Hauteur minima d'une passe navigable

Макс.э.о.г.-Максимальная эксплуатационная отметка гидроузла

C.max. e.c.h. Cote maximum d'exploitation d'une centrale hydraulique

Приложение № 8/а

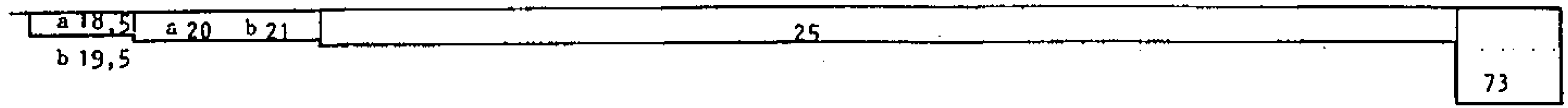
Annexe N° 8/a

СХЕМАТИЧЕСКОЕ ПРЕДСТАВЛЕНИЕ ГАБАРИТОВ

PRESENTATION SCHEMATIQUE DES GABARITS

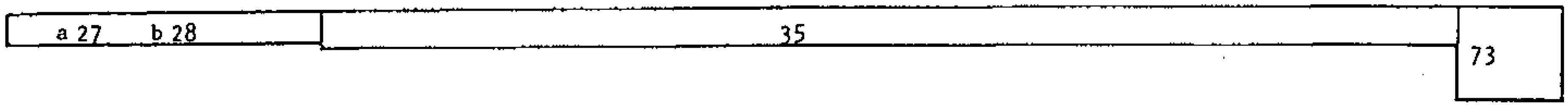
Минимальная глубина на участках со свободным течением, в дм

Profondeur minima sur les sections à courant libre, en dm



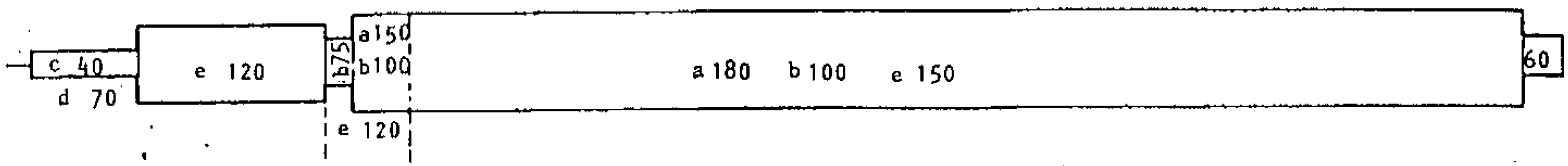
Минимальная глубина на подпорных участках, в дм

Profondeur minima sur les sections de retenue, en dm



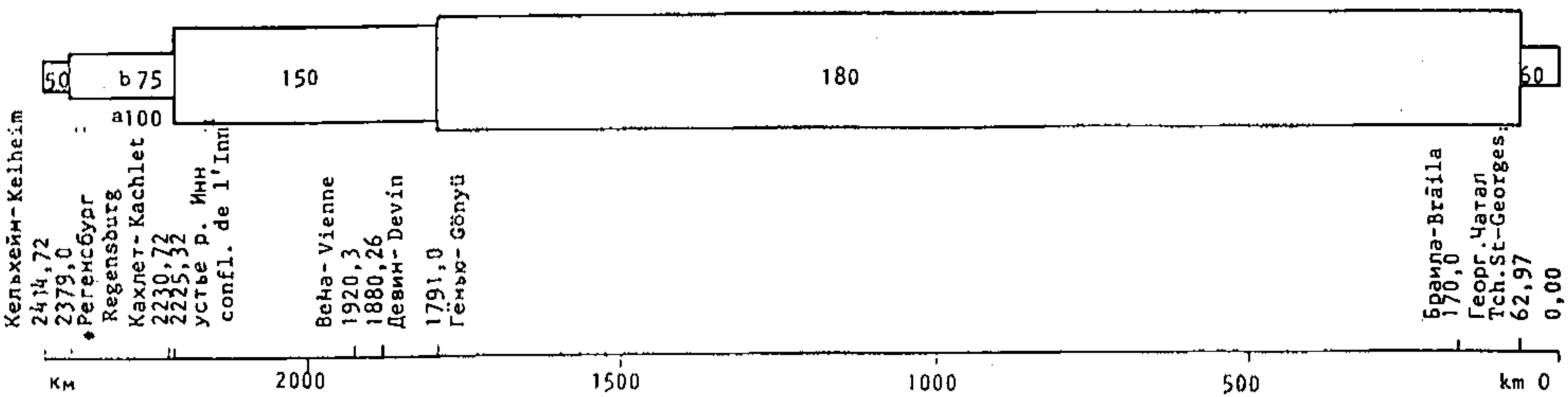
Минимальная ширина на участках со свободным течением, в м

Largeur minima sur les sections à courant libre, en m



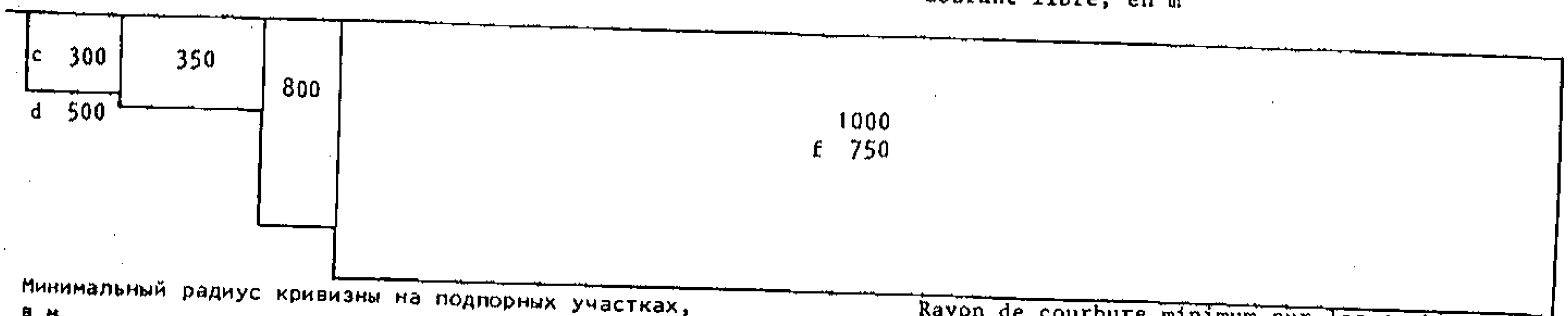
Минимальная ширина на подпорных участках, в м

Largeur minima sur les sections de retenue, en m



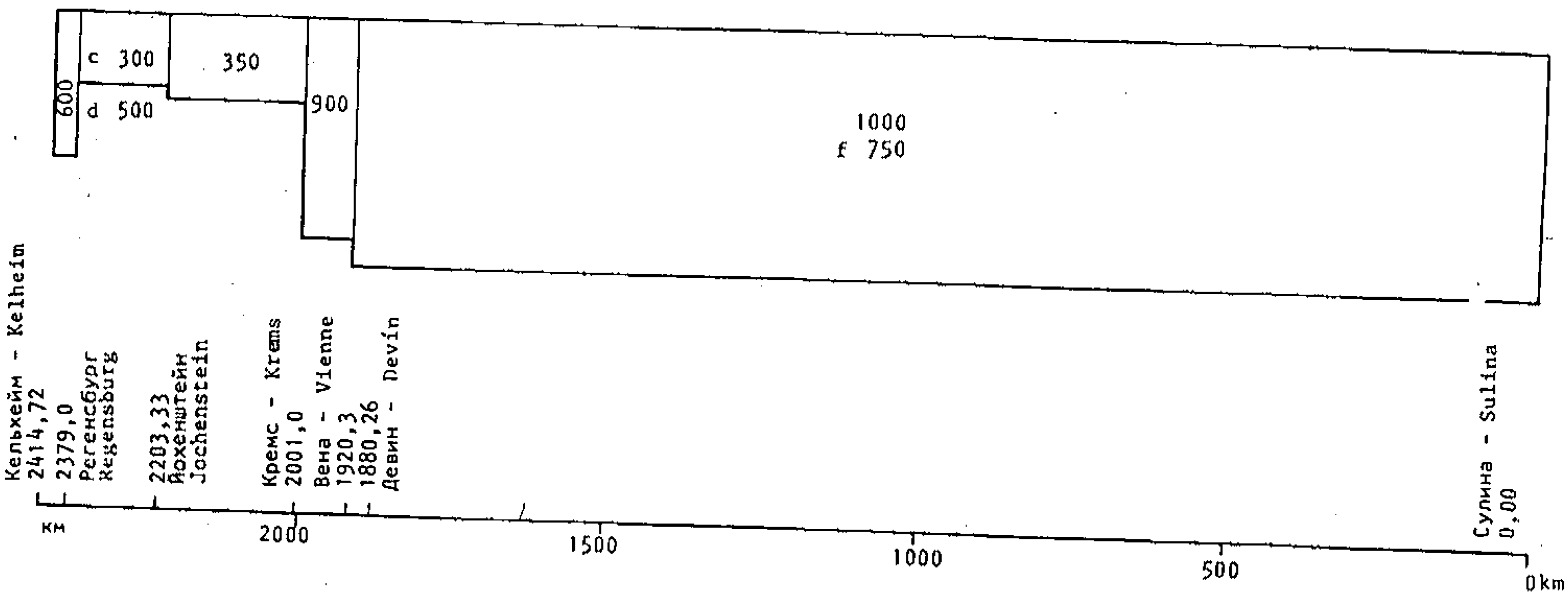
Минимальный радиус кривизны на участках со свободным течением, в м

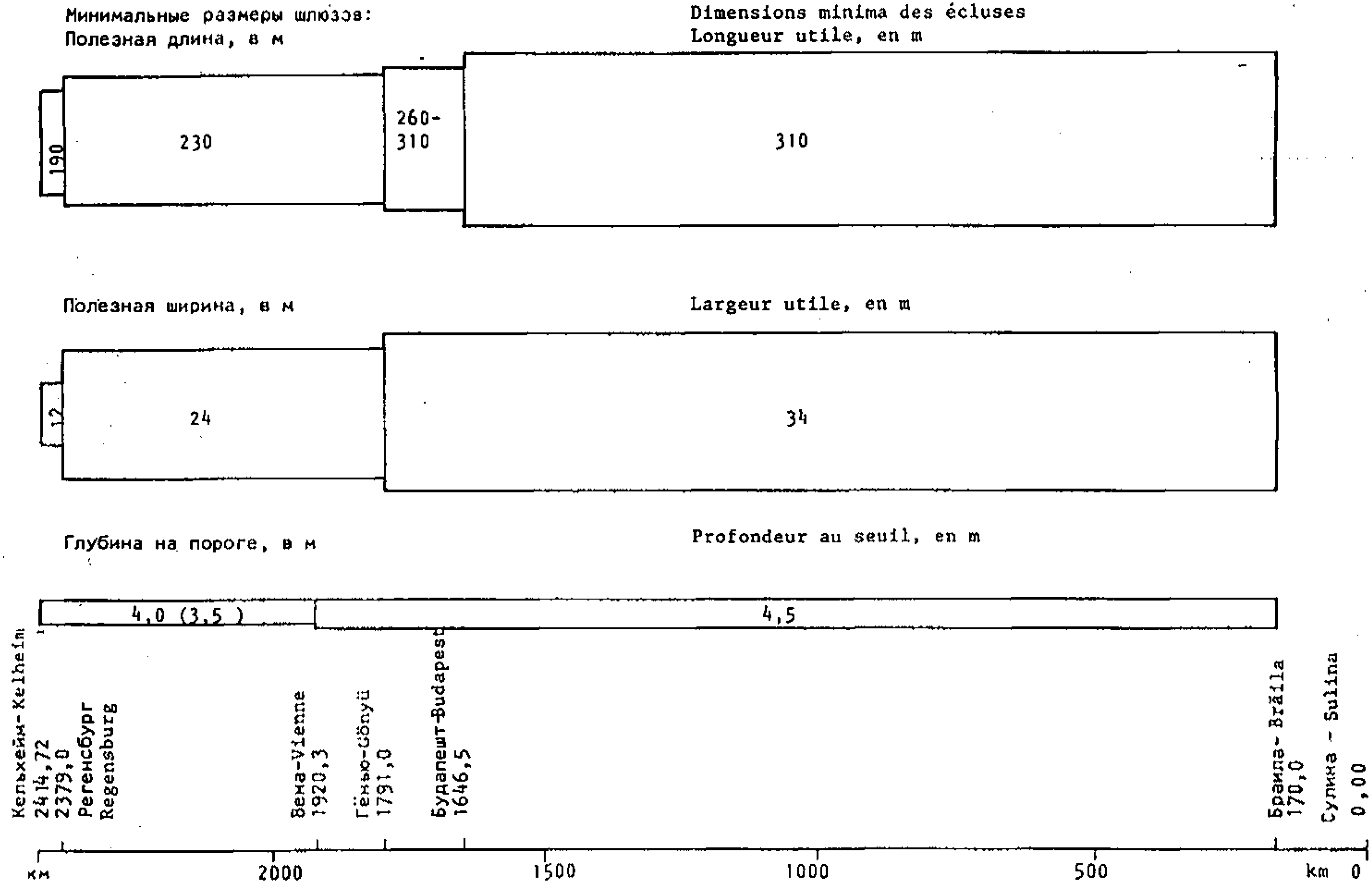
Rayon de courbure minimum sur les sections à courant libre, en m



Минимальный радиус кривизны на подпорных участках, в м

Rayon de courbure minimum sur les sections de retenue, en m




Минимальные размеры шлюзов:
Полезная длина, в м
Dimensions minima des écluses
Longueur utile, en m
190
230
260-310
310
Полезная ширина, в м
Largeur utile, en m
12
24
34
Глубина на пороге, в м
Profondeur au seuil, en m
4,0 (3,5)
4,5
Кельхейм-Kelheim 2414,72
2379,0 Регенсбург Regensburg
Вена-Vienne 1920,3
Гёнью-Gönyü 1791,0
Будапешт-Budapest 1646,5
Браила- Brăila 170,0
Сулина - Sulina 0,00
км
2000
1500
1000
500
km 0

Приложение № 8/d

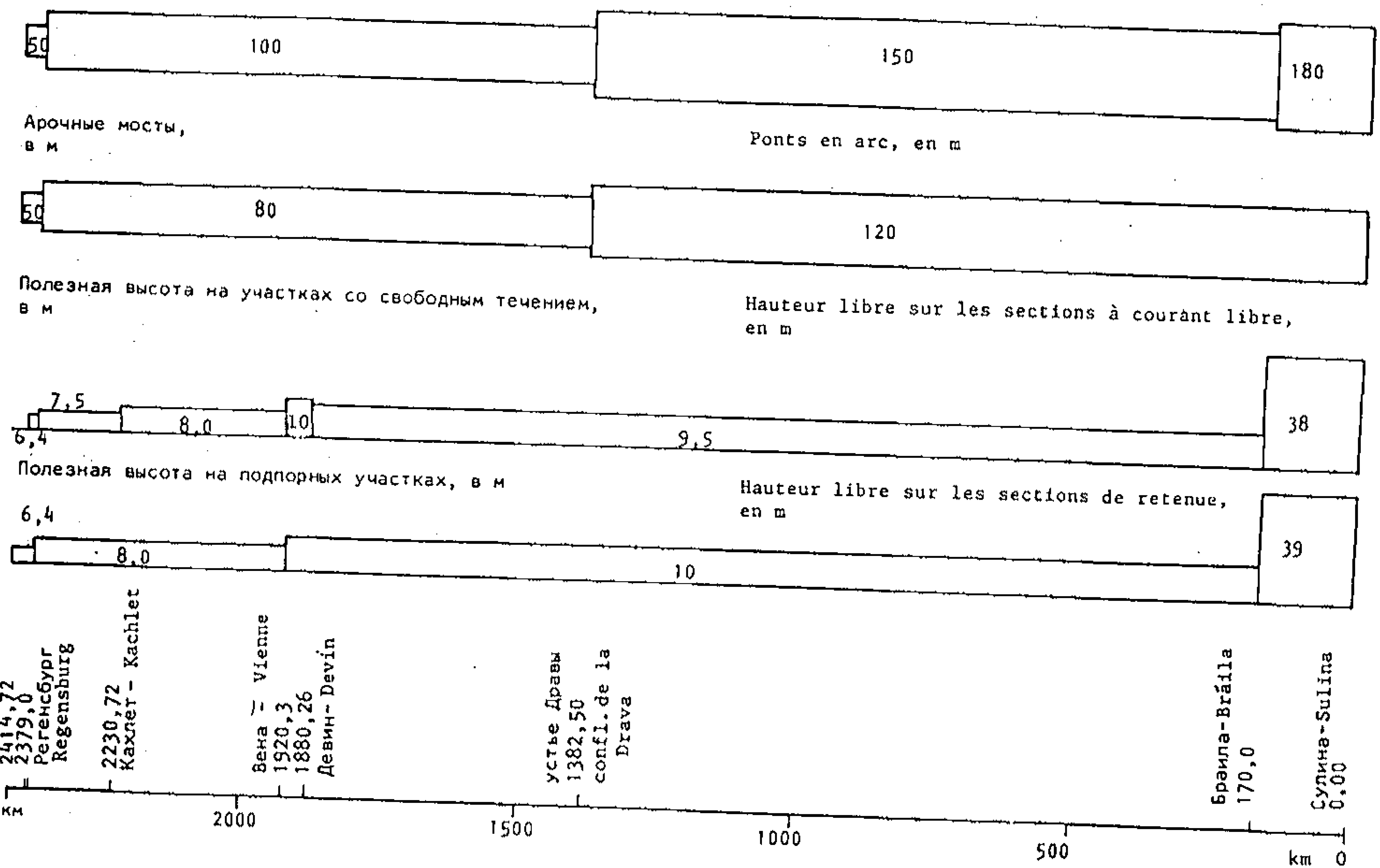
Annexe N° 8/d

Минимальные габариты судоходных пролетов мостов

Gabarits minima des passes navigables des ponts

Полезная ширина, в м

Largeur libre, en m



Приложение № 8/e

Annexe N° 8/e

Полезная высота воздушных линий, переброшенных через реку

Hauteur libre des câbles aériens traversant le fleuve

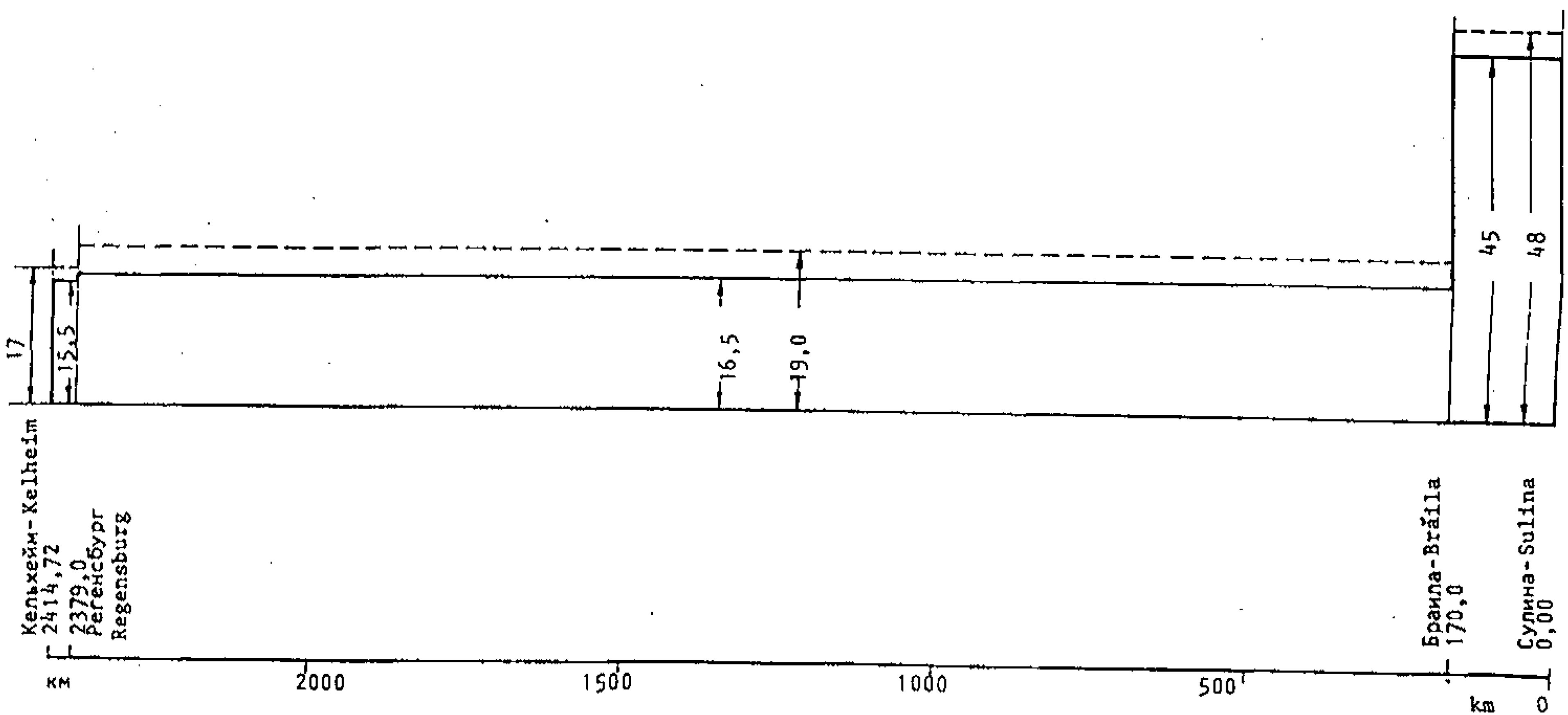


TABLE DES MATIERES

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Annex No. 15

(Without appendices)

Commission du Danube

Cinquante-et-unième session

Rapport de la réunion d'experts pour les questions techniques, 7-15 décembre 1992

CD/SES 51/11

COMMISSION DU DANUBE

(RE Tech. déc. 1992)

Cinquante-et-unième session

RAPPORT

de la réunion d'experts pour les questions techniques

(7 - 15 décembre 1992)

La réunion d'experts pour les questions techniques (ci-après: "la réunion") convoquée en vertu du point 12 du Plan de travail de la Commission du Danube pour 1992-1993 a tenu ses séances du 7 au 15 décembre 1992.

Ont participé aux travaux de la réunion des experts de l'Autriche , de la Bulgarie, de la Hongrie, de la Roumanie, de la Russie, de la Tchécoslovaquie, de l'Ukraine et de la Yougoslavie. Ont pris part également aux travaux de la réunion le représentant de la Commission Economique pour l'Europe de l'ONU ainsi qu'un expert du Ministère des Transports de la République Fédérale d'Allemagne (Annexe 1).

De la part du Secrétariat de la Commission du Danube ont participé à la réunion MM. Strasser, Balasoiu, Moraliyski, Szathmáry, Vorontzov, Naskovic. Cibak. Pavlovic. Mme Svehlova, MM. Jivodinov, Marton.

La réunion a été ouverte par le Vice-Président de la Commission du Danube, Monsieur Chmel, qui a souligné l'importance que présentent pour la navigation danubienne les questions examinées par la réunion ainsi que leur influence positive sur la garantie de la navigation sur tout le parcours de la liaison Rhin-Main-Danube. Il a souhaité aux experts de grands succès dans leurs travaux.

Sur la proposition de Mme Cucu (Roumanie), soutenue par M. Kelle (Tchécoslovaquie), M. Veressotski (Russie) a été élu président de la réunion.

Sur la proposition de M. Veressotski (Russie), M. Kelle (Tchécoslovaquie) a été élu vice-président de la réunion.

La réunion a adopté l'ordre du jour suivant:

a) Examen des avis et des propositions des autorités compétentes des pays danubiens au sujet de l'amélioration des conditions de navigation et du balisage du Danube.

b) Examen des avis des autorités compétentes des pays danubiens au sujet de la mise en vigueur du Certificat de bateau unifié en voie d'élaboration à la CEE de l'ONU.

c) Examen des Informations du Secrétariat de la Commission du Danube préparées sur la base des données reçues des autorités compétentes des pays danubiens sur les questions suivantes:

- Mise en vigueur des "Recommandations relatives à la formation des conducteurs de bâtiment et à la délivrance des brevets pour la navigation internationale sur le Danube";

- Mise en vigueur sur leurs secteurs de fleuve des nouvelles Règles de navigation basées sur les nouvelles "Dispositions Fondamentales relatives à la Navigation sur le Danube" adoptées par la Quarante-huitième session de la Commission du Danube;

d) Examen de la version réélaborée du Guide des bateliers, Tome II, dans le but de le perfectionner et de le rééditer.

e) Examen du projet de propositions des pays danubiens et des Administrations fluviales spéciales relatives à l'établissement du projet de Plan des grands travaux pour la période 1991-2000, visant l'obtention des gabarits du chenal, des ouvrages hydrotechniques et autres recommandés sur le Danube.

f) Examen du projet préliminaire du "Rapport sur le régime des glaces du Danube pour la période 1900-1960-1985", préparé par le Secrétariat.

g) Examen des avis et propositions des autorités compétentes des pays danubiens sur le perfectionnement de l'Annuaire statistique de la Commission du Danube et du projet d'Annuaire statistique. Examiner en même temps que le projet de l'annuaire les propositions des experts de la Hongrie concernant la nouvelle nomenclature des marchandises qui seront fournies jusqu'au 15 juillet 1992.

h) Examen des problèmes actuels de la navigation internationale danubienne à la suite de la mise en oeuvre de la construction de l'ouvrage hydrotechnique de Gabčikovo.

Lors de l'examen de l'Ordre du jour et du Plan de déroulement de la réunion, les délégations d'experts de la Hongrie et de la Tchécoslovaquie ont informé les participants à la réunion qu'elles présenteraient à l'examen de la réunion des informations sur le point h), en russe et en français.

En même temps la délégation d'experts de la Tchécoslovaquie a informé la réunion que le 12 décembre 1992 la partie tchécoslovaque organisait pour les participants de la réunion un voyage à Gabčikovo afin de visiter les installations hydrotechniques et de navigation du complexe.

ad point a) de l'Ordre du jour la réunion a examiné les informations reçues des autorités compétentes de la Bulgarie, de la Roumanie, de la Tchécoslovaquie, de l'Ukraine et de la Yougoslavie, en conformité avec le point 4 du Plan de travail pour 1992/1993 concernant les conditions de navigation et du balisage sur le Danube ainsi que les mesures prises en vue de leur amélioration.

Les experts de l'Autriche ont présenté à la réunion une information concernant leur secteur.

La réunion a pris note du fait que les autorités compétentes de tous les pays danubiens ont pris les mesures appropriées en vue de l'amélioration des conditions de la navigation et a relevé en même temps les difficultés toujours croissantes dans la garantie de la navigation en toute sécurité, allant jusqu'à l'interruption totale de la navigation sur une série de secteurs du Danube.

La réunion a noté que ces dernières années sur les secteurs non éclusés du Danube, surtout dans des conditions de basses-eaux dues à la sécheresse, les gabarits effectifs du chenal ne répondaient pas pendant 100 à 200 jours par an à ceux exigés par les "Recommandations relatives à l'établissement des gabarits du chenal, des ouvrages hydrotechniques et autres sur le Danube" de la Commission du Danube surtout en ce qui concerne les profondeurs.

Pendant la période de bas niveaux sur une série de seuils (y compris dans le secteur Bratislava - Nagymaros) les profondeurs minima étaient jusqu'à 13 - 14 dm.

La réunion attire l'attention de la Commission du Danube sur le fait que suite à l'ouverture du canal Main - Danube les profondeurs insuffisantes sur le Danube limiteront la navigation sur tout le parcours de la liaison Rhin - Main - Danube.

La réunion prie avec insistance la Cinquante-et-unième session de recommander aux autorités compétentes des pays danubiens de prendre les mesures nécessaires en vue d'une amélioration des conditions de la navigation sur le Danube en conformité avec l'article 3 de la Convention relative au régime de la navigation sur le Danube (Belgrade, 1948) et avec les "Recommandations relatives à l'établissement des gabarits du chenal, des ouvrages hydrotechniques et autres sur le Danube" adoptées par la Commission du Danube.

Dans le cas contraire, en raison des profondeurs insuffisantes, sous peu le trafic fluvial ne saura faire concurrence aux autres modes de transport.

La réunion prie les autorités compétentes des pays danubiens d'examiner et d'adopter si possible les propositions concrètes qui ont été faites en vue de l'amélioration des conditions de navigation et du balisage sur les différents secteurs et d'informer la Commission du Danube des résultats obtenus.

Lors de l'examen de ce point, les experts de la Tchécoslovaquie ont informé la réunion que sur le secteur éclusé entre Bratislava et Palkovičovo, suite à l'achèvement de la construction de l'ouvrage hydrotechnique de Gabčikovo, les conditions de navigation se sont améliorées, les gabarits recommandés par la Commission du Danube pour les secteurs éclusés étant atteints.

Dans ce contexte, les experts de la Hongrie ont attiré l'attention sur la partie de l'Information transmise par eux ad point h) de l'Ordre du jour de la réunion d'experts et concernant cette question.

La réunion a considéré utile de garder à l'avenir aussi cette question à l'ordre du jour de la réunion d'experts pour les questions techniques.

ad point b) de l'Ordre du jour la réunion a examiné les avis des autorités compétentes des pays danubiens concernant la question de la mise en vigueur sur le Danube du Certificat de bateau unifié élaboré à la CEE de l'ONU par le Groupe de travail principal des transports par voie navigable de la CEE de l'ONU en même temps que la Résolution N° 33 du 10 novembre 1992 à ce sujet.

La réunion a relevé que le Certificat de bateau de la CEE de l'ONU fournit des informations plus complètes concernant le bâtiment, correspond dans une mesure importante au Certificat de visite utilisé sur le Rhin et contient en même temps les données principales présentées par l'Attestation de bord actuellement en vigueur sur le Danube.

La réunion recommande à la Cinquante-et-unième session de la Commission du Danube d'adopter pour les bâtiments naviguant sur le Danube la nouvelle forme de Certificat de bateau élaborée par la CEE de l'ONU (Annexe 2) à la place de l'Attestation de bord en vigueur actuellement sur le Danube et adoptée en 1961 par Décision de la Dix-neuvième session de la Commission du Danube (doc. CD/SES 19/31).

En même temps, la réunion considère utile que le Secrétariat de la Commission du Danube poursuive ses contacts avec la Commission Centrale pour la Navigation du Rhin et dans le cadre de la CEE ONU, afin de trouver les voies pour une reconnaissance réciproque des Certificats de bateau délivrés aux bâtiments sur le Danube et sur le Rhin.

La réunion recommande, en cas de l'accord de la Cinquante-et-unième session de la Commission du Danube, de procéder à des pourparlers entre les Secrétariats de la Commission du Danube et de la Commission Centrale pour la Navigation du Rhin en vue de l'examen de la question susmentionnée en réunion d'experts commune.

Dans le contexte de l'examen de ce point de l'Ordre du jour, la réunion a exprimé sa satisfaction du fait qu'en préparant cette question en vue de son examen par la réunion, le Secrétariat ait envoyé aux pays membres de la Commission du Danube une grande quantité de documents de référence traitant des prescriptions en vigueur dans le domaine de la navigation sur le Rhin et sur d'autres voies navigables ouest-européennes ainsi que les modèles de divers certificats.

Lors de l'examen de ce point le représentant du Secrétariat de la CEE de l'ONU a présenté une information sur les travaux accomplis par la CEE de l'ONU en vue de l'unification future, au niveau paneuropéen, des exigences à l'égard des bâtiments de navigation intérieure.

ad point c) de l'Ordre du jour la réunion a examiné les informations préparées sur la base des données fournies par les autorités compétentes des pays danubiens et concernant

- la mise en vigueur des "Recommandations relatives à la formation des conducteurs de bâtiment et à la délivrance des brevets pour la navigation internationale sur le Danube";

- la mise en vigueur sur leurs secteurs de fleuve des nouvelles Règles de navigation basées sur les nouvelles "Dispositions fondamentales relatives à la Navigation sur le Danube" adoptées par la Quarante-huitième session de la Commission du Danube.

La réunion a pris note des informations préparées par le Secrétariat de la Commission du Danube et a considéré nécessaire de poursuivre le travail concernant ce point.

Compte tenu du fait que la Résolution N° 31 concernant les "Recommandations sur les prescriptions minimales relatives à la délivrance des certificats de conducteur de bateau de navigation intérieure en vue de la reconnaissance réciproque dans le trafic international" a été adoptée le 10 novembre 1992 au sein de la CEE/ONU, les experts ont estimé utile de prévoir dans le Plan de travail de la Commission pour 1993/1994 un point concernant la mise en vigueur sur le Danube des dispositions de cette Résolution ainsi que des Recommandations y annexées.

Ayant en vue la Décision de la Cinquantième session de la Commission du Danube, la réunion estime également opportun de recueillir de la part des autorités compétentes des pays danubiens jusqu'au 1er mars 1993 des informations relatives aux conditions sous lesquelles elles reconnaissent les brevets de conducteur de bateau des pays non danubiens.

Il est nécessaire de faire examiner les informations reçues par le groupe de travail pour les questions techniques de la Cinquante-et-unième session et d'élaborer une approche unitaire de ce problème.

Lors de l'examen de la question de la mise en vigueur de la nouvelle rédaction des DFND, les experts ont considéré qu'il serait utile d'examiner également à la prochaine réunion d'experts pour les questions techniques les différences existant entre les dispositions des articles des DFND et du RPNR, en premier lieu en ce qui concerne la signalisation des bâtiments et de la voie navigable.

La réunion a constaté que les pays ont adopté, sur la base des nouvelles Dispositions Fondamentales relatives à la Navigation sur le Danube, les nouveaux règlements de navigation sur leurs secteurs de fleuve qui ont été mis en vigueur au début de 1992.

Les experts ont considéré également nécessaire de confier au Secrétariat la tâche de poursuivre les contacts avec le Secrétariat de la CCNR au sujet de la reconnaissance mutuelle des attestations délivrées aux conducteurs de bâtiments et d'en informer les pays membres de la Commission.

ad point d) de l'Ordre du jour la réunion a examiné le projet préparé par le Secrétariat de la variante réélaborée du Guide des bateliers, tome II.

En conformité avec la décision de la Cinquantième session, il était prévu de perfectionner le Guide et de le rééditer à l'avenir, étant donné que son tirage est à l'heure actuelle totalement épuisé.

Le grand travail effectué par le Secrétariat en vue de la préparation du projet de Guide a été souligné.

La version révisée du Guide est préparée sur la base du schéma de l'ancienne édition et selon ce schéma, en tenant compte des précisions et des complètements reçus des autorités compétentes de la Bulgarie, de la Roumanie, de la Tchécoslovaquie et de l'Ukraine.

Ont été également utilisées dans le Guide les données nécessaires extraites du Routier du Danube, édition 1989, des nouvelles Cartes de pilotage du Danube ainsi que de l'Album des ponts, qui est prêt pour l'édition.

La réunion a procédé à une discussion de caractère général sur le projet du Guide, au cours de laquelle il a été noté que le Guide ne reflétait pas dans une mesure suffisante les changements qui se sont produits sur le Danube, étant donné que les pays n'ont pas tous communiqué les données relatives à la situation des conditions de navigation. Dans ce contexte, de l'avis de toute une série d'experts, le travail sur le Guide doit être poursuivi.

Les experts de la Yougoslavie ont relevé de ce fait que de leur avis la publication d'un tel Guide dans le cadre de la Commission du Danube n'est pas obligatoire, étant donné que pratiquement il contient seulement les matériaux du Routier du Danube et d'une série d'autres documents à caractère juridique déjà édités.

Toutefois, tenant compte des décisions déjà prises par les sessions de la Commission du Danube, la réunion a considéré que le travail sur le Guide devait être poursuivi et prie les autorités compétentes des pays danubiens d'envoyer au Secrétariat jusqu'au 30 juin 1993 leurs propositions à ce sujet.

La réunion recommande à la Cinquante-et-unième session de la Commission de prévoir dans le Plan de travail de la Commission du Danube pour 1993 1994 l'examen supplémentaire à la prochaine réunion d'experts pour les questions techniques du projet de Guide précisé et complété par les documents nouvellement reçus de la part des pays.

Dans ce contexte, il a été relevé qu'il est indispensable de présenter en tant qu'annexes au Guide les nouveaux textes des Recommandations relatives aux surveillances douanière, sanitaire, vétérinaire et phytosanitaire sur le Danube ainsi que les Règles de la surveillance fluviale sur le Danube.

ad point e) de l'Ordre du jour la réunion a examiné l'Information préparée par le Secrétariat de la Commission du Danube sur les propositions des pays danubiens et des Administrations fluviales spéciales relatives à l'établissement du projet de Plan des grands travaux pour la période 1991-2000, visant l'obtention des gabarits du chenal, des ouvrages hydrotechniques et autres recommandés sur le Danube.

Au cours de leurs travaux les experts ont formulé une série d'observations et de propositions essentielles concernant la forme et le contenu de l'Information. La réunion a chargé le Secrétariat de la Commission du Danube de tenir compte des observations énoncées et d'inclure les propositions reçues dans le projet définitif du Plan des grands travaux pour 1991-2000 lors de son élaboration. Le Secrétariat s'est engagé à effectuer les modifications proposées par les experts, autant en ce qui concerne la forme que le contenu.

Pendant les discussions, plusieurs délégations d'experts (Yougoslavie, Tchécoslovaquie) ont relevé que la longue expérience qu'ont acquise leurs pays dans l'exécution des travaux de régularisation sur le Danube a conduit à la constatation que sur les secteurs non éclusés du Danube il est impossible d'obtenir les gabarits de chenal recommandés par la Commission du Danube (profondeur 25 dm et largeur 180 m auprès de l'ENR) et que des profondeurs de 15-20 dm sont garanties avec peine.

En même temps, sur les secteurs éclusés il est possible de garantir des profondeurs de 35 dm même lors de bas niveaux de retenue, ce qui était d'ailleurs prévu par le Plan des grands travaux pour 1981-1990 déjà adopté.

La délégation d'experts de la Hongrie a déclaré qu'en ce qui concerne les principaux travaux jusqu'à l'an 2000 elle ne pourra communiquer les données y afférentes qu'après la révision des recommandations périmées de la Commission du Danube relatives aux gabarits du chenal sur la base de la nouvelle classification des voies navigables adoptée au sein de la CEE de l'ONU, et qu'après avoir convenu avec le Gouvernement tchécoslovaque sur l'éventail des questions découlant de la construction du complexe hydraulique de Gabčíkovo.

La réunion a relevé que la satisfaction des exigences des Recommandations en vigueur relatives à l'établissement des gabarits du chenal, des ouvrages hydrotechniques et autres sur le Danube, constitue la garantie pour que les conditions nécessaires à la navigation soient assurées.

La réunion estime utile de prier la Cinquante-et-unième session de la Commission du Danube de prévoir pour le 1er juillet 1993 le délai de l'achèvement du recueil des propositions et des compléments des pays danubiens pour l'établissement définitif du projet de Plan des grands travaux pour 1991-2000.

La réunion prie la Cinquante-et-unième session de la Commission du Danube de confier au Secrétariat la tâche de préparer le projet définitif du Plan des grands travaux pour la période 1991-2000 et de le soumettre à l'examen définitif de la réunion d'experts pour les questions techniques en décembre 1993, en conformité avec un point pertinent prévu dans le Plan de travail de la Commission du Danube pour la période avril 1993 jusqu'à la Cinquante-deuxième session de la Commission du Danube.

Dans le contexte de la déclaration faite par la délégation hongroise concernant le point e), la délégation tchécoslovaque a relevé ce qui suit:

"1. Dans la déclaration n'est pas indiqué le secteur du Danube (hongrois ou tchécoslovaco-hongrois) auquel se rapportent les données relatives au projet de Plan des grands travaux.

2. A l'issue de l'examen de cette question la réunion d'experts pour les questions techniques tenue en 1991, n'a pas estimé nécessaire de réviser les Recommandations de la Commission du Danube relatives aux gabarits du chenal qui satisfont les exigences actuelles de la navigation. La délégation hongroise n'a pas pu également argumenter sa proposition quant à la nécessité de modifier ces Recommandations.

3. Les questions de la navigation, de la reconstruction des voies d'eau et de l'exécution de travaux hydrotechniques sur le secteur commun tchécoslovaco-hongrois du Danube sont définies dans l'Accord intergouvernemental relatif à la construction et à l'exploitation du Complexe d'ouvrages hydrotechniques de Gabčikovo-Nagymaros de 1977 ainsi que dans l'Accord sur la gestion des eaux sur les secteurs frontaliers de 1976. A l'heure actuelle, les conditions de la navigation sur le secteur Bratislava-Palkovičovo sont résolues au moyen de la construction de la centrale hydraulique de Gabčikovo, mais elles restent complexes et non résolues sur le secteur Palkovičovo - confluent de l'Ipel'.

Suite au refus de la Hongrie de construire la centrale hydraulique de Nagymaros, les conditions sur ce secteur à courant libre du fleuve sont restées très défavorables, avec des seuils limitatifs."

La délégation hongroise a communiqué qu'en ce qui concerne la déclaration de la délégation de la Tchécoslovaquie, la Hongrie communiquera sa position au sujet des questions exposées par une lettre adressée aux Représentants des pays membres de la Commission du Danube.

ad point f) de l'Ordre du jour la réunion a examiné le projet préliminaire du Rapport sur le régime des glaces du Danube pour la période 1900-1960-1985.

Suite à un échange de vues et à un examen minutieux, article par article, la réunion a considéré opportun que le Secrétariat de la Commission du Danube introduise les précisions et complètements nécessaires dans le projet préliminaire, en conformité avec les observations et propositions faites par les experts, afin de préparer son édition en 1993.

La réunion recommande à la Cinquante-et-unième session de la Commission du Danube de prévoir dans le Plan de travail pour 1993 1994 un point approprié.

ad point g) de l'Ordre du jour la réunion a eu à examiner le projet de Schéma de l'Annuaire statistique de la Commission du Danube, la comparaison de l'Annuaire statistique de la Commission du Danube et du Rapport annuel de la Commission Centrale pour la Navigation du Rhin, ainsi que la proposition des autorités compétentes hongroises relatives à la nouvelle nomenclature des marchandises.

Ayant en vue le délai très court accordé pour l'étude détaillée de ces documents, la réunion d'experts a considéré utile de poursuivre l'examen de la question donnée en 1993.

Dans ce but, la réunion considère utile que le Secrétariat de la Commission du Danube prépare un nouveau projet récapitulatif du Schéma de l'Annuaire statistique, compte tenu des observations des pays danubiens au sujet de la nouvelle nomenclature des marchandises et de la comparaison des documents statistiques de la Commission du Danube et de la Commission Centrale pour la Navigation du Rhin, ainsi que des éventuelles nouvelles propositions des pays danubiens qui seront présentées au Secrétariat jusqu'au 1er juillet 1993.

Afin d'augmenter l'efficacité de ce travail il a été proposé de prévoir à ce sujet des consultations avec la CCNR et la CEE de l'ONU et que l'examen par chapitres du projet de Schéma soit effectué dans le cadre d'une réunion spéciale d'experts.

Dans ce sens, la réunion recommande à la Cinquante-et-unième session de la Commission du Danube de prévoir dans le Plan de travail pour 1993, 1994 un point à ce sujet.

ad point b) de l'Ordre du jour la réunion a examiné, en conformité avec la décision de la Quatrième session extraordinaire de la Commission du Danube, la question: "Examen des problèmes actuels de la navigation internationale danubienne à la suite de la mise en oeuvre de la construction de l'ouvrage hydrotechnique de Gabčikovo".

L'examen du point donné a eu lieu sur la base des informations écrites de la Hongrie et de la Tchécoslovaquie et des informations supplémentaires fournies de vive voix au sujet des rencontres trilatérales (Hongrie, Tchécoslovaquie, Commission des Communautés Européennes). La réunion a remercié la partie tchécoslovaque d'avoir organisé pour les participants de la réunion une visite du complexe hydrotechnique de Gabčikovo, le 12 décembre 1992.

A l'issue de l'examen des informations autant orales qu'écrites de la Hongrie et de la Tchécoslovaquie et ayant écouté les interventions des experts des pays, la réunion d'experts en a pris note et a considéré utile de faire figurer les informations écrites en tant qu'annexes au rapport (Annexes 3 et 4).

Les experts ont relevé en même temps qu'après l'achèvement par la partie tchécoslovaque du complexe hydrotechnique de Gabčikovo, les gabarits du chenal sur le secteur du Danube de Bratislava à Palkovičovo répondront aux "Recommandations de la Commission du Danube relatives à l'établissement des gabarits du chenal, des ouvrages hydrotechniques et autres sur le Danube" en vigueur.

Selon la communication de la délégation de la Tchécoslovaquie, sur le secteur de Bratislava à Palkovičovo la profondeur de 25 dm est assurée actuellement auprès d'une cote de 129 m au-dessus du niveau de la mer, ainsi que les autres gabarits de chenal requis pour les secteurs éclusés. Après l'obtention de la cote projetée de 131.10 m au-dessus du niveau de la mer dans le bief amont de la centrale hydraulique de Gabčikovo. la profondeur de 4.5 m sera assurée à partir du printemps 1993.

La réunion a prié la partie tchécoslovaque de fournir au Secrétariat de la Commission du Danube. si possible dans les plus brefs délais. une information sur la manière projetée pour l'exploitation. du point de vue de la navigation. des ouvrages hydrotechniques de Gabcikovo.

La réunion a pris note de la déclaration de la délégation de la Tchécoslovaquie informant que la documentation cartographique de ce secteur est actuellement en voie de préparation et sera remise au Secrétariat de la Commission du Danube aux fins de l'édition de la Carte de pilotage en 1993.

En même temps, la réunion a estimé désirable que la Commission du Danube attire l'attention des parties intéressées sur le fait qu'en établissant le régime d'exploitation du débit d'eau il faut assurer des conditions de sécurité normales pour la navigation.

Dans ce contexte, la réunion prie la Cinquante-et-unième session de la Commission du Danube de prévoir dans le Plan de travail de la Commission du Danube un point concernant la nécessité de l'observation du régime de fonctionnement du complexe jusqu'au moment où toutes les questions liées à la mise en exploitation des ouvrages de Gabčikovo seront pleinement concertées.

En ce qui concerne la question de la répartition du débit d'eau et du régime de fonctionnement du complexe d'ouvrages hydrotechniques de Gabčikovo. la délégation tchécoslovaque a déclaré ce qui suit:

"Lors de la rencontre trilatérale des délégations de la RFTchS. de la RH et de la CCE qui a eu lieu le 27 novembre 1992 à Bruxelles, la Tchécoslovaquie et la Hongrie sont convenues que jusqu'à la décision de la Cour internationale. elles se guideront du régime temporaire sur le Danube. en conformité avec le procès-verbal de l'Accord de Londres du 28 octobre 1992 et le rapport du groupe de spécialistes. Pour cette raison. la délégation tchécoslovaque a prié la réunion d'experts de ne pas prendre, au sein de la Commission du Danube, des décisions qui pourraient empêcher le travail de la commission trilatérale. En outre, la délégation a relevé que les questions de la répartition du débit d'eau ainsi que l'examen du régime de fonctionnement de l'ouvrage hydrotechnique dans son intégralité ne relevaient pas de la compétence de la Commission du Danube.

Les spécialistes qui s'occupent de la répartition du débit d'eau entre le vieux lit du Danube, ses bras, et le nouveau canal navigable, sont les spécialistes en écologie, en hydro-énergétique, en gestion des eaux et d'autres spécialistes. Du point de vue de la création de conditions favorables pour la navigation, ce qui constitue la direction principale de l'activité de la Commission du Danube, il faut relever que sur le secteur Bratislava-Palkovičovo une voie navigable commode et à grandes profondeurs a été créée. Pendant la réunion, aucune délégation n'a proposé d'observations concrètes au sujet des défauts de la nouvelle voie d'eau et n'a pas non plus formulé de réclamations quant au fonctionnement de la centrale hydraulique de Gabčikovo. Au contraire, certaines délégations ont relevé que sur le secteur en question et à l'écluse de Gabčikovo ont été créées des conditions de navigation qui sont meilleures que sur certains autres secteurs éclusés du Danube. Pour cette raison, la délégation tchécoslovaque ne voit le moindre motif pour que la Commission du Danube examine le régime de fonctionnement de la centrale hydraulique. Au contraire, elle réaffirme son intention de coopérer étroitement dans toutes les questions ayant trait à la navigation, dans le but de créer des conditions favorables pour son développement".

La réunion a pris note de l'information des experts hongrois quant à l'avis de la partie hongroise d'assurer, en coopération avec la Tchécoslovaquie, la navigation des bâtiments avec un tirant d'eau de 2,5 m sur le secteur en aval de Palkovičovo sans y créer de retenue mais par l'exécution de travaux de régularisation.

La réunion a pris note de la déclaration de la délégation d'experts tchécoslovaques au sujet de la communication de la délégation hongroise concernant le fait que la Tchécoslovaquie est prête à collaborer au sujet des questions visant à l'amélioration des conditions de la navigation sur le secteur

Palkovičovo-Nagymaros, si le but de ces travaux est d'obtenir des gabarits de chenal conformes aux Recommandations de la Commission du Danube.

Tenant compte des autres propositions des experts hongrois et tchécoslovaques, présentées dans leurs informations écrites (Annexes 3 et 4), la réunion recommande à la Cinquante-et-unième session d'étudier la possibilité de faire inclure des points pertinents dans le Plan de travail de la Commission du Danube pour 1993-1994.

La réunion considère opportun que la Hongrie et la Tchécoslovaquie informent la Commission du Danube des résultats des travaux de recherches effectués par les établissements de recherche scientifique de ces pays en matière de travaux hydrotechniques, dans le but d'obtenir les gabarits du chenal, des ouvrages hydrotechniques et autres recommandés par la Commission du Danube pour le secteur en aval de Palkovičovo.

La réunion a considéré utile que les experts de la Hongrie et de la Tchécoslovaquie poursuivent la collaboration dans le but d'obtenir à la question examinée une solution qui soit acceptable pour les deux parties.

La réunion d'experts adresse aux parties tchécoslovaque et hongroise la prière d'informer la Commission du Danube de tous les pas qu'elles entreprendront dans le futur en vue de la solution de ce problème.

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L'expert du Ministère des Transports de la RFA a communiqué qu'il participait à la présente réunion en tant qu'observateur.

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La réunion d'experts soumet le présent Rapport à l'examen de la Cinquante-et-unième session de la Commission du Danube.

Annex 16

(Extract)

International Energy Agency
Energy Policies
Hungary : 1991 Survey

ENERGY POLICIES

HUNGARY

1991 SURVEY

the power stations and in the varying circumstances of the distributers, which would normally lead to financial differentiation among the units. These differences are taken into account in the preparation of an annual business plan and internal transfers are agreed to compensate distribution companies for differences in revenue resulting from differences in customer mix. If a company reduces its operating costs below those foreseen in the business plan, it keeps the extra profit. From this surplus the company can raise salaries, make social investments (such as recreational facilities) and sometimes make productive investment. The improved performance is taken into account in setting the next year's business plan. The outcome of each annual negotiation determines what remains with the company and what passes to MVMT and the state.

Electricity Supply

The structure of fuel inputs to the MVMT system since 1955 is summarised in Table 27. The main trends are clearly visible. Brown coal and lignite predominated in the 1950s and '60s. An important penetration of fuel oil and natural gas occurred in the '70s. Nuclear energy entered the system in the early '80s and to some extent has displaced all fuels, but especially fuel oil.

The generating plants of MVMT reflect this pattern of fuel use in their age (and therefore size) and geographical location. Plants burning brown coal, generally rather small and old, are located near the coal mines. They were mostly commissioned in the 1950s and early '60s but some date back to the '40s.

Table 27
Structure of Fuel Inputs to the MVMT System, 1955-1990 (PJ)

	Lignite	Brown Coal	Hard Coal By-products	Fuel Oil	Natural Gas	Nuclear	Total	Net Cons. (GWh)
1955	19.3	47.8	4.1	1.6	0.0	0.0	**72.8**	4 691
1965	22.0	92.2	13.6	19.6	8.7	0.0	**156.1**	10 410
1975	41.8	91.0	19.3	63.9	52.5	0.0	**268.5**	20 807
1985	46.5	75.4	14.8	59.8	85.0	72.7	**354.2**	31 771
1986	44.5	77.6	18.7	59.8	92.1	80.2	**372.9**	32 400
1987	45.8	79.2	18.3	48.4	77.8	119.5	**389.0**	33 836
1988	36.9	79.3	17.5	26.3	74.8	147.3	**382.1**	33 735
1989	35.8	75.3	16.7	20.4	82.0	151.0	**381.2**	33 942
1990	35.5	72.8	16.1	18.6	73.8	148.4	**365.2**	32 991
As a proportion of the total (%)								
1955	26.5	65.7	5.6	2.2	0.0	0.0		
1965	14.1	59.1	8.7	12.6	5.6	0.0		
1975	15.6	33.9	7.2	23.8	19.6	0.0		
1985	13.1	21.3	4.2	16.9	24.0	20.5		
1986	11.9	20.8	5.0	16.0	24.7	21.5		
1987	11.8	20.4	4.7	12.4	20.0	30.7		
1988	9.7	20.8	4.6	6.9	19.6	38.6		
1989	9.4	19.8	4.4	5.4	21.5	39.6		
1990	9.7	19.9	4.4	5.1	20.2	40.6		

Source: MVMT.

Annex 17

Declaration of 16 May 1992 of the Government of the Republic of Hungary on the Termination of the Treaty concluded between the People's Republic of Hungary and the Socialist Republic of Czechoslovakia on the Construction and Joint Operation of the Gabčíkovo-Nagymaros Barrage System, signed in Budapest on 16 September 1977

DECLARATION

of the Government of the Republic of Hungary
on the Termination of the Treaty
Concluded Between the People's Republic of Hungary
and the Socialist Republic of Czechoslovakia
on the Construction and Joint Operation
of the Gabcikovo-Nagymaros Barrage System,
Signed in Budapest on 16 September 1977

Handed over, accompanying a note verbal, to the Embassy of the Czech and Slovak Federal Republic in Budapest on the 19th May 1992.

DECLARATION

of the Government of the Republic of Hungary
on the Termination of the Treaty
Concluded Between the People's Republic of Hungary
and the Socialist Republic of Czechoslovakia
on the Construction and Joint Operation
of the Gabcikovo-Nagymaros Barrage System,
Signed in Budapest on 16 September 1977

The Government of the Republic of Hungary, according to the resolution of the Hungarian Parliament of 24 March 1992 and taking into account the rules of international law, terminates the Treaty Between the People's Republic of Hungary and the Socialist Republic of Czechoslovakia on the Construction and Joint Operation of the Gabcikovo-Nagymaros Barrage System, signed in Budapest on 16 September 1977, modified by the Protocol signed in Prague on 10 October 1983, including all related agreements specified in its Annex, as from 25 May 1992.

The Government of the Republic of Hungary has been compelled to doing so for the following main reasons:

- Hungary cannot accept

— that the population of the region suffers from the consequences of the functioning of a barrage system planned without professional and public control,

— that irreversible damage afflicts the ecological and environmental resources of the region, first of all the presently available and potential drinking water reserves of millions of people,

— that degradation and, in certain cases, extinction threaten the vegetation and fauna of the region,

— that serious damage afflicts unique landscapes,

– that imminent catastrophe threatens the population due to barrages and dykes of insufficient stability as a consequence of shortcomings of research and planning.

- The Government of the Republic of Hungary cannot accept the fact that the Government of the Czech and Slovak Federal Republic continues the construction of the so-called provisional solution, thus causing practically as serious a danger as it would happen by the realization of the original plans of the Gabcikovo power station. With this behaviour, the Czech and Slovak Party has made it impossible - despite the efforts made on the Hungarian side - that a trilateral special committee, including the representatives of the European Communities, begin its work.

- In the opinion of the Hungarian Party the so-called provisional solution infringes numerous international agreements and does violate the territorial integrity of the Hungarian State by diverting the natural course of the Danube.

I.

ANTECEDENTS OF THE TERMINATION OF THE TREATY

Antecedents of the Conclusion of the Treaty

1. In April 1963, government committees of the Peoples's Republic of Hungary and the Socialist Republic of Czechoslovakia agreed to draw up a joint investment programme in order to realize the Gabcikovo-Nagymaros Barrage System. The final scheme of the project was finished in 1973. It was accepted by the Government of the Socialist Republic of Czechoslovakia in January 1974 and by the Government of the People's Republic of Hungary in February 1974. Permission to preparatory work of the project was granted at the same time. First a so-called Joint Agreed Plan was drafted which became an inter-governmental agreement on 6 May 1976.

According to the Joint Agreed Plan, the goal of the construction of the Gabcikovo-Nagymaros Barrage System was the complex utilisation of the Danube

- for the production of electric power,
- for international inland navigation,
- for the management of water supplies,
- for the economic development of neighbouring regions.

The Joint Agreed Plan admitted that the maximum energy production of the Gabcikovo-Nagymaros Barrage System could supply only a small part of the demand in both countries but stated that as a power station in a peak-load operational mode could play an important role.

Since it had been known for a long time that the operation of such a type of hydroelectric power plants on lowlands involves serious ecological consequences, the Joint Agreed Plan laid down the necessity of complex investigations on the environmental effects of the system. According to the inter-governmental agreement that put the Joint Agreed Plan into force, the Czechoslovak State became the responsible Party for this task.

Signing and Modification of the Treaty

2. The prime ministers of the People's Republic of Hungary and the Socialist Republic of Czechoslovakia signed the Treaty on the Construction and Operation of the Gabcikovo-Nagymaros Barrage System in Budapest, on 16 September 1977. The exchange of ratifications took place in Prague on 30 June 1978. At the same time, the two Parties concluded an Agreement on their mutual assistance during the construction of the Gabcikovo-Nagymaros Barrage System. This Agreement provided particulars on the time schedule of the construction, work assumed on each side and quotas of the electric power to be produced until 1989. The contracting Parties engaged themselves to put the power generators into operation between 1986 and 1990.

3. After signing the 1977 Treaty, due to the economic difficulties arising simultaneously in both countries, the two Parties started inter-governmental negotiations in 1981, considering a significant postponement or even a possible renouncement of the project. Finally the Parties modified the 1977 Treaty by signing a Protocol in Prague on 10 October 1983. They decided to postpone the operation of the power generators by 5 years. Accordingly, they signed also another Protocol on the modification of the Agreement that regulated the mutual assistance. They put the final deadline of the construction work to 1995. This Agreement was modified once more in Budapest on 6 February 1989, then the final deadline was changed to 1994. This last modification of the Agreement on the mutual assistance did not involve the modification of the 1977 Treaty.

4. During the years when the programme and plans were established, the public opinion's attention was more and more focused on the protection of environmental and natural resources. This was manifested particularly by the Declaration accepted at the UN Conference on the Human Environment in Stockholm, 1972, by the World Charter on Nature accepted at the General Assembly in 1982, and by the document of the UN World Commission on Environment and Development ('Brundtland Report'). This change of approaches in the public opinion brought about a revaluation of environmental and other values not measurable in economic terms, as well as the acceptance of the key idea of sustainable development as basic principle of the management of natural resources. At the same time the world has seen a decreasing prestige of technologies with low efficiency in energy and raw-material consumption, which also implied the reassessment of the basic conceptions of energy production. In

the years of the emerging need for changing the political regime, the Hungarian society changed also its attitude towards environment by its growing environmental consciousness and by acknowledging the ecological priorities. This led to the revaluation of the goals of the Gabcikovo-Nagymaros Barrage System.

5. The necessity of a scientific investigation of the environmental effects arose in Hungary at the time of the re-examination of the Gabcikovo-Nagymaros Barrage System in 1981. At the request of the Central Committee of the Hungarian Socialist Workers' Party, the Hungarian Academy of Sciences set up an ad hoc committee to investigate the scientifically contested problems of the Gabcikovo-Nagymaros Barrage System.

The report of the ad hoc committee, compiled from technical, agricultural, hydrotechnical, transport, economic, environmental and resettlement studies, was approved by the Presidium of the Academy in a statement of December 1983. The statement said: "The Joint Agreed Plan did not consider in any comprehensive way the ecological effects and consequences of the Gabcikovo-Nagymaros Barrage System. No assessment has been made of the technical, ecological, economic risks of the project as a coherent and interactive system. On the basis of the enumerated and other factors, the Presidium of the Hungarian Academy of Sciences considered it justified and, at least reasonable to postpone significantly the construction work, to make changes in the plans, or rather to cancel the construction once for all." It was characteristic for the political circumstances at that time, that the statement was completely neglected by the government and by party officials and its publication was simply prohibited.

6. By the mid-eighties it became evident that the construction of the Nagymaros dam exceeded the possibilities of Hungary both in financial and technological terms. Therefore the Hungarian investor concluded a private contract with an Austrian company for financing and accomplishment of the construction. The dam at Dunakiliti was built mainly by Austrian companies, financed from Austrian bank loans. The dredging of the downstream channel was made by a Yugoslavian company on the basis of another private contract.

Antecedents of the Suspension of the Construction

7. When the dam construction at Nagymaros started, the Hungarian Parliament made inquiries about the Gabcikovo-Nagymaros Barrage System and the contested ecological and environmental problems. Following a government report, the Parliament passed a resolution on 7 October 1988 about the continuation of the construction on the condition of observing strict rules of environment protection. According to the resolution, "The ecological risks must be minimized, therefore the ecological interests must have priority over the economic interests during construction as well as during operation. The fundamental principle of the operation must be that the quality of the water of the river must not deteriorate. The peak-load operation must not begin before building sewage farms on both sides which is necessary for the safe operation of the barrage system, free of environmental risks."

8. In accordance with the resolution of the Parliament, the review of the construction programme continued in 1988 and 1989. A great number of serious insufficiencies were discovered in the preparatory work carried out in the 70's, e.g. the lack of a detailed geological and seismological survey necessary for construction planning, the lack of an established hydrogeological model and the lack of hydrobiological and water quality studies. To allow sufficient additional time for detailed investigations, it seemed inevitable to postpone every irreversible construction work. This was also recommended by an US expert board, 'Ecologia' (University of Massachusetts), which prepared a report at the request of the Hungarian government in March 1989.

Suspending the Construction

9. The Hungarian government suspended the construction at Nagymaros on 13 May 1989. The Hungarian prime minister informed the Czechoslovak prime minister several days later, on 24 May, proposing further studies and a joint analysis of the ecological risks arising from the operation of the Gabcikovo--Nagymaros Barrage System.

10. On 2 June 1989, the Hungarian Parliament approved the resolution of the government of 13 May, and stated that "further investigations were necessary on the conditions and consequences of the construction." At the same time, the Parliament authorized the government "to enter into preliminary negotiations with the Czechoslovak Party about the conditions and possible consequences of the modification of the 1977 Treaty, should this be required by the results of investigations carried out during the suspension."

11. Through diplomatic channels, on 26 June 1989, the Hungarian Party submitted the summary of findings that had been prepared by the ad hoc committee of the Hungarian Academy of Sciences in June 1989 about the technological-scientific reasons leading to suspension. The reply of the Czechoslovak government commissioner, which claimed the findings unfounded, was handed over to the Hungarian Party on 14 July 1989. (It is worth mentioning that the Czechoslovak government has submitted only two written expert analyses during the three years of the dispute. The second one was handed over in July 1991.)

Between 17 and 19 July 1989 a Hungarian-Czechoslovak expert conference was held in Budapest on ecology, hydrology, geology, seismology, pedology and agricultural production. The records of the meeting showed that the participants agreed on considering the Gabcikovo-Nagymaros Barrage System as an immense intervention in nature which affects invaluable ecological resources. Mutual consent was recorded in the protection of drinking water reserves: "It is of vital interest to keep undisturbed water supply from the Danube terrace concerned. This is the water supply of 3 million (or, in the long run, 5 million) people in Hungary and 5 million people in Czechoslovakia." The disagreement between the two countries appeared in the way they wanted to preserve the natural resources: the Czechoslovak experts considered that subsequent technical corrections would be sufficient for this purpose while the Hungarian Party did not accept this concept.

The same kind of agreement and disagreement were seen at the expert conference held in Bratislava between 25 and 27 September 1989. The final joint statement laid down: "The quality of the underground water reserves should by all means be protected for the purpose of drinking water supply. All necessary measures have to be done in order to neutralize the menace on the self-cleaning capacity of the Danube water." The dissenting opinion of the Hungarian experts was recorded as follows: "We do not agree with the opinion of the Czechoslovak delegation that the majority of the problems could be solved after accomplishing the construction of the barrage system and filling up the Dunakiliti-Hrusov reservoir. The possible alternatives are unknown in many cases, therefore it is extremely dangerous to carry out 'experiments' in nature.

We consider it as a proven fact that the functioning of the Dunakiliti-Hrusov reservoir would result in a disadvantageous change in the trophity index, namely in a multiplication of the algal biomass."

12. The two prime ministers met again in Budapest on 20 July 1989. The Hungarian prime minister announced the prolonged suspension of the Nagymaros construction until 31 October 1989, and the suspension of the work at Dunakiliti till the same date. The reason for this decision was that, according to the re-examination of the project, the Dunakiliti reservoir implied serious environmental risks even in the continuous operational mode. (The reservoir had originally been planned to serve in a peak-load mode.) The Hungarian prime minister offered alternatives for the joint revision: suspension of the construction work for 1 or for 3 to 5 years. Among the possible alternatives, there was a proposal for the definitive abandonment of the barrage system.

The Czechoslovak Party refused the Hungarian proposals, first in an aide memoire of 25 July 1989, then in a diplomatic note of 18 August 1989. This was also the content of the letter of the Czechoslovak prime minister of 31 August 1989, in which he gave notice of the possible provisional solution, i.e. diverting the Danube on Czechoslovak territory, in case the Hungarian Party suspended the construction for a long time or for ever.

In his reply on 4 October 1989, the Hungarian prime minister expressed his protest against the provisional solution, noting that it would be irreconcilable with the norms of international law. At the same time he noted that, in accordance with the results of expert investigations, the Hungarian government would initiate negotiations on the modification of the bilateral Treaty with the proposition of abandoning the peak-load operational mode and, consequently, the Nagymaros power plant.

The official positions did not come closer at the next meeting of the prime ministers in Bratislava on 26 October 1989. The Czechoslovak prime minister outlined the prospect of recurring to the provisional solution. The Hungarian prime minister protested against it and stressed that the behaviour of the two Parties was not regulated solely by the 1977 Treaty but also by the general international rules of environment protection. In case of ecological danger, international law requires the suspension of work on both sides, starting negotiations, and the modification of the treaty in order to keep the ecological consequences at a tolerable level.

13. On the basis of a government report that summarized the results of technical and scientific investigations carried out during the suspension, the Hungarian Parliament took a stand on 31 October 1989 on abandoning the peak-load operational mode and, consequently, abandoning the Nagymaros power station, too. The resolution considered it necessary to continue the investigations about the ecological risks and to conclude a new inter-governmental agreement on the ecological guarantees, prior to putting the Gabcikovo plant into operation. The Hungarian government was authorized to propose the Czechoslovak Party a modification of the Treaty in this sense. The Hungarian Ministry of Foreign Affairs indicated the intention of modifying the Treaty in a memorandum of 3 November 1989. The Hungarian proposal was handed over to the Czechoslovak Party in an Annex of the memorandum on 30 November 1989. The government of the Socialist Republic of Czechoslovakia never replied to this proposal.

14. As to the work done by Austrian and Yugoslavian companies, the related private contracts were terminated in November 1989 and June 1990, respectively. The parties agreed on the financial consequences of the termination.

15. The Hungarian Party hoped that the new Prague government, following the historical changes, would take a new stand on the debated questions in accordance with earlier declarations of prominent personalities who had condemned the Gabcikovo-Nagymaros Barrage System. Therefore, in his letter of 10 January 1990, the Hungarian prime minister did not propose any discussion on the modification of the Treaty, but recommended joint investigations on the ecological effects of the Gabcikovo dam. He announced that Hungary would suspend all construction work for the time of the investigations and recommended to do the same on the Czechoslovak side. He considered it desirable that the final decisions be made by the new governments after the free elections in both countries. The Czechoslovak prime minister refused the Hungarian proposals in his reply in February. In a next letter of 6 March 1990, the Hungarian prime minister expressed his regret that the Czechoslovak Party was unwilling to begin common investigations, and recommended even more explicitly the suspension of the construction work on the Czechoslovak side.

Inter-Governmental Negotiations on the 1977 Treaty in the Years 1991-1992

16. After the change of the political regime, the new Hungarian government published his general political programme on 22 May 1990. The programme announced among others that "The government, on the ground of the experts' opinion, considers the construction of the Danube Barrage System as a mistaken project, and will initiate, as soon as possible, negotiations on the rehabilitation and the sharing of the damages with the Czechoslovak government to be elected." At a meeting in Győr on 31 May 1990 the Hungarian government commissioner handed over to his Czechoslovak counterpart details of the government programme related to the Gabcikovo-Nagymaros Barrage System.

17. After the political changes in both countries, inter-governmental negotiations were started again in April 1991. Prior to that, the government commissioners met in Bratislava on 9 January 1991 where the Hungarian Party, at his partner's request, handed over the report prepared by the experts of the Hungarian Academy of Sciences in December 1990 about the ecological--environmental risks of the barrage system, together with a study made by an expert group of the World Wide Fund for Nature. (This latter work was requested by the Hungarian government in summer 1989.)

18. In a resolution made on 16 April 1991, the Hungarian Parliament authorized the government to enter into negotiations with the Czech and Slovak government on the termination of the 1977 Treaty by agreement as well as on the preparation of a new treaty. This latter should settle all consequences arising from the abandonment of the Gabcikovo-Nagymaros Barrage System, by observing the priority of ecological aspects.

19. On 22 April 1991, the two Parties met again at inter-governmental level in order to discuss the official standpoints of their governments. The standpoints differed significantly. The Hungarian Party stressed the principle of the protection of natural conditions of human life and human communities as well as the maintenance of friendship and cooperation of the two nations. The functioning of the Gabcikovo-Nagymaros Barrage System would trigger irreversible and damaging ecological processes with serious environmental consequences on the territory of both countries. According to the

Hungarian Party this fact had gained high certainty during the time of suspension of the construction. Thus, the termination of the 1977 Treaty by mutual consent would serve the interests of both nations. The Hungarian Party proposed the conclusion of a new treaty on the ecological rehabilitation of the region, the protection of drinking water, flood control and development of inland navigation. The Hungarian Party requested to suspend, by mutual consent, all further construction work until the conclusion of the new treaty. The Hungarian Party handed over the written opinion of the Academy of Sciences on the ecological--environmental effects of the Gabcikovo power plant, a scheme outlining the main elements of the new treaty and a proposal for cooperation in the field of energy production, observing environmental priorities.

The Czech and Slovak Party, admitting the importance of ecological aspects, stressed its determination to accomplish the construction according to the original Treaty. Judging the environmental damages avoidable by additional technical interventions, it proposed to set up joint working groups for studying the problems where the two Parties had different standpoints. It did not see any possibility to suspend the construction, claiming that the Gabcikovo plant was complete up to 90 per cent. The Czech and Slovak Party did not present any written documents.

The two Parties agreed to inform their own Parliaments and governments about the negotiations. They expressed their wish that the two Academies continue the investigations related to the barrage system in the framework of their existing cooperation. Both Parties regarded it necessary to continue the negotiations.

20. The next meeting took place in Bratislava on 15 July 1991. The Hungarian Party repeated its standpoint based on the priority of ecological--environmental aspects. Prior to the negotiations, the Czech and Slovak Party handed over to the Hungarian Party the opinion of its delegation on the report of the Hungarian Academy of Sciences. The opinion maintained that the specified dangers could be avoided by technical interventions. The Hungarian Party pointed out that the Czech and Slovak viewpoint ignored the long-term ecological effects, e.g. the risk menacing the underground water reserve, the biggest one in Central Europe. The Hungarian experts were unaware of any Czech and Slovak appraisal proving that no ecological damages could be expected in the long run.

The Czech and Slovak Party expressed again its intention to put the Gabcikovo plant into operation. It regarded the existing results of investigations sufficient to evaluate the effects arising from all possible operational variants of the Gabcikovo power plant. They proposed to set up a trilateral (Hungarian, Czech and Slovak and EC) expert Committee which could prepare a proposal to the governments within several months, specifying a technical solution for the operation of the Gabcikovo power plant. They noted that, failing to agree on the issue, the unilateral solution, i.e. putting the Gabcikovo plant into operation by construction work made exclusively on Czech and Slovak territory, could be realized. The Hungarian Party replied that this solution, by diverting the Danube unilaterally, would seriously violate the territorial integrity of the Hungarian State and a number of rules of international law. The Hungarian Party proposed a bilateral (Hungarian and Czech and Slovak) committee for the assessment of ecological risks, requesting at the same time the cancellation of work on Czech and Slovak territory.

21. The next inter-governmental meeting took place in Budapest, on 2 December 1991. The delegations agreed that the Gabcikovo-Nagymaros Barrage System constituted a complex technical-scientific problem and it was reasonable to set up a joint expert Committee for reviewing the whole question. Both Parties had prepared proposals for the mandate and tasks of the Committee. The Hungarian Party accepted the Czech and Slovak proposal to complement the Committee with the experts of a third party, the European Communities. The Hungarian delegation pointed out that the goal of the work of the Committee would be to prepare a well-established common decision. Therefore, the committee's activity has no sense if the Czech and Slovak Party continues the work aiming at the so-called provisional solution, i.e. diverting the Danube. The head of the Czech and Slovak delegation declared, however, that the suspension of the construction, even temporarily, was out of question.

The head of the Czech and Slovak delegation, in a letter sent to the head of the Hungarian delegation on 18 December 1991, confirmed the above Czech and Slovak standpoint. He stressed that the only solution he could accept should contain the functioning of the Gabcikovo power plant.

22. On 19 December 1991, the Hungarian prime minister addressed a letter to the Czech and Slovak prime minister expressing his concerns that the chances of setting up the planned joint Committee were very little. He pointed out that the establishment of such a Committee would only be reasonable if both Parties agreed to take into account the experts' opinion in their future decisions. The simultaneous realization of the provisional solution, he stressed, would put improper pressure on the experts by suggesting the irreversibility of the construction. Under such circumstances the Hungarian government would be compelled to consider the fate of the 1977 Treaty and the necessary counter-measures.

In a reply of 23 January 1992, the Czech and Slovak prime minister asserted that his government was ready to take into account the committee's conclusions but not to suspend the work of the provisional solution. He wrote: "If these conclusions and the trial operation of the Gabcikovo plant prove that the harmful ecological consequences are higher than the expected benefits, the Czech and Slovak Party will be ready to cancel the work on the provisional solution."

23. On 14 February 1992, the Hungarian Ministry of Foreign Affairs protested at the Czech and Slovak Party in a verbal note against the unilateral construction work that had been started to divert the Danube. In a reply note of 18 March 1992, the Czech and Slovak Ministry of Foreign Affairs refused the protest.

24. On 26 February 1992, the Hungarian prime minister sent another letter to the Czech and Slovak prime minister. He pointed out that the Czech and Slovak Party had not presented any expert opinion proving that the possible damages and risks described by the Hungarian experts were implausible. The prime minister confirmed that the Hungarian Party accepted the establishment of a trilateral Committee. This body, however, could not be set up while construction work of the unilateral provisional solution were in progress. Repeating that the diversion of the Danube violated seriously the rules of international law, the Hungarian prime minister warned that the behaviour of the Czech and Slovak government would compel the Hungarian Party to terminate the Treaty.

According to the contents of the prime minister's letter, the Hungarian government contacted the Commission of the European Communities. In a letter addressed to the foreign ministers of the two countries on 13 April 1992, the vice-president of the Commission expressed the readiness of the Commission to take part in the resolution of the dispute. However, he laid down the condition that both countries refrain from steps that could influence or anticipate the future conclusion of the trilateral committee.

In a reply letter of 23 April 1992, the Czech and Slovak prime minister called the Hungarian request aiming at the cancellation of unilateral construction work as "ultimatum" He announced that the Czech and Slovak Party would not suspend but continue the work of the provisional solution. He indicated 31 October 1992, as the final deadline of the accomplishment of the provisional solution, i.e. the diversion of the Danube. Thus the Czech and Slovak Party made it impossible to set up the trilateral Committee.

On 8 May 1992, the Hungarian government proposed further negotiations to the head of the Czech and Slovak delegation in order to start the trilateral investigations with a simultaneous moratorium on the provisional solution. The investigations could lead to the resolution of the dispute by mutual consent. The head of the Czech and Slovak delegation refused this proposal, maintaining that the Czech and Slovak Party was unwilling to suspend the work of the provisional solution. As to other questions, i.e. the date of damming-up the Danube, he would be ready to negotiate.

25. It is clear from the foregoing that the Hungarian Party has tried again and again to reach a mutual agreement since 1989, for more than three years, but met a permanent and consequent refusal on the Czech and Slovak side at every occasion. The Hungarian Party presented numerous expert opinions on the serious environmental risks and irreversible damages arising from the operation of the Gabcikovo-Nagymaros Barrage System. The Czech and Slovak Party regarded these opinions unfounded, although without detailed analysis, and did not present any result that could prove the lack of danger. Finally, the Hungarian Party tried to call the attention of the Czech and Slovak government in vain to the fact that the diversion of the Danube would seriously violate the norms of international law. Its legal arguments met the same refusal as the efforts aiming at the mutual recognition of ecological risks.

II.

ECOLOGICAL-ENVIRONMENTAL RISKS OF THE GABCIKOVO-NAGYMAROS BARRAGE SYSTEM

During the long-lasting period of planning the Gabcikovo- Nagymaros Barrage System, fundamental research and investigations were neglected and not carried out. The program and plans were prepared without the invitation and participation of institutions that would have been competent in the problems to be solved.

The construction of the Gabcikovo-Nagymaros Barrage System approaching the stage when the natural environment was to undergo profound changes, several prognostic schemes and environmental risk assessments were compiled by the experts of such questions, although official demand had never been expressed to this goal before the end of the 80's. These schemes were sufficiently precise to show the dimensions of the natural resources involved, and called attention to the serious danger caused by the construction. However, presentation of the risks in their exact form was not possible due to the lack of investigations that would have been fundamental during the planning and early constructions.

In the recent past, admittedly with a long time lost, the Hungarian Party started the assessment of environmental conditions and the solution of some modelling problems along the common Hungarian - Czech and Slovak section of the Danube. Thus, the most urgent tasks of environment protection and water management will have enough ground to be planned on.

Three times since the suspension of construction, the Hungarian Party handed over to his partner summaries prepared by institutions investigating the environmental risks of the Gabcikovo-Nagymaros Barrage System. Hungary urged joint research and investigations. On the other hand, the Czech and Slovak Party has never presented results that would prove the risks to be under a tolerable level.

It is regrettable that the radical differences of viewpoints apparent in official opinions of the two parties still prevent the technical-scientific discussions from being started. Without this, the problems of the region are not likely to find solution.

Geological and geophysical risks

1. From the point of view of geology, the greatest risk is the lack of detailed knowledge of the area: in such circumstances a number of preparatory and planning tasks (environmental impact assessment, technical planning) cannot reach grounded results. Safe prognosis can be made only on the basis of systematic studies revealing the background geological conditions.

2. The planning of the Danube dams was not preceded by a detailed geological survey of the region. A serious mistake is that there was no structure-exploring deep drilling in the impact area of the dams. The insufficiencies of planning are well demonstrated by the fact that the contractors did not even have the necessary permit of the geological authorities.

3. A further problem is that the research results obtained separately in Hungary and Czech and Slovak Republic have never been integrated. For example, the so-called Gabcikovo fault line discovered in Slovak territory has not been traced further in Hungary. This fault was the reason why the site of the Gabcikovo dam was changed in the early 70's, although by not more than 600 m with respect to the original plan. Thus, as is admitted by a Slovak expertise, this dam has been built in the neighbourhood of a geologically young fault.

4. The most important element of the deep structure in the impact area of the Gabcikovo dam is the Rába line, the border of the Alpine and Transdanubian tectonic units. Its position is highly uncertain, at present it can be traced in two alternative variants. Structural exploration by means of drillings in the young sediment has not been carried out; satellite photos which may be evaluated in numerous possible ways do not allow to form a unanimous and profound opinion. In the structure of the neogene sediments listric and other fault planes can be found by the analysis of seismic profiles. Consequently, clear structural view cannot be constructed yet.

5. Another set of problems concerns the seismology of the area of the Gabcikovo-Nagymaros Barrage System. The seismicity values of the Joint Agreed Plan cannot be accepted; the seismicity problem cannot be answered with a reliability required by international norms since the necessary studies are missing. The seriousness of the problem is shown by the fact that the expected intensity estimated for the Dunakiliti area from historic quakes is 8.7-9.0 MSK at the usual security threshold, while the original plans were prepared by assuming 6.0 MCS.

6. The sizing of the embankment is an especially grave problem among the uncertainties of planning, owing again to insufficiencies of prior investigations. The weakest point of the Dunakiliti reservoir is the embankment: it is the largest structure regarding its volume but it is also the most heterogeneous one in its size, structural constitution, material and quality. One of the most important pieces of information obtained from the geophysical analysis of the Dunakiliti reservoir on the Hungarian side (1991) is that high-resistivity gravelly structures - ancient riverbeds - have been found beneath the embankment at several places. This was not explored earlier. Examples from the past show that this structure can lead to a breach in the embankment and, subsequently, to serious flood. The stability of certain parts of the embankment cannot be considered safe against earthquakes that are likely here. The same applies to the stability of the banks higher than 7 m, as they are not sufficiently safe against sliding. On the contact surface between the base and the body of the embankment, soil liquefaction can occur.

Security tests along the Dunakiliti reservoir show that the safety characteristics of the embankment do not fit the international standard norms. The risk level taken into consideration in the plans applies only to common buildings where environmental effects can be excluded.

Effects influencing the ground water

The environmental and ecological consequences of the Gabcikovo dam will follow from the hydrological and hydraulic changes and from the pollution of water. These phenomena will accumulate and amplify each other, their interaction may give rise to further effects.

For the prediction of the resulting damage it is to be taken into account that the self-inducing effect of the changing environmental conditions will manifest itself slowly, and partly in a hidden manner, at least in some aspects of the changing ecological system. Thus the conclusions drawn from short-period model studies may be highly uncertain and unrealistic.

There is a group of damages and drawbacks that are proven unambiguously, further ones supported by field data but not fully verified, and a last group which has not been studied yet but is very probable.

7. It is right in the area of the Danube affected by the Gabcikovo-Nagymaros Barrage System where the most important drinking water reserves of both Hungary and Czech and Slovak Republic can be found. 45% of Hungary's drinking water supply comes from percolated water in the area of the Gabcikovo--Nagymaros Barrage System, providing e.g. Budapest with drinking and industrial water for more than a century. A similar system serves the water supply of Bratislava. The relevant part of percolation and natural filtering occurs in the uppermost layer of the riverbed, some centimetres thick. It is therefore highly necessary to maintain the conditions that preserve the original state of this biologically active layer providing physico-chemical filtering.

8. It is again the filtering capacity of the riverbed that determines the quantity and quality of the water stored in the alluvial cone of Csallóköz--Szigetköz, a gravel layer several hundred metres thick. Fortunately enough this water reserve, which is permanently refreshed from the Danube, has not been disturbed in the course of the construction activities related to the Gabcikovo--Nagymaros Barrage System. Thus both countries have riverbeds of great length, Hungary about 40 km and Slovakia more than 70 km, that can be used later for water supply, according to detailed water quality and hydrogeochemical analyses. On the Hungarian side, this means a capacity of 1 million m^3/day permanent drinking water supply - the average need of the Hungarian capital -, while in Slovakia this amounts to 2 million m3/day.

9. As a result of the operation of the barrage, fundamental changes will occur in the area of the Dunakiliti reservoir. The basic problem will be caused by the deposition of polluted silt, with its anaerobic dynamics, iron and manganese mobilization, and infiltration of toxic organic materials. This silt would mean a permanent source of viral contamination.

10. Because of the specific hydrogeological situation of Szigetköz, the toxic materials will pollute the ground water reserves within some tens of years. Moreover, since periodic dredging is planned for the removal of accumulating

silt, this will not only be harmful to the quality of the surface water but, by destroying the filter layer, it will allow organic micropollutants and microbes to reach the ground water level. The channel system, planned to counterbalance the deepening water table (ground water level) along the Old-Danube under the Dunakiliti dam, will result in the pollution and loss of stored water depending on the quality of the inlet water and the state of the colmatated river branches. The degree of this pollution and loss can be estimated only very roughly, due to the lack of detailed long-period hydrological and water quality studies.

To preserve the role of the riverbed in filtering and decomposing the toxic organic matter, the present dynamics of the Danube should be maintained. Without this, the required oxygen supply, the self-purifying capacity of the Danube water and the regular renewal of the filtering bedsurface cannot be guaranteed.

It is to be noted that the conclusions of the Hungarian experts concerning ground water are identical to those found in the February 1990 report of the Slovak scientists. As to the missing investigations, similar conclusions were obtained by the Hydroquebec Company: this Canadian firm was requested by the Slovak government to form an opinion in the fall of 1990.

The water table will rise around the reservoir owing to the damming-up and to the change in the riverbed, while it will sink around the Old-Danube and the power canal due to the decrease of natural infiltration from the main branch.

11. Where the water table is lowered, mineralization of the vegetation remains is accelerated; the organic material content of the soil is diminished; deterioration of the soil structure and the eluviation of nutrients grows dangerous. Where the operation of the barrage lowers the ground water level from the fine surface layer down to the gravel, capillary water supply of the root zone is stopped. As a result, the crop of cultivated plants is reduced considerably and becomes uncertain; drought-resistance is weakened; water supply of the forests in the inundation area changes unfavourably; now contiguous ecosystems become isolated patches with a reduced production of organic material. (As is testified by the Upper-Rhine dams, a 50 cm lowering of the water table results in a 50% loss of crop.)

12. Where the water table is raised, air ventilation of the soil is diminished and anaerobic processes become predominant; there is a growing danger of inland waters; secondary sodification can occur in areas with bad natural drainage conditions, especially on the left bank of the Danube, east of the mouth of the river Vág. (Several years after damming up the river Tisza at the

Tisza II barrage in Hungary, the surrounding agricultural area became a marshland and a dramatic loss of crop resulted on many thousands of hectares. This process could not be counterbalanced, therefore the gold crown value of these lands was halved by the authorities.)

Effects on the surface waters

13. The Dunakiliti reservoir, after being filled up, will be the scene of unambiguous water quality deterioration. The reproduction of phytoplankton, which plays a key role in the material exchange of the Danube water, is now hindered by two factors: the flow speed and the quantity of light. (The nutrient surplus is already considerable.) As a consequence of the damming-up, the water speed in the reservoir will slow down, stagnant bays will form, the sedimentation rate will shoot up (the deposition of 3-5 million m^3/year suspended material is estimated) and the ground water surface will rise due to the initial infiltration surplus. Since the flow speed will slow down and the water transparency will increase, the efficiency of the factors hindering the reproduction of algae will diminish: thus eutrophication is inevitable. The organic matter production of algae is already 100 tons a day in dry weight along the Rajka-Nagymaros river section. This amount will be multiplied as soon as the reservoir is put into operation, and the consequences of the decay of this algal biomass will afflict the Hungarian section of the Danube above all.

14. The soil humidity of the inundation areas along the abandoned riverbed of the Danube will decrease, the ground water surface will sink and arborescent vegetation will spread over the dry riverbed.

15. The sediments of the reservoir, an expected quantity of 3-5 million m^3/year as mentioned above, will contain industrial, agricultural and communal pollutants (viral and bacterial contamination, toxic organic matter, heavy metals). This implies deterioration of water quality and, in addition, serious reposition problems if the removal of sediments, costly for itself, seems necessary. Hygienic and bacteriologic indices show that the water is polluted already and this situation may worsen if the reservoir is filled up. The human and non-human biological effects of the bituminous insulation that has been laid

down in some places on the reservoir embankment are still uncleared. Similar asphalt insulation has been built in the embankment all along the 17 km long power canal, again without clear knowledge of its effect on water quality. Fishing utilization of the power canal may reach only a small fraction of the one of the Old-Danube, present main branch of the river. The consequences of the negative effects discussed above are likely to be felt down the river for, possibly, 150-200 km (i.e. also at Budapest) in the best part of the year. A significant and prolonged increase of the organic matter load, decay of the self-clarifying capacity, possible deterioration of the oxygen circulation and hygienic indices are factors that can cause grave and costly damages in the drinking and industrial water supply.

Ecological and genetical problems

From the point of view of biology, the affected region constitutes an integral system. The construction of the Gabcikovo- Nagymaros Barrage System caused damage to two areas of outstanding natural value: Szigetköz and the bend of the Danube (Dunakanyar). Although the devastation of the natural resources and that of the landscape is significant, the damage is mostly reparable.

16. The biocenoses of Szigetköz still occupy a considerable area in natural or near-natural conditions, especially in the inundation zone. These ecosystems have adapted themselves to the seasonal dynamics of water. They follow gradually the constant changes in the Szigetköz branch system (cenological succession). In the case of forest populations this process is considerably slower and can be measured in terms of centuries. The answer to quick and drastic changes is degradation and decay. For the regeneration of forests living in near-natural conditions, centuries would be needed at the very best.

17. The forests of Szigetköz are Hungary's highest yield growing stock, the two-thirds of which is constituted by poplars spreading everywhere from the 1930's on (30 m^3/hectare/year). This population utilizes the fluctuation of low and high water optimally. On account of the river regulation, the productivity of these populations has been diminished significantly. By further lowering of the water table, these excellent wooded areas will be lost and only forests of much lower productivity could be replanted later.

18. Szigetköz is especially rich in species, only of flowering plants 60 protected ones can be found in this area. A considerable part of the flowerless plants and microorganisms is unknown so far. In the past few years only, 11 new species of fungi - unknown in other parts of the country - have been discovered here. The fauna of Szigetköz is similarly rich. 63 fish species of the 80 ones living in Hungary can be documented in the area. Several groups of animals have not been documented fully until now. Each year, there are a number of new species found. All of them are of national value: their preservation for the future generations is a moral obligation.

19. It is evident from the consequences of the construction activities carried out so far that the extensive destruction of biological resources cannot be evaded even by the most careful operation of the Gabcikovo barrage. The indirect effects are far more dangerous than the direct ones. Changes like that of the water table, disappearance of the seasonal fluctuation, modification of the oxygen supply of water, all have their effect on species organized into populations with redoubled intensity. New conditions of competition, predation and other interactions in the new environment lead to the local extinction of species or their degradation. The probability of survival after any significant environmental change depends on the scope of genetic diversity. Only numerous, genetically diverse populations can have a chance to accommodation.

20. It is more worrying that the disappearance of genetic diversity and a consequent lack of adaptability may cause further extinction, leading finally to a severe degradation of the region and an 80-90 % decrease in the number of species.

Part of the described ecological and environmental risks are proven unambiguously, further ones are supported by analogous experience abroad and at home: therefore they can be predicted reliably. The Czech and Slovak Party has, up to now, not presented results demonstrating that these serious dangers could be reduced to a tolerable degree by posterior technical measures.

INTERNATIONAL LEGAL ARGUMENTS FOR THE TERMINATION OF THE TREATY

The 1977 Treaty, like the majority of international treaties, does not contain any provision for termination. Referring to this fact, the Czech and Slovak Party has proclaimed many times that the Treaty cannot be terminated unilaterally. However, in every case when the text of a treaty is silent on the possibility of termination, the subsidiary rules of general international law are to be applied. These rules allow unilateral termination, even in the absence of agreement between the parties, if there is sufficient ground for termination.

Not only international practice points in this direction, but also numerous Articles of Part V of the 1969 Vienna Convention on invalidity, termination, and suspension of treaties. Although the Vienna Convention cannot directly be applied in the legal dispute of the 1977 Treaty (it entered into force for both countries after 1977), its provisions are guiding in many respects, concerning the content of generally accepted international legal norms at the time of the Treaty's conclusion. This does not mean that the parties may not invoke other rules of general international law not mentioned in the Vienna Convention, neither does it mean that norms of the Vienna Convention, even if indirectly applicable, literally apply in the present case. One of the reasons is that the Convention, at the time of its formulation partially conformed with customary law; in some respects it developed and tightened these rules.

In the opinion of the Hungarian Party, the 1977 Treaty can lawfully be terminated for the following reasons:

1. As a consequence of the factors enumerated in Chapter II, the construction and operation of the barrage system causes an ecological state of necessity which precludes the wrongfulness of the termination.

This norm of general international law appears, first of all, in Article 33 of the Draft on State Responsibility prepared by the UN International Law Commission. According to paragraph 1 of this Article, a state can invoke the state of necessity as a ground for precluding the wrongfulness of its act if (a) "the act was the only means of safeguarding an essential interest of the state against a grave and imminent peril;" and (b) "the act did not seriously impair an essential interest of the State towards which the obligation existed." For the Hungarian State, grave and imminent peril would follow from the operation of the barrage system. Since, in his letter dated April 23, 1992, the Czech and Slovak Prime Minister has set October 31, 1992 as the time of the unilateral diversion of the Danube, the peril can be regarded as imminent. In the commentary appended to the above-mentioned Article (to which there was not objection by the representative of Czech and Slovak Federal Republic), the International Law Commission pointed out that "Reference can be made to the state of necessity. as a ground for State conduct not in conformity with international law in cases where such conduct proves necessary by way of exception, in order to avert a serious and imminent danger which , even if not inevitable, nevertheless a threat to a vital ecological interest.

As to subparagraph (b) of the Draft, the Hungarian Party is of the opinion that the environmental danger would be just as significant in Czech and Slovak Republic as in Hungary. Consequently the termination of the Treaty would not seriously impair an essential interest of the Czech and Slovak Republic.

2. The termination of the 1977 Treaty cannot be considered wrongful because international law accepts the principle ad impossibilia nemo tenatur maxima, that is one cannot be obliged to perform the impossible.

In 1912 Russian Indemnity case, the arbitration award confirmed that a treaty obligation need not be performed "si l'observation du devoir international est .... self destructive" (R.I.A.A. vol.XI., p.443). Thus, the Republic of Hungary cannot be obliged to fulfil a practically impossible task, namely to construct a barrage system on its own territory that would cause irreparable environmental damages.

3. Since the conclusion of the 1977 Treaty, the underlying circumstances have changed fundamentally.

This principle concerning a fundamental change of circumstances has a long history in international law. and is also included in the Vienna Convention on the Law of Treaties. According to Art. 62. par. 1 of the Convention, a fundamental change of circumstances which has occurred with regard to those circumstances existing at the time of the conclusion of a treaty and which was not foreseen by the parties may be invoked if "(a) the existence of those circumstances constituted an essential basis of the consent of the parties to be bound by the treaty".

The preamble of the 1977 Treaty stated explicitly that the construction of the barrage system would "significantly contribute to bringing about the socialist integration of the member states of CMEA". Obviously, the historical changes that took place in both countries in 1989 could not be foreseen. These changes resulted in a complete turnover of the domestic and international situation, including the end of the CMEA and the "socialist integration". It is also obvious that this led to radical changes in the circumstances of the barrage system, putting similar gigantic constructions in a different light. These changes made it possible for environmental considerations to become a priority, at least in Hungary.

As to the second condition in the cited subparagraph (b) of the Vienna Convention ("the effect of the change radically to transform the extent of obligation still to be performed under the treaty"), this cannot yet be applied to the relations of the two countries. This is one of the new provisions of the Vienna Convention, which was meant to narrow the possibility of the application of the clausula rebus sic stantibus. In international judicial practice there was no case in which either of the parties would have successfully relied on this condition before the adoption of the text of the Vienna Convention. In other words, this condition was not part of the customary law that regulated the relations of the two countries in 1977.

Finally, the circumstances have radically changed from another point of view as well: namely, the importance of environmental resources and values has increased not only in Hungary but all over the world.

4. The Czech and Slovak Party did not fulfil its duties prescribed in the 1977 Treaty for the protection of nature and water quality. Therefore Czech and Slovak Republic can be condemned for material breach of the Treaty. According to general rules of international law, a treaty can be terminated unilaterally against a violating state.

As it is clear from Chapter II of the present Declaration, the Czech and Slovak Party, continuing the constructions, did not fulfil the obligations included in Articles 15 and 19 of the Treaty according to which "The Contracting Parties ensure that the quality of the water in the Danube is not impaired as a result of the construction and operation of the barrage system" and "ensure compliance with the obligations for the protection of nature arising in connection with the construction and operation of the barrage system". Considering that the above-mentioned facts imply "the violation of (a) provision(s) essential to the accomplishment of the object or purpose of the treaty" as it is expressed in Art.60, subparagraph 3(b) of the Vienna Convention, the Hungarian Party can invoke "a material breach of a bilateral treaty ... as a ground for terminating the treaty " (Art.60, par.1).

The so-called "provisional solution" can be regarded as an even more severe breach of the Treaty. The Contracting Parties determined very precisely the work to be carried out in the original Treaty in 1977 and in the subsequent related agreements. The diversion of the Danube near Bratislava was not part of them in any form. During the implementation of a treaty neither of the parties has the right to activities that are not authorized to by the treaty: such a behaviour amounts to a material breach of the treaty.

5. The "provisional solution" seriously violates other norms of international law. This fact, in accordance with the rules of general international law, entitles the injured Party to take lawful counter-measures (repressalia). The termination of bilateral treaties effective between two parties may constitute such a counter-measure.

The "provisional solution" - the diversion of the Danube - violates the following international legal norms and agreements:

a) It constitutes a breach of the sovereignty and territorial integrity of the Republic of Hungary, which is protected by peremptory rules of international law. Leaving Bratislava, the Danube becomes an international boundary river, partly under Hungarian, partly under Czech and Slovak sovereignty. Neither of the parties can determine unilaterally the fate of the river. Thus, neither of them may divert the river to its own territory as if it were its own national river.

b) The "provisional solution" violates the inviolability of the frontiers of Hungary, protected by peremptory rules of international law. The diversion of the river would transfer the main navigation route to Czech and Slovak territory from the joint stretch. This route was designated as the frontier line between the two countries, first by the Peace Treaty of Trianon, Art.27, paragraph 4, then by the Peace Treaty of Paris, Art.1, paragraph 4(a), and finally by a bilateral treaty concerning the regime of the state frontiers concluded in 1956, Art.2., paragraph 3.

c) The "provisional solution" violates the 1976 bilateral Treaty of the two countries, regulating the questions of water management of the boundary rivers. This postulates that the precondition of any water management activity is the agreement of the contracting parties. In Art.3, paragraph 1, of this Treaty, the parties undertook "a) not to practice water management in such manner, that would prejudice the jointly established water relations unfavourably, b) to maintain the waterbed in their own territory in good condition and to utilize them in a way that they do not do damage to each other". Another provision of the treaty, Art.4, paragraph 3, unambiguously precludes unilateral steps, stating that "in accordance with the laws and regulations of both Contracting Parties a previous consent is needed to any water management activity that would result in changing the line or character of the state border".

d) The "provisional solution" violates the rules and principles of customary international law that regulate the utilization of international environmental resources. The "provisional solution" would deprive Hungary of its due share of water quantity, water quality and power potential. These principles have been formulated in various documents, e.g., in the International Law Association's Rules on the uses of waters of international rivers, adopted in Helsinki in 1966. Article V, paragraphs 1 (f), (g) and (i) of this document prescribe that each state is entitled to the use of parts of an international drainage basin within its territory only within the limits of reasonableness and equity. While sharing the resource, several relevant factors must be considered, like the [illegible] of the population dependent on the waters of the basin, the costs of alternatives to the planned use, and the need to avoid waste in the utilization of waters. This document states that no use is entitled to an inherent preference over the other. The expert group of lawyers on environmental law of the Brundtland Commission has also adopted, in its principle No.9, the principle of reasonable and equitable use of trans-boundary natural resources, referring in its commentary to various agreements and judicial decisions.

The principle of reasonable and equitable use is enshrined in principles 5 and 8 of the United Nations International Law Commission's draft on the law of non-navigational uses of international watercourses. According to them the affected states have to consult if they do not reach agreement concerning effects of the planned activity on the conservation of water resources, on their protection, development, and economic viability of their uses. For the duration of the dispute, but at least for six months, the planned measures have to be suspended.

Article 2 of the Convention on the Protection and Use of Transboundary Watercourses and International Lakes, prepared under the auspices of the UN Economic Commission for Europe not only obliges the Parties to rational management, but also to a use which is ecologically sound, conserves the water resources and protects the environment.

e) The "provisional solution" violates the principle of the prohibition of transboundary harm affecting the neighbouring state. This principle was reflected in the arbitration award of the Trail Smelter arbitration in 1941, in the judgement of the International Court of Justice in the Corfu Channel case in 1949, by Principle No.21 of the Declaration adopted by the Stockholm Conference on the Human Environment in 1972; by principles No.11 and 21 of the Brundtland Report's recommendations on environmental law, Art.294 the Convention on Law of Sea of 1982, and by Art.2 of the 1991 Convention adopted in Espoo on environmental impact assessment in a transboundary context.

f) The "provisional solution" is in contradiction with the spirit of the Belgrade Convention on the Danube adopted in 1948. The danger that one of the Contracting States would divert the natural course of the river from its natural riverbed did not occur to the signatories, therefore the Convention does not contain an explicit prohibition for this case. However, other regulations of the Convention, like Art.3 which deals with work that become required by unforeseen circumstances and are carried out within the frontiers of a country, make it clear that lawful interventions can be carried out only by agreement of the riparian states.

g) The argument appearing, for example, in the reply note of the Czech and Slovak Ministry for Foreign Affairs, dated 12 March 1992 that the "provisional substitute solution" is being carried out because of the suspension of construction on the Hungarian side, i.e., in order to fulfil the 1977 Treaty, is incorrect. The present practice of general international law does not accept the so-called teleological way of interpretation and application of international treaties according to which the aims of a treaty could be achieved without the unanimous will of the Parties. This is plainly demonstrated by the discussions of the UN International Law Commission on the Law of Treaties (see Yearbook of the International Law Commission, 1966, vol.2, page 219).

6. Returning to the reasons for the termination of the 1977 Treaty, it is important to note that the rules of general international law on environmental protection, which have developed since the adoption of the plans for the system, take precedence over treaty provisions which were adopted earlier or are contradictory to them (lex posterior derogat legi priori, lex specialis derogat legi generali). These norms have recently been expressed in a number of international documents.

The most important rules prescribing the protection of the natural and human environment, the priority of environment, the necessity of the preservation of ecosystems, and the abandonment of contradicting economic activities are as follows:

Principle No.4 of the Stockholm Declaration prescribes that "Nature conservation, including wildlife, must therefore receive importance in planning for economic development." Principle No.3 of the World Charter for Nature adopted by the UN General Assembly in 1982 declares that "special protection shall be given to unique areas, to representative samples of all different types of ecosystems and to the habitats of rare or endangered species." It also states that "man's needs can be met only by ensuring the proper functioning of natural systems", and that conservation of nature must become an integral part of the planning process. The recommendations of the Brundtland Report on the law of environmental protection prescribe that "States shall maintain ecosystems and ecological processes essential for the functioning of the biosphere, shall preserve biological diversity, and shall observe the principle of optimum sustainable yield in the use of living natural resources and ecosystems."

The importance and priority of the cooperation in environmental problems were emphasized by the Helsinki Final Act and the Final Document of the Vienna follow up meeting.

7. The foregoing paragraphs justify the decisions of the Hungarian Government and Parliament which led to the unilateral suspension of construction first at Nagymaros, later at the upper Danube. As it is clear from the cited regulations of the Vienna Convention, the reasons serving as grounds for termination of a treaty can also be invoked as grounds for the suspension of the application of a treaty. Section 3 of the Vienna Convention (Termination and Suspension of the Operation of Treaties) treats these two measures in a parallel manner. Therefore it is sufficient here to refer to Chapter III, sections 3, 4, and 5 of the present Declaration. These sections prove that the suspension of the construction was a lawful act in the same way as the termination itself.

In addition, it can be established that the Hungarian Party has met the requirements of international law after the suspension in every respect. Hungary did not confront the Czech and Slovak Party with a fait accompli but rather made continuing efforts, according to the cited Parliament resolution, to achieve the termination of the 1977 Treaty by mutual agreement. Thus, Hungary has met her obligation established by Art. 65 of the Vienna Convention, to settle disputes arising from a treaty by peaceful means.

IV

CONSEQUENCES OF THE TERMINATION OF THE 1977 TREATY

Considering that the 1977 Treaty is terminated in its entirety with effect from May 25, 1992, the Government of the Republic of Hungary requests the Government of the Czech and Slovak Federal Republic to take measures towards the immediate stop of all work and construction related to the Gabcikovo-Nagymaros Barrage System.

The Hungarian Government is ready to conclude a new treaty in order to settle, jointly, every consequence arising from the termination of the 1977 Treaty in view of the following order of priorities:

1. rehabilitation and maintenance of the ecological and natural resources and values of the region, primarily, the protection of the drinking water reserves;

2. flood control;

3. development of navigation, in conformity with the natural conditions of the region.

The Government of the Republic of Hungary awaits the response of the Government of the Czech and Slovak Federal Republic, so that the negotiations on the new treaty can be started as early as possible.

Budapest, 16th May 1992

József Antall
Prime Minister of the Republic of Hungary

Handed over, accompanying a note verbal, to the Embassy of the Czech and Slovak Federal Republic in Budapest on the 19th May 1992.

Annex 18

(Translation)

Declaration of the Energy Forum concerning the putting of the hydroelectric power plant Gabčíkovo into operation, 1990

DECLARATION OF THE ENERGY FORUM CONCERNING THE PUTTING OF THE HYDROPOWER PLANT GABČÍKOVO INTO OPERATION (1990)

The undersigned engineers - specialists and research employees of the following organizations: Slovak energetic plant (SEP), Hydropower plant Trenčín (HPT), Research institute of fuel energetic complex, branch Bratislava, Research Institute of Energetics, branch Bratislava (RIE), State energetic inspection of the Slovak Republic (SEI),

associated in the energetic forum call on the Government of the Slovak Republic and the Federal Government to complete, as soon as possible, the waterwork Gabčíkovo and put it into operation. This demand was formulated at the forum of engineers in Bratislava and was supported by among experts well-known facts, the most important of them are the following ones:

1. The hydropower plant Gabčíkovo will produce in an average year about 2,74 billions kWh, what represents, during the 50 years period of the supposed life of the hydropower plant, 137 billions of kWh. The Czechoslovak ratio in the mentioned production should be determined by an interstate treaty with Hungary. In case that the hydropower plant Gabčíkovo is not put into operation, it would be necessary to ensure the equivalent annual production of electric energy (2,74 billions kWh) in another, alternative power plant. In Czechoslovakia, it is possible only in a thermal or nuclear power plant.

2. For comparison the power plant Nováky and its energetic source - the Slovak coal mines (SCM) Prievidza were considered. To ensure the above mentioned annual production of 2,74 billions kWh in thermal power plant Nováky, it would be necessary to burn 3,726 millions tonnes of brown energetic coal exploited in SCM Prievidza what represents an annual capacity of coal mines Nováky, Handlová and Dolina together.
   Burning this coal in thermal plant Nováky would mean the production of 1,1 mil.tonnes/year of ashes what would represent 55 millions tonnes of ashes, i.e. 77 mil.m^3 in the 50 years life period of the hydropower plant Gabčíkovo

and what is twice more than the whole volume of water reservoir Nosice. An area of about 940 hectares would be necessary to deposit this ash (according to parameters from North Bohemia). By burning 3.726 million tonnes of coal, 3,987 million tonnes of oxygen would be annually consumed and for reproduction of this oxygen quantity 398,7 thousand hectares of forest would be necessary.

The following emissions into atmosphere would take place:

- 29 thousand tonnes ash/year, in 50 years it would represent 1,450 millions tonnes,
- 124 thousand tonnes of SO_2 in a year, 6,200 mil.tonnes in 50 years,
- 10 thousand tonnes of NO_x in a year, 500 thousand tonnes in 50 years,
- 69,7 tonnes of arsenic in a year, 3,48 thousand tonnes in 50 years,
- 3,57 millions tonnes of CO_2 in a year, 178,5 millions tonnes in 50 years.

The coal production of 3,726 millions tonnes of coal in a year would demand 9 280 workers, from this number 6 153 would be miners. The operation of the thermal plant would demand 1 150 more workers than the operation of the hydropower plant. The production of electric energy in a hydropower plant will save annually the work of 10 430 employees, from this 6 153 miners.

3. The average annual production of 2,74 billions kWh in a nuclear plant would demand 13,3 tonnes of atomic fuel, i.e. 665 tonnes in 50 years. The burnt radioactive fuel which weight does not change, needs a special transport and deposit. The operation of equivalent nuclear plant needs a water source of annual capacity of 10,768 million m^3 water, from this the consumption of it represents 7,89 million m^3. It means the need of 538 million m^3 water in 50 years, from what the consumption represents 394 million m^3. During the cooling process connected with this production a great quantity of heat is released into atmosphere.

   The production of 2,74 billions kWh in a nuclear plant would demand 570 more workers than in a hydropower plant.

The operation of nuclear plants in the Slovak and Czech Republics is undoubtedly needed. Nevertheless putting the hydropower plant Gabčíkovo into operation would result in a decrease of the need of construction of further nuclear capacities.

By its annual production of 2,74 billions kWh, the hydropower plant Gabčíkovo would guarantee the covering of energy consumption in households for 4,765 millions inhabitants (together for both sides).

A great advantage of a hydropower plant in comparison with a thermal or nuclear plant is its significant longer life, at least twice longer. It is proved by operation of hydropower plant Ladce which is in operation since 1936, i.e. 55 years and it is still in a good condition. It may be supposed that by the year 2050 all present and now constructed thermal and atomic plants would be out of life, but the hydropower plant Gabčíkovo would be still in operation.

An outstanding ecological as well as economic advantage of hydropower plant is the fact that no gas, liquid or solid waste are formed, water is not consumed but it is artificially aerated by its discharge through turbines. The energetic source of water is permanently restored in nature and cannot be exhausted.

The production of electric energy in the hydropower plant Gabčíkovo will make possible already in the first year of its operation to substitute the production of electric energy from the thermal power plant Nováky or to decrease the import of electric energy to Slovakia.

This would lead to the reduction of annual exploitation of energetic coal in Slovak Coal Mines Prievidza.

It should be stressed at this place that the interstate division of the produced electric energy (in hydropower plant Gabčíkovo) should be done according to actual investments of work and ratio of occupied land, because two thirds (40 km^2) of area of the reservoir, the whole inlet canal, the hydropower plant, the navigation locks and the outlet canal are situated on the Czechoslovak territory.

Only 1/3 of the reservoir area (20 km^2) and the weir Dunakiliti are situated on the Hungarian territory. Further, the loss on the production of electric energy in the hydropower plant Nagymaros and pre-investments into the constructions connected with the Nagymaros project realized on our territory in advance, must be taken into account.

One of the proves of economic and ecologic advantages of the waterworks on the Danube is the fact that in neighbouring countries, e.g. in Austria, 9 hydropower plants from among 13 planned since 1954 have already been constructed. From the total average annual production of 16 billions kWh, 12 billions kWh, i.e. 75% is already utilized. Only three hydropower plants remain to be constructed and one joint Czechoslovak-Austrian (Wolfsthal), the annual average production of which would be 4 billions kWh, alltogether i.e. 25%. A joint hydropower plant Djerdap I (Iron Gate) began to be built in 1964 on the lower flow of the Danube by Romania and Yugoslavia. It was completed in 1971. Its total installed output is 2050 MW and average annual production 11,3 billions kWh. It was followed by the construction of the step Djerdap II with installed output 450 MW and annual average production 2,4 billions kWh. It was put into operation in 1985. The construction of this step was a consequence of the demand to utilize the step Djerdap I for the production of peak electric energy without unfavourable effects on the water flow below the step. The Djerdap II functions thus as a balance hydropower plant, similarly as the hydropower plant Nagymaros within the G/N Project.

The advantage of utilization of hydroenergetic capacity of water flows is also proved by the fact that hydroenergetic technically utilizable capacity is utilized e.g. in France on 94,7%, in Switzerland on 79,5%, in German Federal Republic on 78,8%, in Italy on 65,0%, in Finland on 60,5%, in Norway on 59,30% and Austria on 56,7%. In Czechoslovakia, the present utilization of hydroenergetic capacity is 35,8% and in Hungary only 4,5% ranging thus these countries at last places in Europe.

The following conclusion can be drawn from the mentioned facts: the production of electric energy in hydropower plant is ecologically advantageous. Compared with ecological criteria published by the Ministry of Interior and Environment of the Slovak Republic, the hydropower plant Gabčíkovo belongs to facilities that do not pollute the environment with flying dust and ashes, sulphur oxides and other harmful substances spread into atmosphere with noise, it does not destroy vegetation by emissions and does not cause a disastrous floods. The practice up to this date on waterworks on the river Vltava and mainly Váh demonstrated that the technical and ecological problems of surface-and groundwaters connected with the construction of reservoirs, inlet and outlet canals had been successfully managed even in such localities as the Piešťany spa. There is a similar waterwork Piešťany-Madunice which has been in operation since 30 years and which did not destroy therapeutic sources and mud but on the contrary it made possible further development of this worldwide known spa. Even if the question of surface and groundwaters belongs to serious problems, we are persuaded that the Czechoslovak experts and ecologists are able to complete the solution of this problem which has been basically solved already in the project itself and that no ecological catastrophe threatens.

This declaration focuses on the energetic and ecological contribution of the waterwork Gabčíkovo, but this waterwork will bring also other beneficial effects, e.g.: protection against floods, amelioration of navigation, development of territory, recreation and other which should be evaluated by experts in relevant fields.

We are persuaded that our standpoint will help to complete the waterwork Gabčíkovo and to put the hydropower plant into operation.

(Followed by more than 600 signatures on 22 pages.)

Annex 19

(Without appendices)

Commission of the European Communities, Republic of Hungary, Slovak Republic,

Working Group of Monitoring and Water Management Experts for the Gabčíkovo System of Locks, Data report of 2 November 1993

COMMISSION OF THE EUROPEAN COMMUNITIES
REPUBLIC OF HUNGARY
SLOVAK REPUBLIC

WORKING GROUP OF MONITORING AND WATER MANAGEMENT EXPERTS
FOR THE GABCIKOVO SYSTEM OF LOCKS

DATA REPORT

- Assessment of Impacts of Gabcikovo Project and Recommendations for Strengthening of Monitoring System

Budapest
November 2, 1993

EXECUTIVE SUMMARY

BACKGROUND

As a follow-up of the 'Special Agreement for Submission to the International Court of Justice of the differences between the Republic of Hungary and the Slovak Republic concerning the Gabcikovo-Nagymaros Project' a Group of Monitoring and Water Management Experts for the Gabcikovo System of Locks (Working Group) was established by the Republic of Hungary, the Slovak Republic and the Commission of the European Communities (CEC).

The tasks of the Working Group fall in two parts:

* On the basis of available data to assess the impacts of the Gabcikovo Project and to prepare recommendations for strengthening the monitoring system in the area.
* Preparation of recommendations for a Temporary Water Management Regime as well as for necessary discharges, water levels and remedial measures.

The present Data Report deals with the first of the above two tasks, while the Final Report of the Working Group scheduled for the beginning of December 1993 shall deal with the second aspect.

The Working Group has obtained most of the relevant data and information requested from the two Governments. The report is based on this information.

IMPACTS OF THE GABCIKOVO PROJECT

Major general impacts as compared to pre-dam conditions have been identified from the available data with regard to the following aspects:

Discharge

In the Old Danube the discharge has in 1993 been reduced to in average about 400 m^3/s corresponding to about 20 % as compared to the pre-dam condition.

Surface water level

At Bratislava the water levels during low flow periods have increased by 1-2 m as compared to pre-dam conditions, i.e. to a level corresponding to the situation 40 years ago. In the upstream part of the Old Danube the 1993 water levels have been reduced by 2-4 m as compared to pre-dam conditions, and have thus reached a level 2 m below the lowest ever recorded values. In addition, the characteristic natural dynamics of the water level fluctuations have been changed (reduced) significantly.

Sediment transport and sedimentation/erosion

Significant erosion occurred the first 500 m downstream the Cunovo structures under the November 1992 flood event. This material has been deposited downstream in the Old Danube. Sedimentation of fine material/silt can be seen in the Old Danube. Most likely, sedimentation of the total bed load and a substantial part of the suspended load have occurred in the reservoir. However, there are presently not sufficient data to quantitatively assess such impacts.

Ground water level

In June/July 1993 the situation in Slovakia shows that over the entire area the ground water levels have increased or have not been affected. The increases have mainly occurred in the upstream area close to the reservoir, i.e. in the area which has been most negatively affected by the long term trend of decreasing ground water levels. On the Hungarian side, where comprehensive assessments have not been made, it appears that ground water levels have increased close to the reservoir (Rajka - Dunakiliti region). Furthermore, it appears that in the middle part of Szigetköz between Dunakiliti and Asvanyraro ground water levels have decreased in areas close to the main Danube. On both sides the ground water level fluctuations have been reduced significantly.

Electricity production

The Gabcikovo hydropower plant has produced 150 - 200 Gwh/month in 1993. This corresponds to about 10% of Slovakia's electricity consumption.

In addition, minor impacts have been observed or no significant impacts can be detected from the available data for the following aspects:

Surface water quality

With exception of November - December 1992, when sudden changes of regime and a high flood event occurred, no significant changes in surface water quality parameters as compared to pre-dam conditions can be detected after damming the Danube.

Ground water quality

In general, no significant ground water quality changes can be identified after the damming of the Danube. One exception is the Rusovce area where some parameters (e.g. Total Dissolved Solids and nitrate) have changed due to changes in the flow pattern. No changes in concentrations of heavy metals nor organic micropollutants have been detected.

Flora and fauna

Due to insufficient data availability and due to the long response time of natural systems with regard to flora and fauna, no major general impacts can be documented as yet. However, changes in the abundance of certain species have been observed.

Agriculture

Due to increases of ground water tables on the Slovak territory a slight increase in the capillary water supply for Slovakian agricultural areas has taken place. In Hungary, where comprehensive assessments have not been made, the impacts on agriculture are uncertain.

Forestry

As a result of the changes in ground water levels the forestry has been positively influenced in Slovakia and negatively in Hungary.

RECOMMENDATIONS FOR STRENGTHENING OF MONITORING SYSTEM

The Working Group recommends that the present monitoring system, including the extended programmes specifically aiming at monitoring possible impacts of the Gabcikovo Project, be continued.

In addition, the Working Group recommends that the monitoring system be strengthened in two aspects:

* aspects requiring more measurements, either in terms of measurements of new parameters or more measurements (in time and space) of already measured parameters; and

* aspects where discrepancies between Slovakian and Hungarian data have been detected, and where coordination efforts therefore are required.

For the different parameters the recommended strengthening is as follows:

Discharge

For obtaining firm conclusions on the discharge uncertainties the following checks are required to be carried out by joint Hungarian-Slovakian teams:

* Check on discharge calibration curve at the bypass weir at Cunovo.
* Check on discharge calibration curve at the turbines at Gabcikovo.
* Check of discharge rating curves at Rajka and Dunaremete.

Surface water levels

There is a need for a new monitoring programme on measurements of surface water levels in the side channels on the flood plains both in Hungary and in Slovakia.

Surface water quality

There is a need for a new monitoring programme on measurements of surface water quality in the side channels on the flood plains both in Hungary and in Slovakia.

Sediment transport and sedimentation/erosion

There is a need for establishment of a permanent sediment transport measurement programme comprising both bed load and suspended load measurements at the following locations:

* Upstream the reservoir.
* In the reservoir.
* In the Old Danube.
* In the side channels of the Hungarian and Slovakian flood plains.
* Downstream the confluence at Sap/Palkovicovo.

Furthermore, there is a need for establishment of permanent programmes for monitoring river bed and reservoir topography.

Ground water quality

The intensive monitoring must be continued for the coming years, especially with regard to areas close to the Danube where the infiltration conditions have been changed. Depending on the development of the measured ground water quality parameters it may be required to add more observations in the future.

Flora and fauna

A biomonitoring programme comprising the following elements should be carried out:

* Geobotanical monitoring.
* Mapping of the bird species.
* Investigations on fish populations, Carabide-beetles, grasshoppers and living and dead mussels and water snails.
* Monitoring of plankton in major water bodies.

Forestry

The following monitoring should be carried out:

* Mapping the forest types in the scale 1:10.000.
* Annual measurements of height, perimeter and leaf area at selected "monitoring trees".

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Background and Objectives for the Working Group

As a follow-up of the 'Special Agreement for Submission to the International Court of Justice of the differences between the Republic of Hungary and the Slovak Republic concerning the Gabcikovo-Nagymaros Project' a Temporary Water Management Regime for the Danube has to be established and implemented.

In order to provide reliable and undisputed data on the most important effects of the current water discharge and the remedial measures already undertaken as well as to make recommendations for appropriate measures a Group of Monitoring and Water Management Experts for the Gabcikovo System of Locks (Working Group) was established by the Republic of Hungary, the Slovak Republic and the Commission of the European Communities (CEC). The Terms of References for the Working Group are enclosed in Appendix A.

The Working Group is composed of the following five experts:

CEC: Professor Johann Schreiner (primus inter pares), Director, Norddeutsche Naturschutzakademie, Germany.

Mr. Jan M. van Geest, Director, DHV Environment and Infrastructure, The Netherlands.

Mr. Jens Christian Refsgaard, Chief Hydrologist, Danish Hydraulic Institute, Denmark.

Slovakia: Professor, Dr. Igor Mucha, Faculty of Natural Science, Comenius University, Bratislava.

Hungary: Professor, Dr. Gabor Vida, Head of Department of Genetics, Eötvös L. University, Budapest.

The five experts were assisted by colleagues as listed in Appendix B. The Working Group had its first formal meeting on September 8-9, 1993 in Bratislava. The second meeting was held in Budapest during the period October 27 - November 2, 1993. Field inspections were carried out on October 30 both in Slovakia and in Hungary. In between the two formal meetings comprehensive work on data collection and analyses were carried out by the Slovak and Hungarian experts and interaction with the CEC experts also took place during this period.

The Working Group has to prepare two reports. The present report, which is the first one, comprises an assessment of the impacts of the Gabcikovo project with regard to discharges, surface water levels and quality, sedimentation and erosion, ground water levels and quality, flora and fauna, agriculture, forestry and electricity production. Furthermore, recommendations for strengthening of the monitoring system in the area are given.

The second and final report, scheduled for the beginning of December 1993, will comprise recommendations for the governments for a Temporary Water Management Regime as well as for necessary discharges, water levels and remedial measures to be taken.

The Working Group has obtained most of the relevant data and information requested from the two Governments. The report is based on this information.

1.2 The Gabcikovo Project

The hydraulic structures and their capabilities with regard to water management as per November 22, 1992 are described in ref /1/. Since then developments have taken place with regard to:

(a) Turbines and shiplocks at Gabcikovo.
(b) Variant C structures at Cunovo.
(c) Structures allowing water flow through the side channels on the Slovakian flood plains. This system, which started operating in April 1993 enables 234 m^3/s to be diverted from the power canal to the side channels through an inlet structure at Dobrohorst. At present about 43 m^3/s flow through the system of side channels.
(d) Structures allowing water flow through the side channels on the Hungarian flood plains. This system, which started operating in August 1993, utilizes some of the water coming through the Mosoni Danube and the seepage canal from Slovakia. At present about 10 m^3/s flow through the system of side channels.

A more detailed description of these structures and their water management capabilities will be given in the final report of the Working Group devoted to Temporary Water Management Regime.

2. DISCHARGE

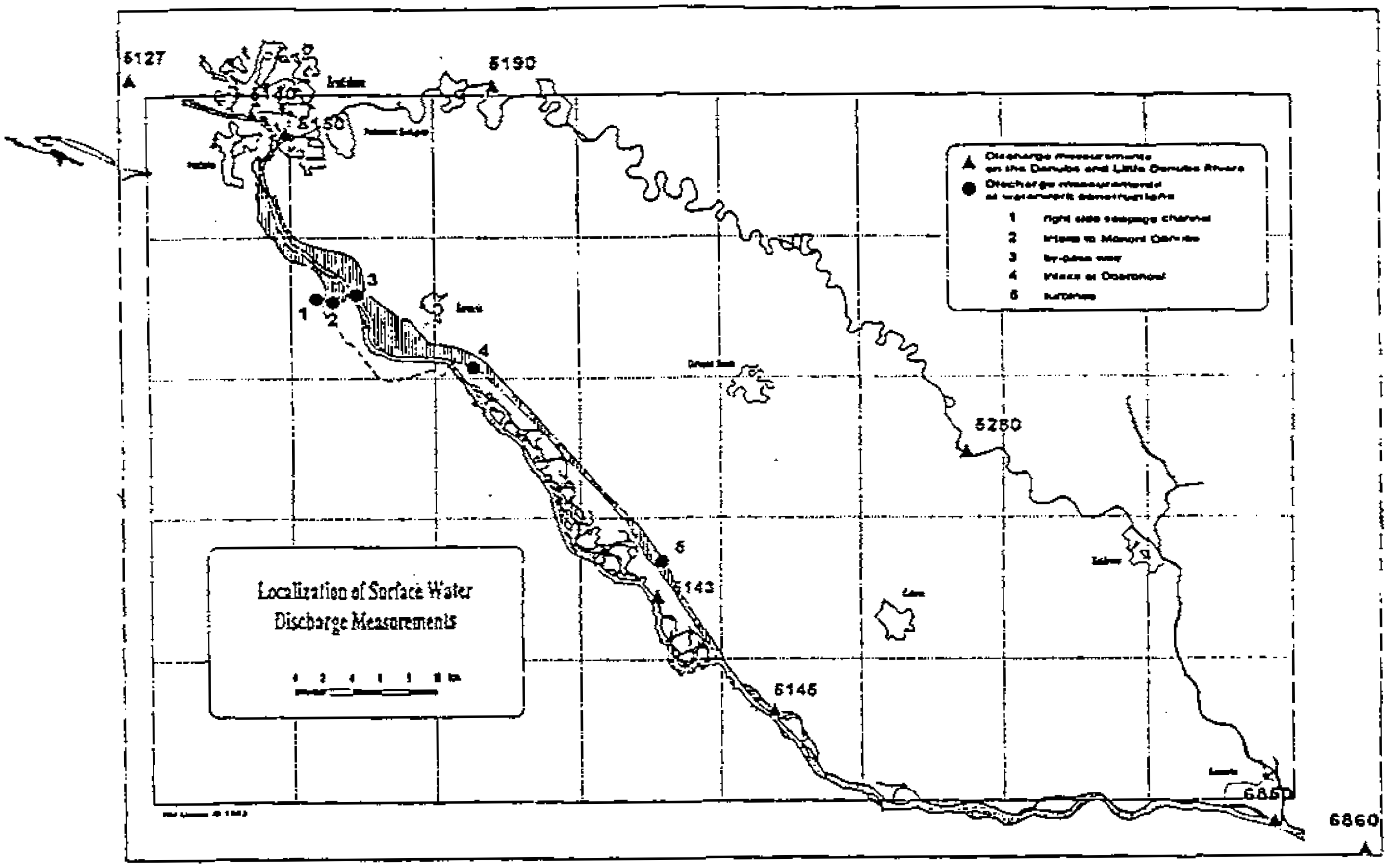
2.1 Available Data

The amount of discharge data in the area is comprehensive. Daily data from the locations listed in Table 2.1 have been analysed. The locations of the stations are shown on the index map in Fig. 2.1

Table 2.1 Discharge stations in the area

Location	Country	Station Code
Danube, Devin	SK	5127
Danube, Bratislava	SK	5140
Danube, Rajka	H	000001
Danube, Dunaremete	H	000002
Danube, Medvedov	SK	5145
Danube, Komarom	H	000005
Danube, Komarno	SK	6850
Danube, Iza	SK	6860
Little Danube, Male Palenisko (intake at Bratislava)	SK	5150
Little Danube, Nova Dedinka	SK	5190
Little Danube, Tratice	SK	5280
Mosoni Danube, Outlet at Cunovo	SK	
Mosoni Danube, Rajka	H	110002
Seepage canal, right side	SK	
Danube, bypass weir Cunovo	SK	
Intake to Slovakian river branches, Dobrohost	SK	
Turbines, Gabcikovo	SK	
Shiplocks, Gabcikovo	SK	

For many of the stations, especially the ones located at the Danube itself, historical time series exist for several decades. In the data analyses presented below mainly the data from the period 1991 - 93 have been considered. However, also the most important long term trends have been analysed.



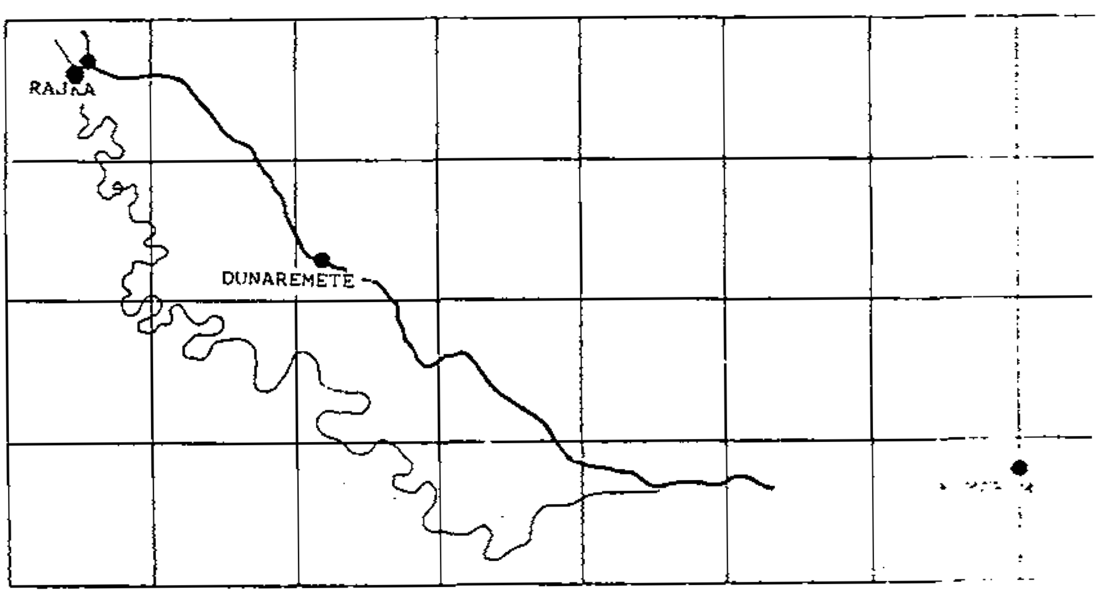


Fig. 2.1 Index map showing locations of discharge stations.

The discharge at the bypass weir at Cunovo is estimated from the setting of the gates. The same procedure could in principle be used also for the inundation weir at Cunovo. However, due to the large width of this weir small uncertainties in water level observation would result in very large uncertainties on the discharge through the weir. Therefore, the discharge is not measured, but has to be estimated from e.g. measured discharge data at Rajka.

At Mosoni Danube historical discharge data exist from the mid 1980's onwards.

In order to assess the impacts of rapid changes of operation of the bypass weir at Cunovo and of the turbines at Gabcikovo hourly discharge values have been analysed for a few selected days.

2.2 Data Analyses - Long Term Trends

The long term trend of the Danube discharge can be evaluated from Fig. 2.2, which shows the Danube discharges (and water levels) at Bratislava for the last 40 years. In addition to the actual data the linear regression line is shown in the figure. Evidently, there is no significant long term trend in the Danube discharge.

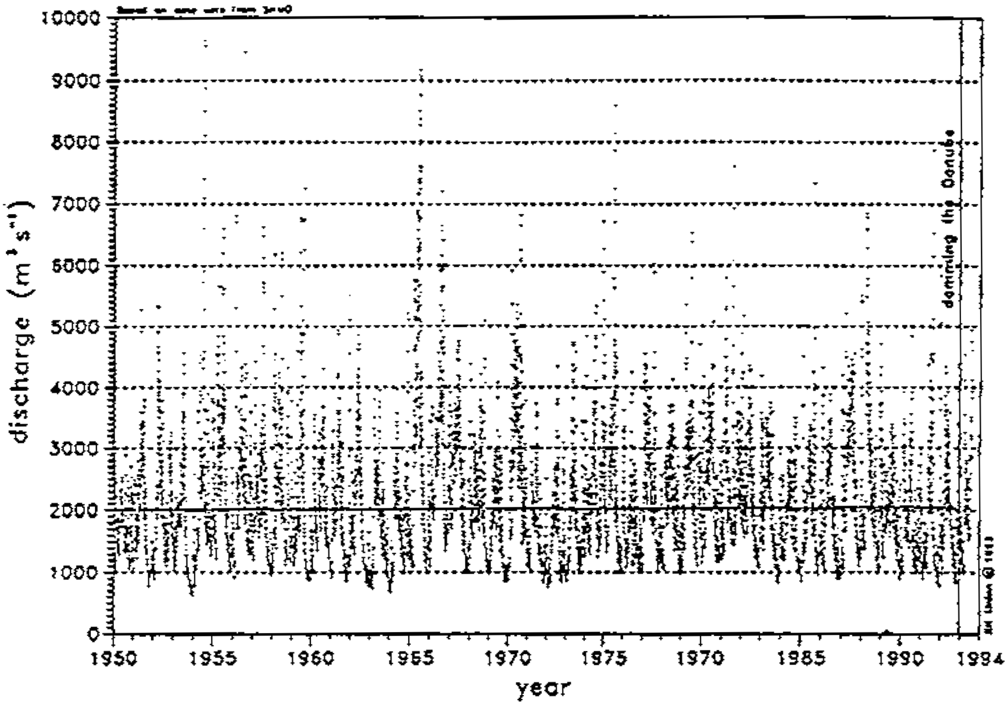
Historical discharge data from the Little Danube, ref. /2/, show a clear decreasing trend from the mid 1970's to 1992. This is a result of a general decrease in Danube water level at Bratislava, cf. Section 3.2.

2.3 Analyses of 1991-93 Data

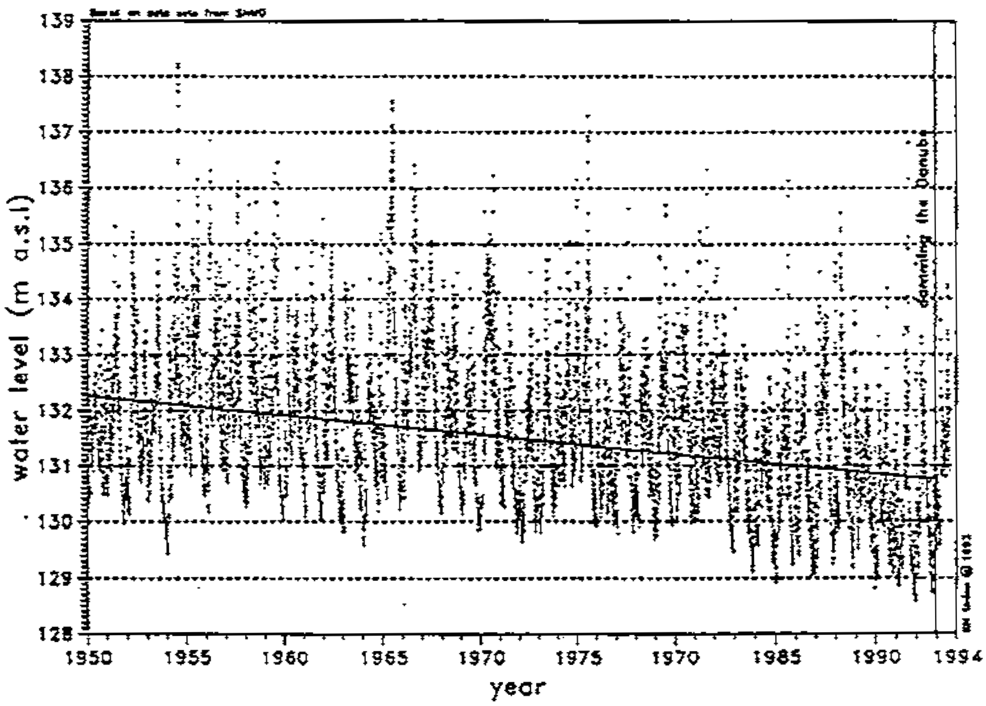
Hydrographs of daily discharges have been plotted for all stations, ref. /2,3/, for the period after January 1991. Furthermore, the monthly average values have been calculated.

Selected hydrographs for the main river system are shown in Fig. 2.3, while discharges to the Little Danube, Mosoni Danube, right side seepage canal and intake to the Slovak flood plains are shown in Fig. 2.4.

A summary of 1993 discharge values stations are given in Table 2.2.



Discharge of the Danube river at Bratislava



The Danube water level at Bratislava

Fig. 2.2 **Danube discharges and water levels at Bratislava for a 40 year period.**

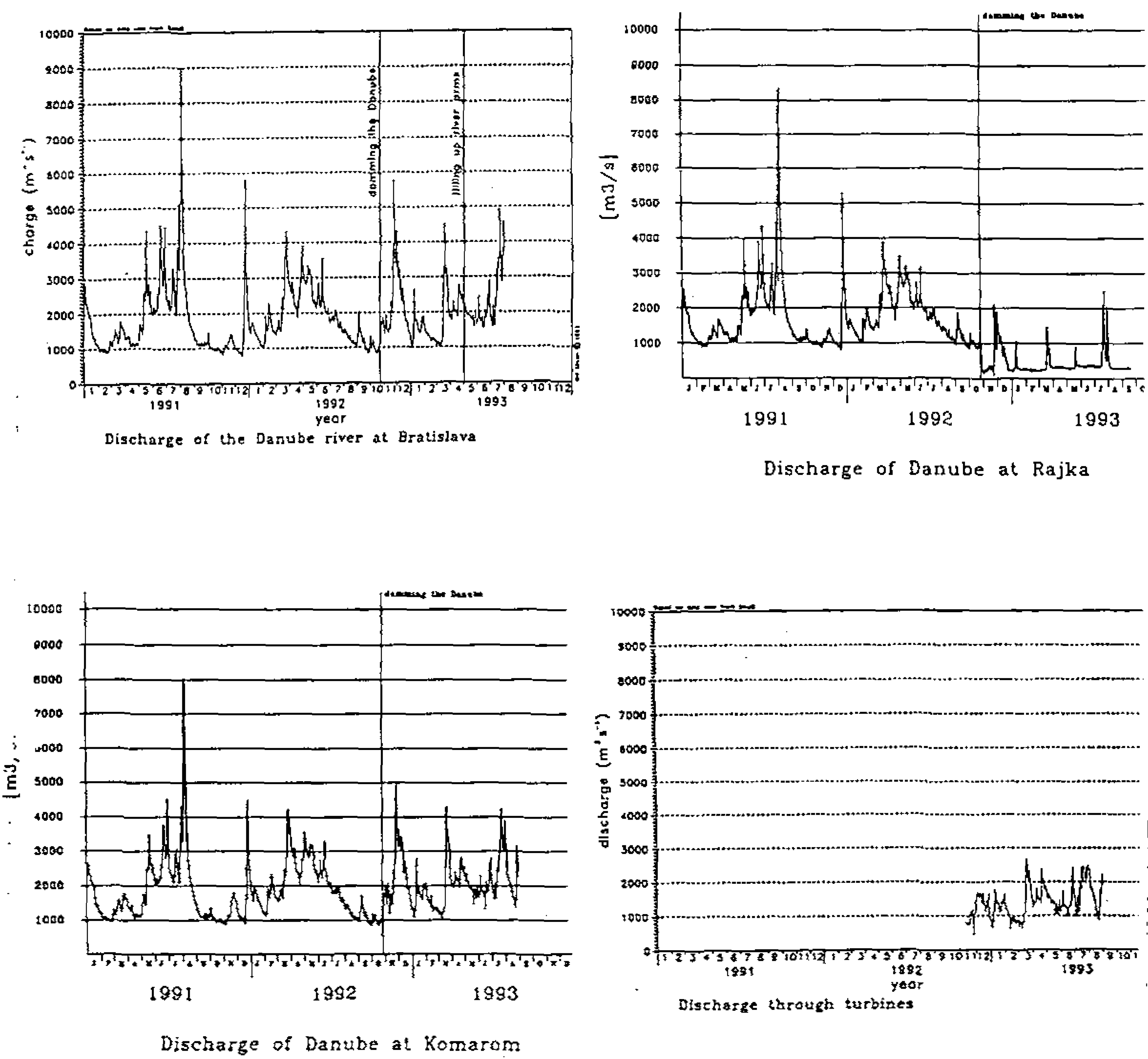


Fig. 2.3 **Discharges at Bratislava, Rajka, Komarom and through the turbines at Gabcikovo 1991-93.**

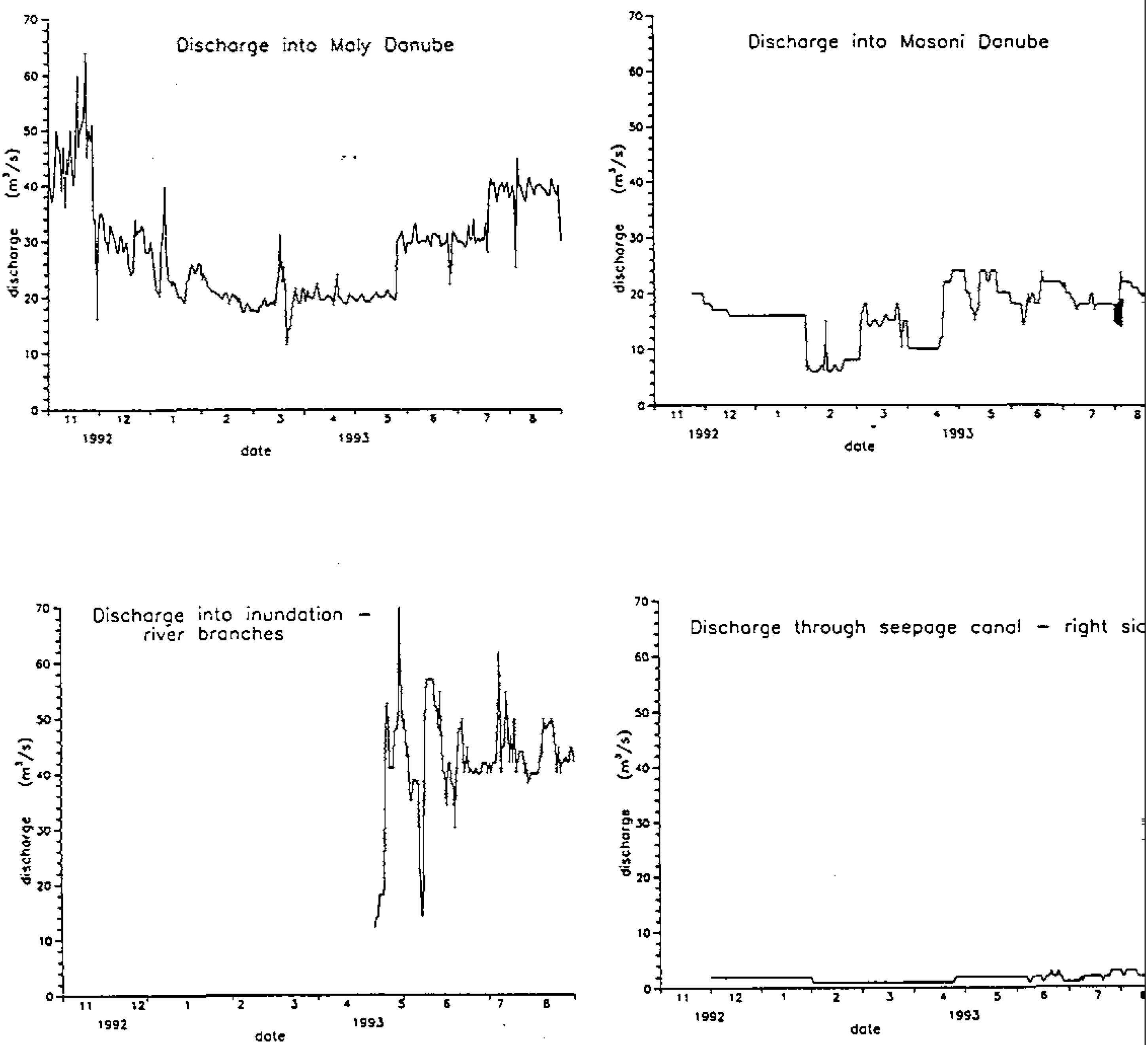


Fig. 2.4 **Discharges at intakes to Little Danube, Mosoni Danube, the Slovak flood plain and discharge in the right side seepage canal 1991-93.**

Table 2.2 Average monthly discharges in 1993

AVERAGE MONTHLY DISCHARGE (m^3/s)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Ave Jan-Jul
Danube, Devin/Bratislava	1607	1313	2025	2177	1925	1964	2830	2129	1.977
Danube, Rajka	303	225	420	294	354	347	731	314	382
Danube, Dunaremete	298	238	467	319	370	382	789	362	409
Danube, Medvedov	1519	1266	1846	2051	1846	1909	2702	2080	1.877
Danube, Komarom	1760	1480	2100	2270	1950	1950	2660	2140	2.024
Danube, Komarno	1613	1440	2025						
Danube, Iza	1810	1583	2254	2412	2066	1969	2733		2.118
Little Danube, Male Palenisko (intake at Bratislava)	20	17	16	17	19	25	29		20
Little Danube, Nova Dedinka	14	12	11	15	13	17	24		15
Little Danube, Trstice	28	25	25	24	18	19	25		23
Mosoni Danube, Outlet at Cunovo	16	7	14	14	21	20	19	19	16
Mosoni Danube, Rajka	12	9	13	12	20	21	23	23	16
Seepage canal, right side	2	1	1	1	2	2	2	2	2
Danube, bypass weir Cunovo	427	335	364	392	405	444	347	426	388
Intake to Slovakian river branches, Dobrohost	0	0	0	6	38	43	44	43	19
Turbines, Gabcikovo	1209	971	1425	1670	1366	1404	1987	1579	1.433
Shiplocks, Gabcikovo	12	16	16	23	26	32	32	34	22

CONSISTENCY CONTROL OF MEASURED DISCHARGES									
Q_{a1}	1.587	1.296	2.009	2.160	1.906	1.939	2.801		1.957
Q_{a2}	1.542	1.220	1.876	2.008	1.807	1.848	2.815		1.874
Q_{a3}	1.531	1.275	1.859	2.063	1.866	1.930	2.725		1.893
Q_{a4}	1.760	1.480	2.100	2.270	1.950	1.950	2.660		2.024
Q_{a5}	1.613	1.440	2.025						
Ave (Q_{a1}..Q_{a5})	1.607	1.342	1.974	2.125	1.882	1.917	2.750		1.942
Std (Q_{a1}..Q_{a5})	95	112	103	115	61	47	72		86
Std/Ave (in %)	6	8	5	5	3	2	3		5
Q_{b1}		335		392		444			
Q_{b2}	303	225	420	294	354	347	731		382
Q_{b3}	298	238	467	319	370	382	789		409

Note: Details are provided in the text

From Fig. 2.3 and Table 2.2 it is evident that the Gabcikovo Project has had a very large impact on the discharge regime in the Danube between the weir at Cunovo and the downstream confluence at Palkovicovo. In this reach (the Old Danube) the discharge has in 1993 been reduced to about 20 % as compared to the pre-dam condition. Fig. 2.5 shows the ratio between the Danube discharge at Rajka and Bratislava from January to August 1993. It is noticed that the Rajka discharge during this period has varied between 11% and 50% of the Bratislava discharge.

From Fig 2.4 it appears that the discharge to Little Danube has been increased with about 10 m^3/s, representing approximately a doubling as compared to the pre-dam conditions. Similarly, the discharge to Mosoni Danube has been significantly increased. Finally it may be noted that with the water intake from the power canal at Dobrohost to the Slovakian flood plains the water flow through the side arms has been very significantly increased as compared to the pre-dam conditions, which most often were characterized by stagnant water.

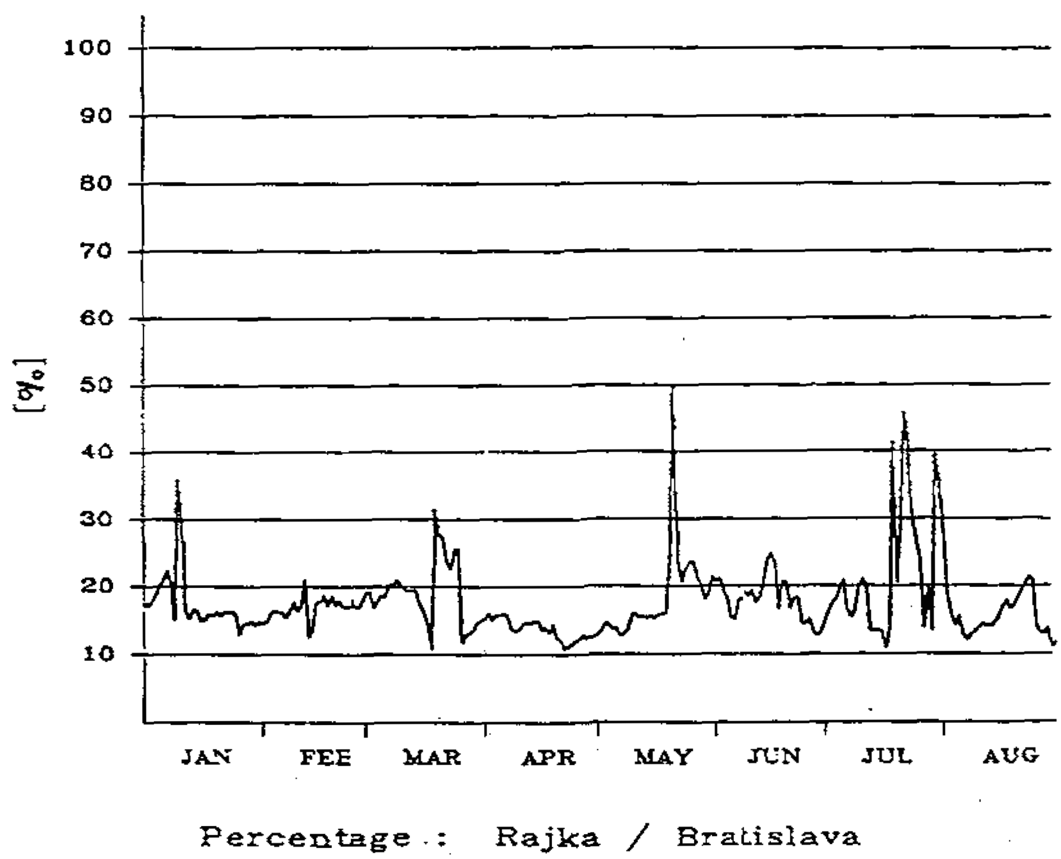


Fig. 2.5 **The ratio of the measured discharges at Rajka and Bratislava for January to August 1993**

An analysis of the uncertainty/consistency of the discharge measurements can be made by considering the following continuity conditions:

(a) Discharges upstream the reservoir compared to discharges through the structures and compared to discharges downstream the confluence.

$$Q_{a1} = Q_{a2} = Q_{a3} = Q_{a4} = Q_{a5}$$

where,

$$Q_{a1} = Q_{Bratislava/Devin} - Q_{Little\ Danube}$$

$$Q_{a2} = Q_{Turbines} + Q_{Shiplocks} + Q_{Dobrohorst} + Q_{Seepage} + Q_{Mosoni\ Danube} + Q_{Rajka}$$

$$Q_{a3} = Q_{Medvedov} + Q_{Mosoni\ Danube}$$

$$Q_{a4} = Q_{Komarom}$$

$Q_{a5} = Q_{Komarno}$ (excluding discharge of river Vah)

(b) Discharge along the Old Danube

$$Q_{b1} =< Q_{b2} =< Q_{b3}$$

where,

$$Q_{b1} = Q_{Bypass\ Weir}\ (+Q_{Inundation\ Weir})$$

$$Q_{b2} = Q_{Rajka}$$

$$Q_{b3} = Q_{Dunaremete}$$

Because the discharge through the inundation weir is not measured equation (b) is strictly only applicable for periods with no discharge through the inundation weir. In other situations only the $Q_{b2} = Q_{b3}$ is valid.

Summary results of this consistency check based on monthly average discharges are given in the second half of Table 2.2. From the table the following findings appear:

* The Danube discharge at Bratislava minus the discharge to Little Danube (Q_{a1}) is except for July larger than the combined discharge at the Cunovo/Rajka and Gabcikovo structures (Q_{a2}). The difference is about 80 m^3/s (5%)

* The Danube discharge at Bratislava minus the Little Danube (Q_{a1}) is constantly larger than the discharge

at Medvedov plus the discharge at Mosoni Danube (Q_{a3}). The difference is about 60 m^3/s (3%).

* The Danube discharge at Bratislava minus the Little Danube (Q_{a1}) is except for July less than the discharge at Komarom (Q_{a4}). The difference is about 70 m^3/s (5%).

* The discharge at the Hungarian station Komarom can be compared to the Slovakian station Iza, which is located a few km downstream with the river Vah joining in between. Considering that the difference between the two stations, about 100 m^3/s, is the same order of magnitude as the average discharge of river Vah, the agreement between these two stations must be characterized as very good.

* The discharge at Komarno (upstream the confluence with river Vah) measured by Slovakia and the discharge at Komarom measured virtually at the same location by Hungary shows a difference of about 70 m^3/s (4%). Based on the above comparison between Komaron and Iza it appears that the discharge data at Komarom are more reliable than those from Komarno.

* The discharge at the bypass weir (Q_{b1}) can be compared directly to the discharge at Rajka (Q_{b2}) for the months February, April and June 1993, where the inundation weir was not used for passing floods. In these three months the discharge recorded at the bypass weir is about 100 m^3/s (30%) larger than the discharge at Rajka.

* The discharge at Dunaremete (Q_{b2}) is, except in January, higher than the discharge at Rajka (Q_{b3}). The difference is in average about 30 m^3/s (7%).

The uncertainties, which should be considered in further assessment of these findings are:

* The following discharges have not been taken into account:
  - Discharge in the left side seepage canal. This is not measured, but can be estimated to be in the order of 5 m^3/s. The main part of this water is diverted to irrigation and the remaining flows to the side channels in the Slovakian flood plain.
  - Infiltration from reservoir and river system to ground water. This is in the order of 18 - 35 m^3/s between Bratislava and Sap/Palkovicovo, downstream of where some of it returns as baseflow.

These two loss terms have to be subtracted from Q_{s1} when comparing with Q_{s2}. Hence, the discrepancy reduces to approximately 50 m^3/s (3%).

* There are the ordinary uncertainties in measuring discharge in rivers, mainly due to uncertainties and instabilities of rating curves.

* The discharge through the bypass weir at Cunovo can be considered especially uncertain because the calibration curve relating the upstream water level and the gate settings to the discharge has been calculated from the designed spillway, which had to be changed just after start of operation due to serious erosion problems.

* The uncertainty on the discharges through the turbines are considered relatively small.

On this basis the following conclusions can be drawn with regard to accuracies in the discharge measurements:

(1) The discharges estimated at the bypass weir are too high. 50-100 m^3/s lower values appear more reasonable.

(2) The accuracy, with which such water balances as $Q_{s1} = Q_{s2} = Q_{s3} = Q_{s4} = Q_{s5}$ can be derived appear to be in the order of $^+/_-$ 2-5 % on a monthly basis.

2.4 Adequacy of the present Monitoring System

The number and location of discharge measurement stations are adequate.

For obtaining firm conclusions on the discharge uncertainties the following checks are required to be carried out by joint Hungarian-Slovakian teams:

* Check on discharge calibration curve at the bypass weir at Cunovo.

* Check on discharge calibration curve at the turbines at Gabcikovo.

* Check of discharge rating curves at Rajka and Dunaremete.

3. SURFACE WATER LEVEL

3.1 Available Data

The amount of surface water level data in the area is comprehensive. Data from the locations listed in Table 3.1 have been analysed. Some of the data are average daily values based on raw data from e.g. hourly manual readings or automatic recorders, while at other stations only immediate water level readings are made once per day. The locations of the stations are shown on the index map in Fig. 3.1

For many of the stations, especially the ones located at the Danube itself, historical time series exist for several decades. In the data analyses presented below mainly the data from the period 1991 - 93 have been considered. However, also the most important long term trends have been analysed.

3.2 Data Analyses for Long Term Trends

The long term trend of the Danube water levels can be evaluated from Fig. 2.2 which shows the Danube water levels at Bratislava for the last 40 years. In addition to the actual water level data the linear regression line is shown in the figure. Evidently, there is a significantly decreasing long term trend in the Danube water levels at Bratislava of about 1.5 m. Between Dunaremete and Gabcikovo the water levels show no clear trend for low flows and a small increasing trend for high flows. The reason for this decrease is described briefly in Section 5.2.

Table 3.1 Water level stations in the area

Location	Country	Station Code	Measurement practise
Danube, Devin	SK	5127, 5128	Automatic recorder
Danube, Bratislava	SK	5140	Automatic recorder
Danube, Bratislava-Rusovce	SK	5141	Manual, daily
Danube, Rajka	H	000001	Automatic recorder
Danube, Dunaremete	H	000002	Manual, 2x per day
Danube, Asvanyraro	H		Automatic recorder
Danube, Nagybajcs	H		Manual, 2x per day
Danube, Gabcikovo	SK	5143	Manual
Danube, Palkovicovo	SK	5144	Manual
Danube, Medvedov	SK	5145	Automatic recorder
Danube, Klizska	SK	6810	Manual
Danube, Zlatna na Ostrove	SK	6830	Manual
Danube, Komarno	SK	6850	Manual
Danube, Iza	SK	6860	Manual
Danube, Radvan nad Dunajom	SK	6870	Manual
Danube, Sturovo	SK	6880	Manual
Flood plain branch, Burjan	H		Automatic recorder
Flood plain branch, Doborgaz	H		Automatic recorder
Flood plain branch, B12	H		Automatic recorder
Little Danube, Male Pakenisko (intake at Bratislava)	SK	5150	Automatic recorder
Little Danube, Vlcie Hrdlo	SK	5155	
Little Danube, Pod. Biskupice	SK	5152	
Little Danube, Most na Ostrove	SK	5156	
Little Danube, Malinovo	SK	5185	
Little Danube, Nova Dedinka	SK	5190	Automatic recorder
Little Danube, Jelka	SK	5215	
Little Danube, Jahodna	SK	5195	
Little Danube, Tratice	SK	5280	Automatic recorder
Mosoni Danube, Outlet at Cunovo	SK		Manual
Mosoni Danube, Mecser	H	000017	Automatic recorder
Power canal, upstream Gabcikovo	SK		Automatic recorder
Outlet canal, downstream Gabcikovo	SK		Automatic recorder

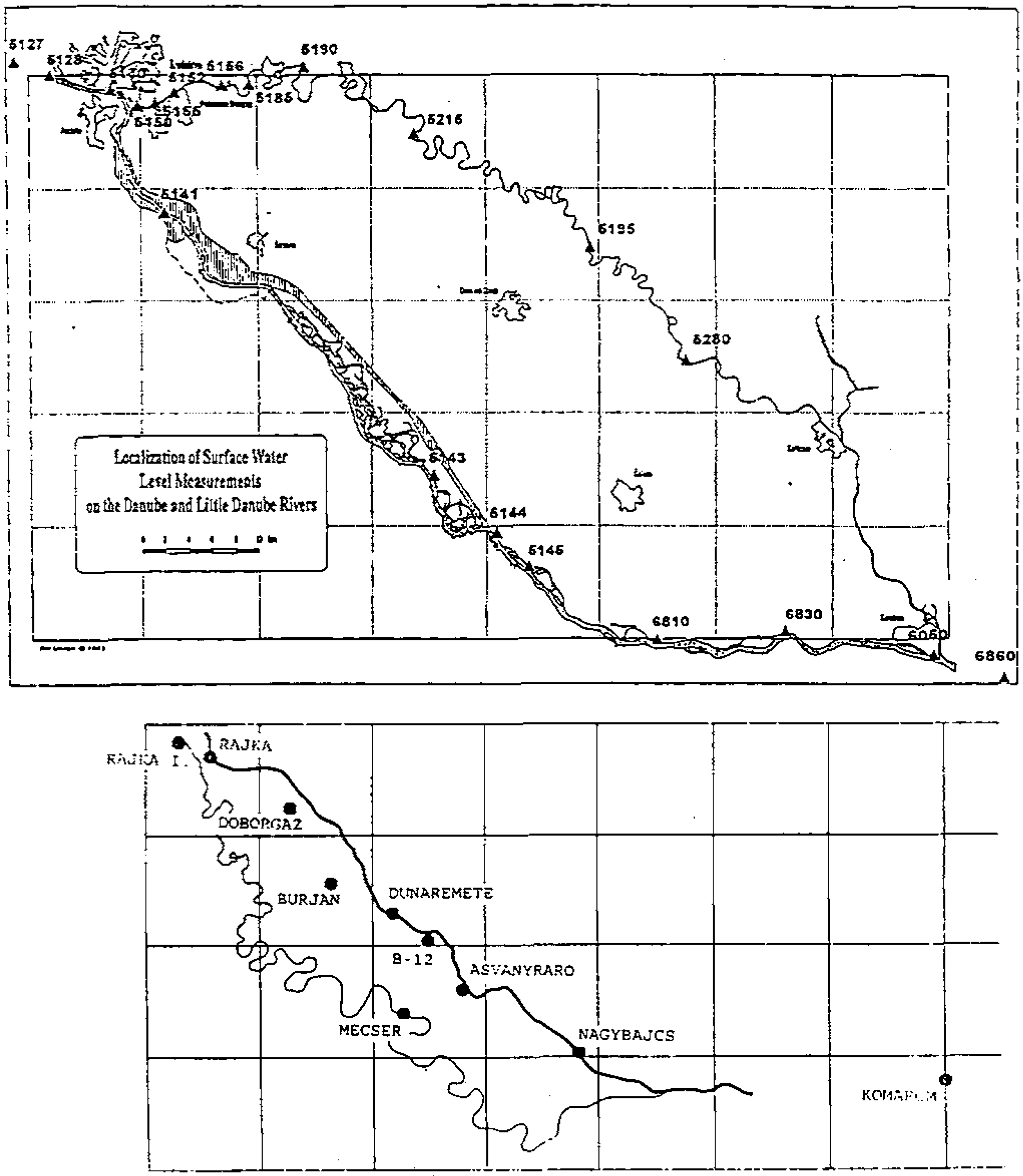


Fig. 3.1 Index map showing locations of water level stations.

3.3 Analyses of 1991-93 Data

Water level hydrographs have been plotted for all stations, ref /2,3/, for the period after January 1991.

Selected hydrographs for the main river system are shown in Fig. 3.2, while water levels in the Little Danube and Mosoni Danube are shown in Fig. 3.3.

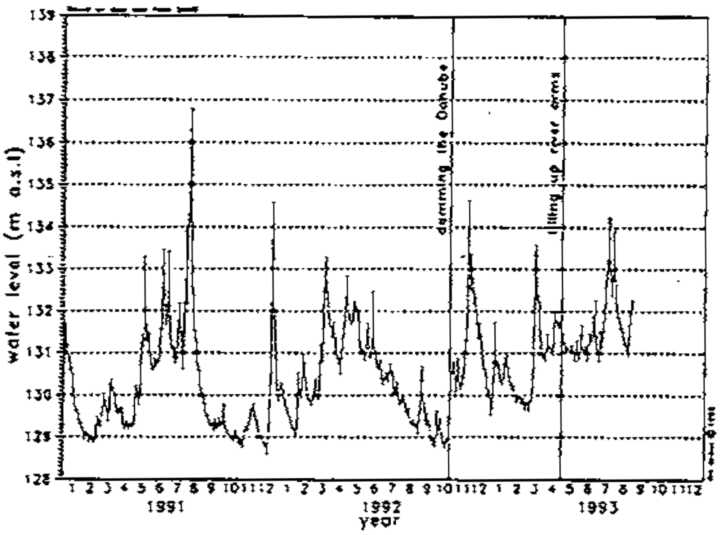
From Fig. 3.2 it is evident that the Gabcikovo Project has had a very large impact on the water level regime in the Danube between Bratislava and the downstream confluence at Palkovicovo. At Bratislava the 1993 water levels during low flow periods have increased by 1-2 m as compared to pre-dam conditions, i.e. the same order of magnitude as the long term decrease during the past 40 years.

From Fig. 3.2 it furthermore appears that the water levels in the Old Danube at Rajka and Dunaremete in 1993 have been reduced by 2-4 m to a level 2 m below the lowest ever recorded values. In addition, the characteristic natural dynamics of the water level fluctuations have been changed (reduced) significantly so that the water level is now more or less constant for several weeks.

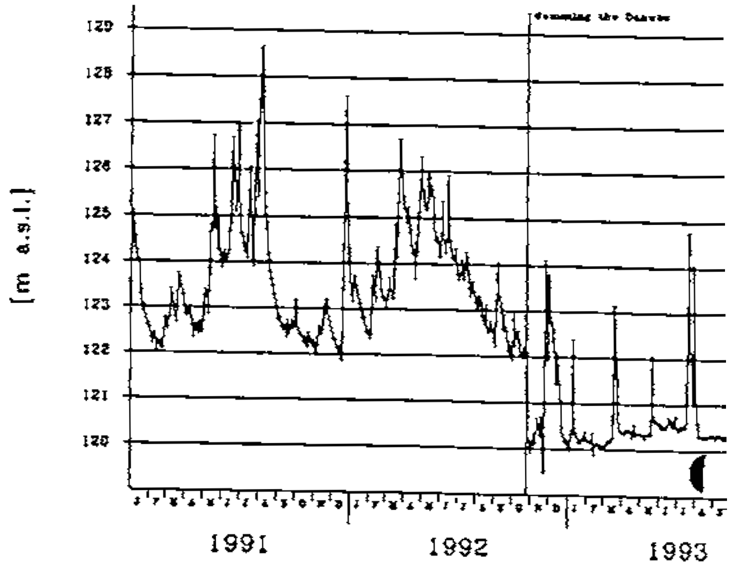
From Fig 3.3 it appears that the 1993 water levels in Little Danube have been increased with 1-2 m as compared to pre-dam conditions. For the Mosoni Danube at Mecser no significant water level changes have occurred.

During the first three months of operation of the weirs at Cunovo unnaturally large and rapid water level fluctuations were generated in Old Danube. Since then the discharge through the weirs at Cunovo have basically been held almost constant except during flood operations where the inundation weir has been used.

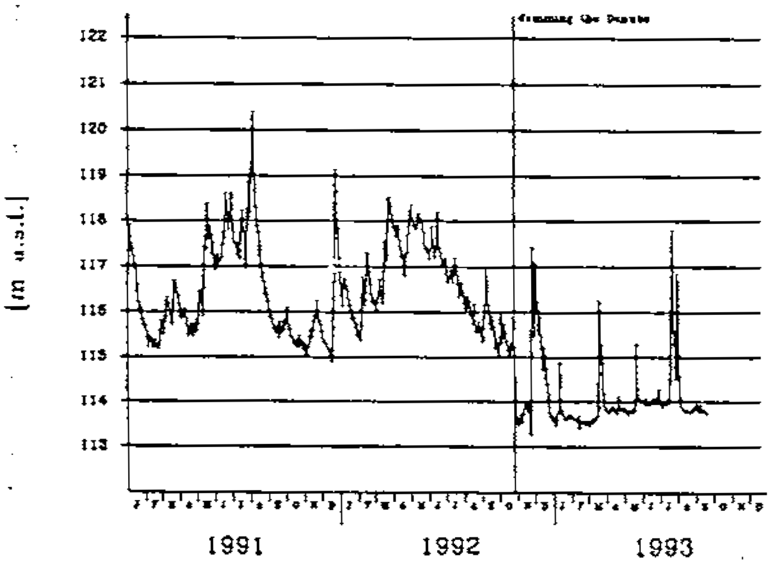
Hourly variations in discharges through the turbines at Gabcikovo are shown for three selected days in Fig. 11.2, from where it appear that the discharge variations from hour to hour typically is in the order of 100 - 300 m^3/s. Such discharge variation will generate downstream water level fluctuations up to 1 m. Larger water level fluctuations were generated on three occasions, 18-19 June 1993, 26-27 September 1993 and 14 October 1993, with the purpose of assisting large ships through shallow water around Nagymaros.



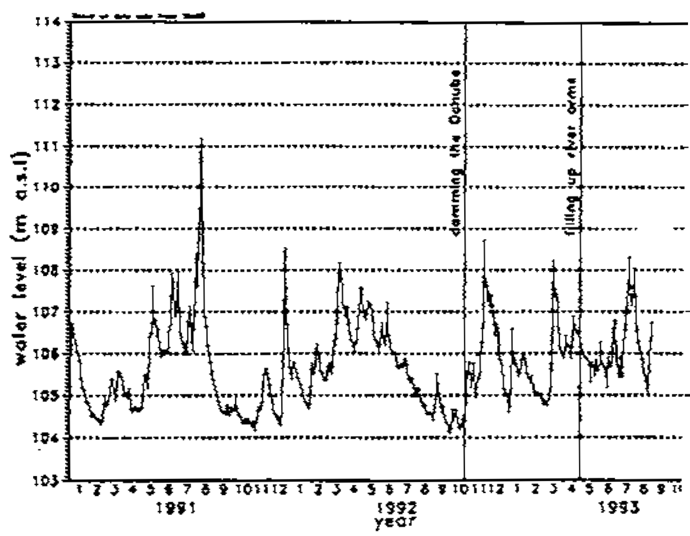
The Danube water level at Bratislava



Water Level of Danube at Rajka

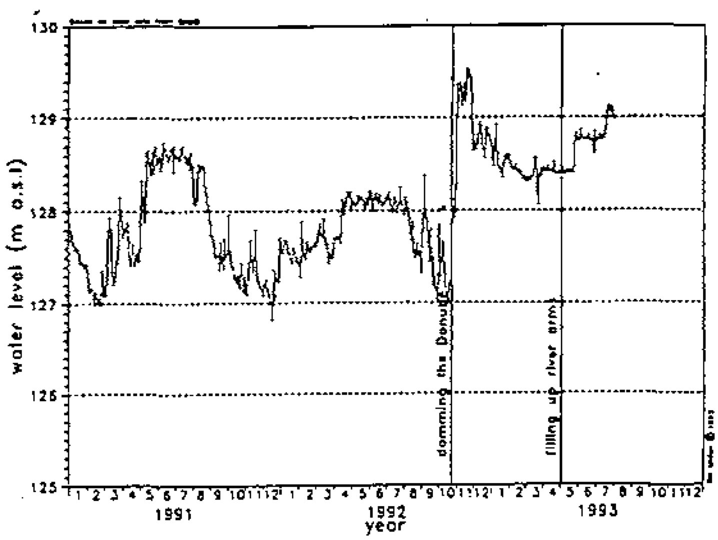


Water Level of Danube of Dunaremete

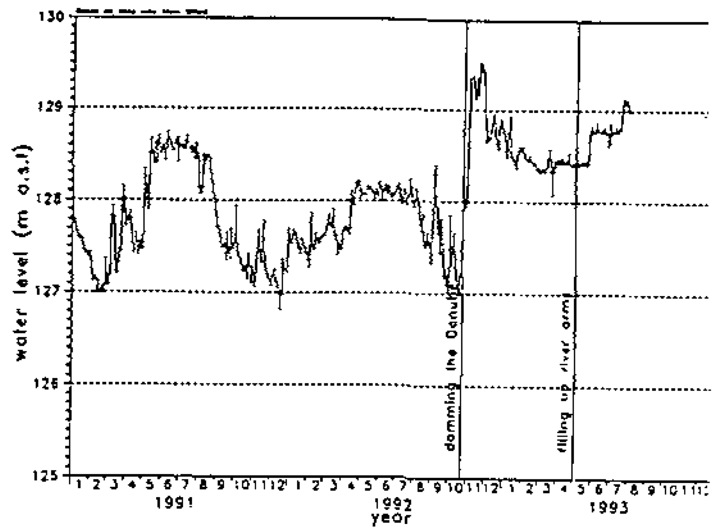


The Danube water level at Komarno

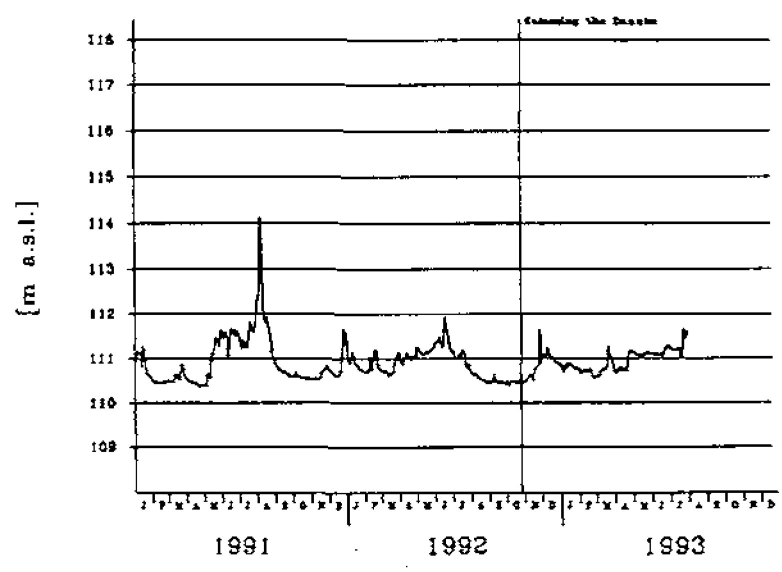
Fig. 3.2 Water levels at Bratislava, Rajka, Dunaremete and Komarno 1991-93.



The Little Danube water level at Bratislava - Malé Pálenisko



The Little Danube water level at Trstice



Water Level of Mosoni-Danube at Mecser

Fig. 3.3 **Water levels at Little Danube and Mosoni Danube 1991-93.**

3.4 Adequacy of the present Monitoring System

In general, the present monitoring of surface water levels appears adequate. However, at present the water levels in the side channels of the flood plains are not monitored on a routine basis on either side of the river.

Furthermore, in areas where rapid water level fluctuations within a day occur it is recommended to substitute the manual observation practice with an automatic recorder.

4. SURFACE WATER QUALITY

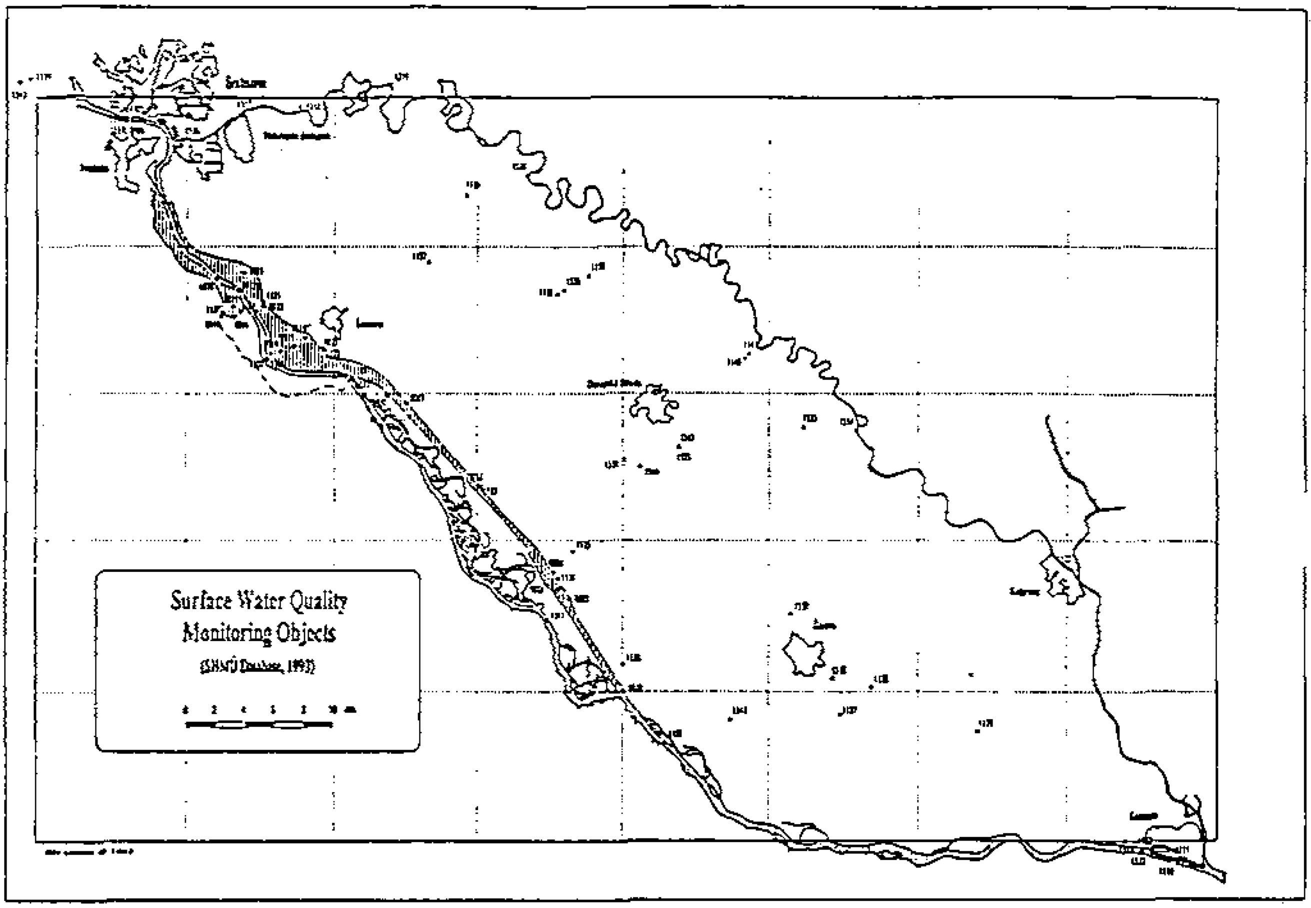
4.1 Available Data

The amount of surface water quality data in the area is comprehensive. The station network is shown in Fig. 4.1, while the analysed parameters are listed in Table 4.1. In addition to this routine programme some special measurements of organic pollutants have been made. The routine programme has been carried out in Slovakia for 10-30 years (depending on parameter) and in Hungary for 10-30 years (depending on parameter).

In addition to the above network a program of surface water quality monitoring in the reservoir has been initiated in 1993. This monitoring comprises the key parameters for assessment of eutrophication conditions.

Table 4.1 Surface water quality parameters presented by the Hungarian and Slovakian Data Reports (ref /2,3/).

Parameter	Hungary	Slovakia
TDS_{res}		X
O_2	X	X
BOD_5	X	X
COD_{Mn}		X
Fe		X
Mn		X
NH_4^+	X	
NO_3	X	X
SO_4^{2-}	X	X
Cl^-		X
PO_4^{3-}	X	X
Chlorophyll-a	X	



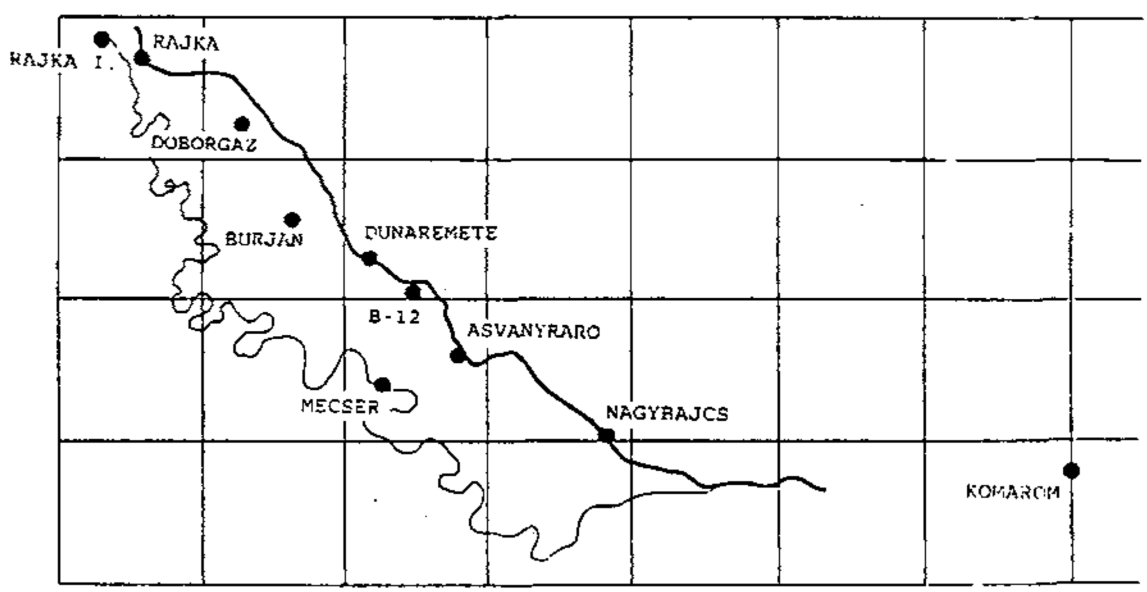


Fig. 4.1 Network for surface water quality observations.

4.2 Data Analyses for Long Term Trends

All the time series of the Slovakian data are plotted in ref /2/. The Hungarian Data Report /3/ provided data from only one station.

The Danube water quality can according to Hungarian classification be categorized as 1st class regarding the majority of the components, as 2nd class regarding Ph, orthophosphate, nitrate, BOD and 3rd class with regard to bacteria and some heavily degradable substances such as e.g. hydrocarbons.

Due to high oxygen content, low organic carbon contents and the very small quantities of fine grained sediments the surface water quality is generally well suited for river bank infiltration, which is the major source of water supply along the Danube between Bratislava and Budapest.

The water quality of the side branches differs from that of the main Danube channel due to the much lower velocities and periods and places with stagnant water. In drier years a negative trend has been observed with high pH, high organic matter and low oxygen contents.

The major sources of water pollution on the Slovak section of the Danube are river Morava and Bratislava.

4.3 Analyses of 1991-93 Data

With exception of November - December 1992, when sudden changes of regime and a high flood event occurred, no significant changes in surface water quality parameters as compared to pre-dam conditions can be detected after damming the Danube. (See also Section 8.3).

4.4 Adequacy of the present Monitoring System

The present monitoring system appears adequate as far as the Danube and the reservoir is concerned. However, there is a need for monitoring of surface water quality in the side channels in the flood plains.

5. SEDIMENT TRANSPORT AND SEDIMENTATION/EROSION

5.1 Available Data

The data available on sediment transport and erosion aspects are limited.

In Slovakia, a comprehensive monitoring and analyses programme was carried out in the 1950's and 1960's, but limited field data have been collected since then. During the period September 1992 to August 1993 a sediment transport field monitoring programme was conducted in connection with the "Danubian Lowland - Ground Water Model" PHARE project. This programme comprised amongst other regular measurements of suspended transport at Bratislava and Medvedov as well as analysis of bed material at different locations in the reservoir.

In Hungary river cross sections are regularly surveyed for the main Danube. Such measurements have also been made in 1993 for comparison with pre-dam conditions (September 1992). However, these data are presently only partly processed. Furthermore, Hungary usually carry out suspended sediment sampling in three sections (Rajka, Dunaremete, Medve) each year simultaneously with the discharge measurements. Occasionally, bed load measurements are carried out in the same sections. In 1992 this was done once, while in 1988-89 there were 13 measurements in this river stretch. Bed material sampling was done approximately for every 1-1.5 km of the river (evidence sections).

5.2 Data Analyses for Long Term Trends

The main channel has been significantly lowered due to erosion caused by a combination of several man made factors:

- dam construction in Austria in the last decades resulting in a sediment (in particular bed load) deficit;
- excavation of gravel;
- bed erosion due to the very high velocities in the straightened and narrowed navigation channel; and
- prevention of bank erosion due to fortification of river banks.

Until the damming of the Danube, erosion took place between Bratislava and Dunaremete. Similarly, sedimentation occurred downstream of Sap/Palkovicovo.

In some places the river bed has been lowered more than two meters since the 1960's, leading to lower ground water levels, occasional drying out of river branches (e.g. downstream of Bratislava) and less flushing of most river branches. The lowering of the riverbed during the past 30 years has been particularly large between Bratislava and Rajka. It is estimated to be about 0.8 meter at Gabcikovo and near Bratislava about 1.5 meter.

According to Hungarian measurements the quantity and concentrations of suspended load on the Danube reach at Rajka has shown a decreasing trend during the past 30 years, see ref /1/.

5.3 Analyses of 1991-93 Data

Qualitatively, the effect of the damming at Cunovo is highly significant on the sedimentation/erosion balance in the Old Danube. Two counteracting processes are important. On the one hand, most of the transported material of the river have already settled upstream in the reservoir (all bed load and 60% of the suspended load according to Slovakian predictions, ref /2/). On the other hand, the water velocity has been reduced very much. The sedimentation is therefore likely to continue and result in finer bed sediments. This will have some implications for the permeability of the river bed.

For quantitative analyses few data exist enabling some tentative but no firm conclusions regarding the impacts due to the Gabcikovo Project.

During the November 1992 flood approximately 2-3 mill m^3 of sand and gravel material were eroded in the first 500 m downstream the inundation weir where the bed protection works were not yet completed. This material has been deposited downstream in the Old Danube. The 2-3 mill m^3 may be compared to the amount of dredged material (for navigation purposes) between Cunovo and Medvedov, which according to ref /2/ is 2.9 mill m^3 over the last 45 years.

As a preliminary conclusion from the Hungarian surveys of river cross sections it can be stated that in some parts of the Old Danube river bed downstream Cunovo (around 1850 rkm and 1811 rkm) there is 1-2 m high freshly sedimented material. This is supported from the observations made during the Working Group's field visit, where a new island of deposited material could be seen in the middle of the river bed.

In Fig. 5.1 suspended sediment concentrations taken in 1993 are compared to pre-dam data. At the two stations in the Old Danube, Rajka and Dunaremete, virtually the same sediment concentration levels have been found after the damming as compared to the pre-dam conditions. However, as the discharges have been very much reduced a significant change in the relationship between discharge and sediment concentration is noticed. Finally, it appears that the impacts for the station downstream the confluence, Medve, may not be significant on the present (small) data basis.

5.4 Adequacy of the present Monitoring System

There is a need for establishment a permanent sediment transport measurement programme comprising both bed load and suspended load measurements at the following locations:

* Upstream the reservoir.
* In the reservoir.
* In the Old Danube.
* In the side channels of the Hungarian and Slovakian flood plains.
* Downstream the confluence at Sap/Palkovicovo.

Furthermore, there is a need for establishment of permanent programmes for monitoring river bed and reservoir topography.

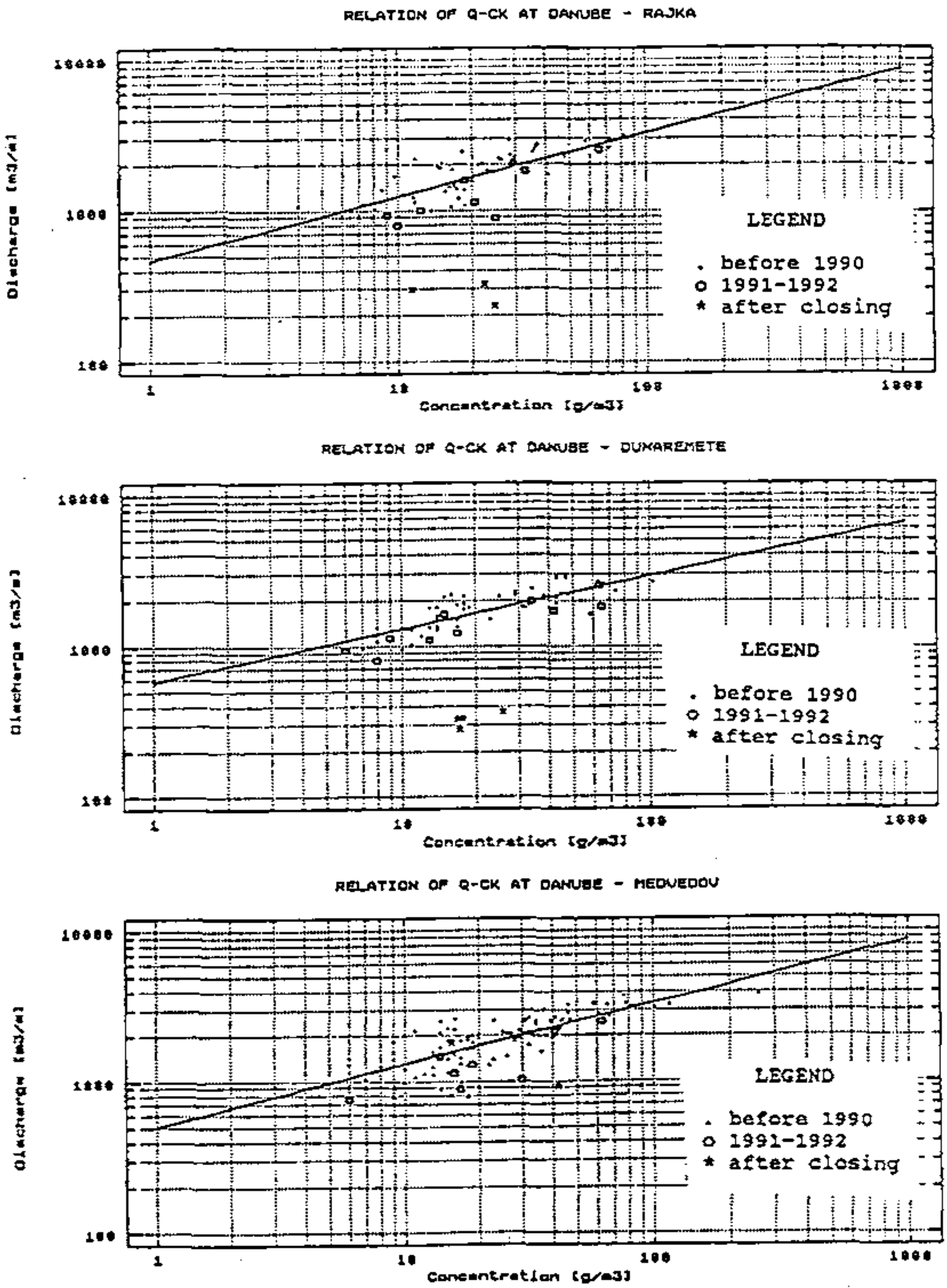


Fig. 5.1 **Measured data of suspended sediment concentrations and discharges at Rajka and Dunaremete in the Old Danube and at Medve in Danube.**

6. GROUND WATER LEVEL

6.1 Available Data

The amount of ground water level data in the area is comprehensive. The network of observation stations is shown in Fig. 6.1. On the Slovak side monitoring is carried out on a weekly basis for about 300 stations and by use of automatic recorders for more than 100 stations. On the Hungarian side the monitoring is carried out mostly by use of automatic recorders. For many of the observation wells historical time series exist for several decades.

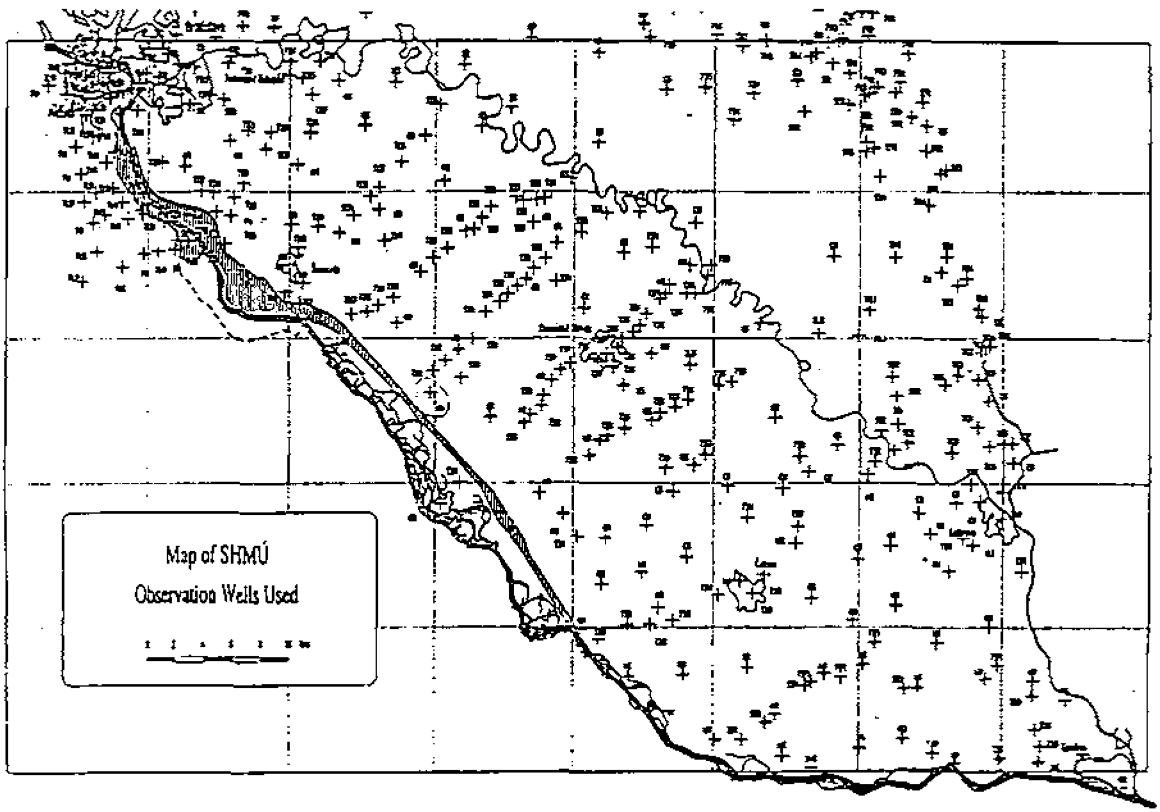
6.2 Data Analyses for Long Term Trends

The ground water regime is to a large extent determined by the permeability of the river channels and the variations in river water table. In the reach between Bratislava and Komarno an estimated 10 - 20 m^3/s infiltrates to gravel aquifers on the Slovakian side and 8 - 15 m^3/s between Rajka and Medve on the Hungarian side. This constitutes one of the largest ground water resources in Central Europe. Due to the very large permeabilities in the gravel aquifer the ground water flow rates are very high (1 - 3 m/day).

The depth of the ground water table, shown in ref /1,2,3/, ranged in the pre-dam condition from more than 5 meters close to Bratislava to around 1 m at Medve. The trend over the past 30 years is illustrated in Fig. 6.2 showing river water level at Bratislava together with ground water levels from five wells located with distances from 0.8 km to 12 km on a transect perpendicular to the Danube on the Slovakian side.

As indicated in Fig 6.2 and documented in ref /1,2/ the ground water levels have decreased ranging from about 2 meters around Bratislava to about zero at Komarno. This decrease is due to erosion of the river bed.

A very important feature of the ground water regime is the large ground water level fluctuations generated by the dynamics of the river water table. This is illustrated in Fig. 6.2, where the fluctuations in the wells located close to the Danube are largely determined by the fluctuations in the river water levels, while ground water level fluctuations further away from the river mainly depend on the annual variation in recharge from rain and snow. Because Szigetköz is narrower than Zitny Ostrov the ground water fluctuations over the entire Szigetköz is dominated by the Danube.



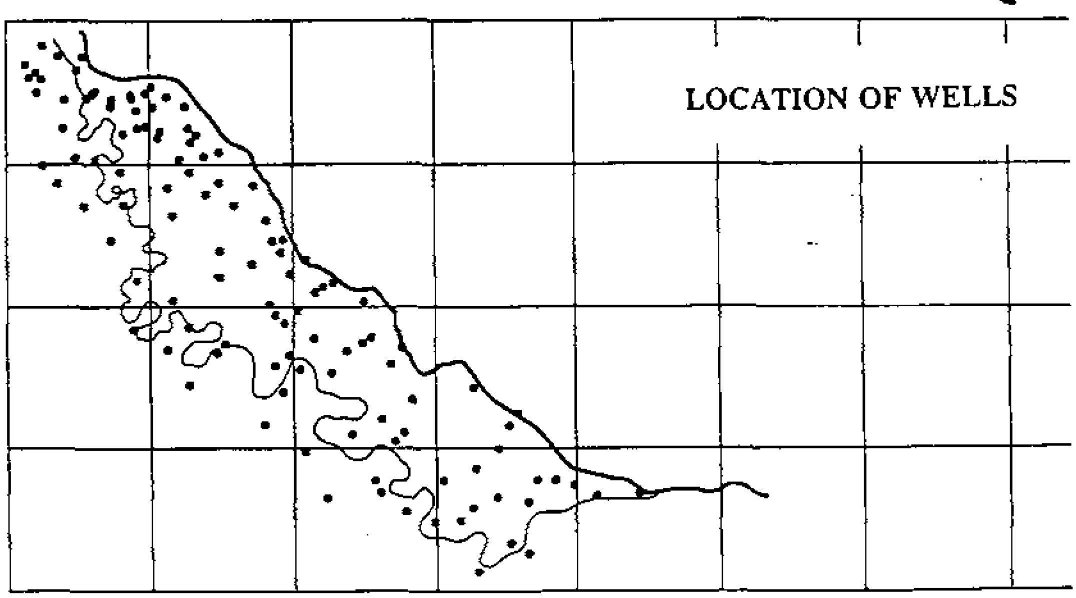


Fig. 6.1 Index map showing network of ground water observation wells.

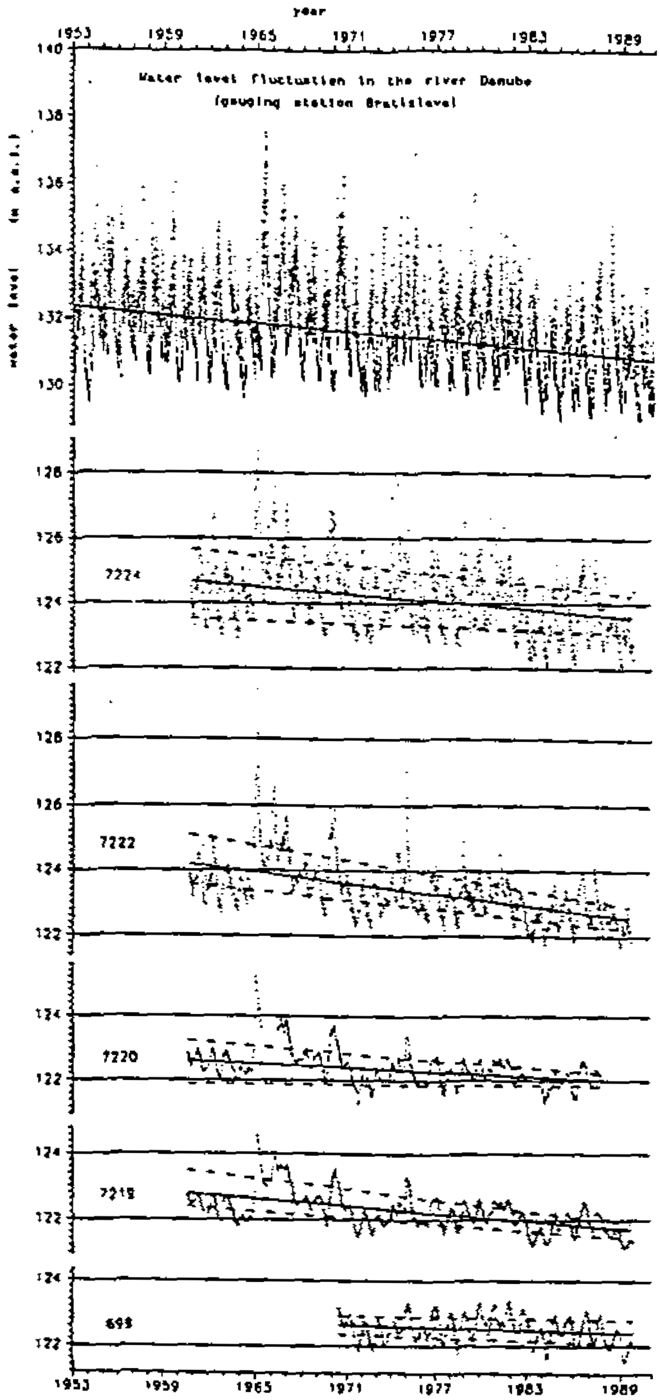


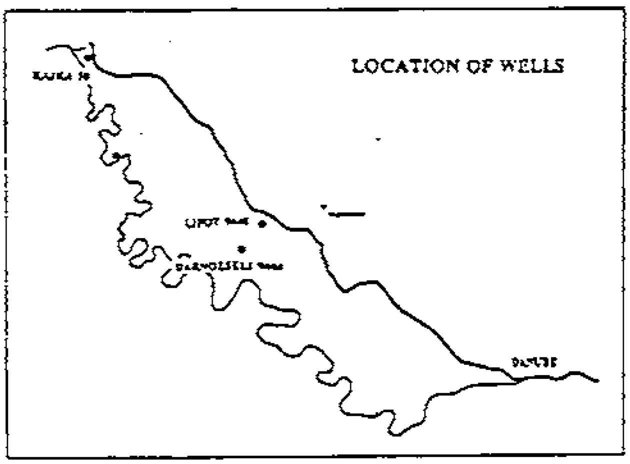
Fig. 6.2 Danube water levels at Bratislava and ground water levels from four selected wells located with different distances from the river.

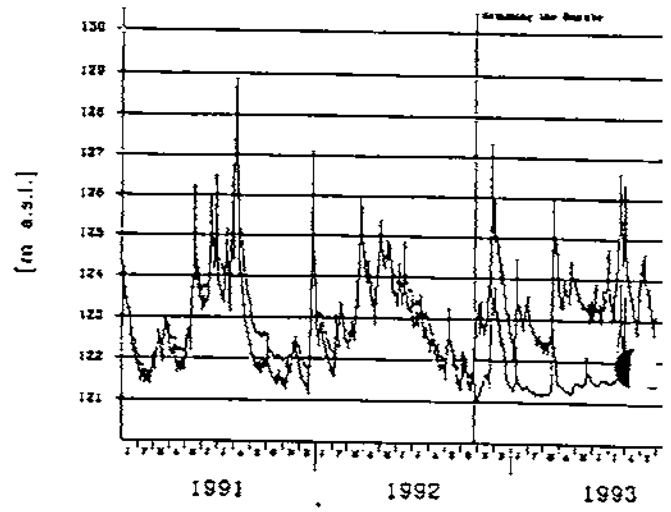
6.3 Analyses of 1991-93 Data

Ground water level hydrographs have been plotted for all stations, ref /2,3/, for the period after January 1991. Due to the large and rapid ground water level fluctuations generated by the Danube it is not possible to accurately assess the impacts of the Gabcikovo projects by direct comparison of observed ground water levels for short periods before and after the damming. Therefore, both the Hungarian and the Slovakian experts have developed regression models for computations of ground water levels corresponding to the pre-dam condition.

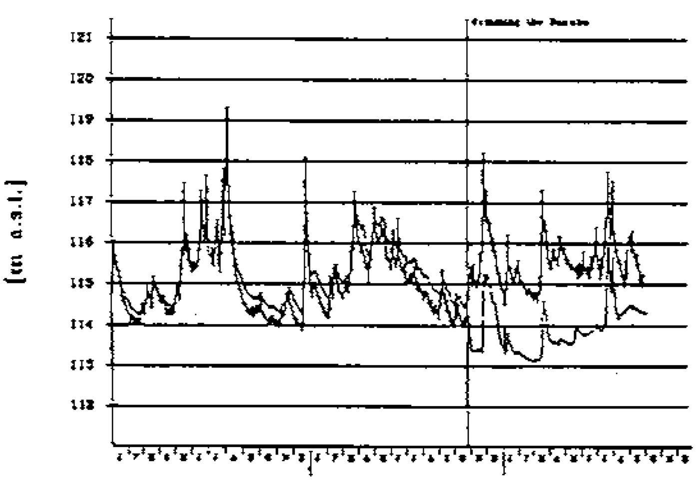
Selected hydrographs are shown in Figs. 6.3 and 6.4. Fig 6.3 shows the ground water levels at three wells in Hungary. The three wells are located at 50 m, 400 m and 4000 m distance from the Danube, see map. At the two wells located closer to the Danube (Rajka and Lipot) the ground water levels were in the beginning of 1993 reduced by 1.5 - 2.0 m corresponding to the decrease in the Danube water level. After May 1993 the reduction at Lipot decreased to about 1.0 m. At Darnozselli the reduction is initially about 0.4 m and after May gradually changes to about 0.2 m. The timing of this reduced impact coincides with inundation of the side channels in the Slovak flood plains. However, the exact reason for this reduced impact (i.e. increased ground water levels) after July 1993 has not been documented. In all cases the ground water level fluctuations have been reduced significantly.

Fig. 6.4 shows similarly the ground water levels at three wells in Slovakia. The good agreement between observed and computed values in the pre-dam conditions is noted. The effect of the damming is clearly seen in all three wells. At well 694, located close to the reservoir, the ground water level has increased by 2-3 m. At the other two wells, located 10-15 km away from the reservoir in the flood plain area and just behind the intake canal, respectively, the ground water level initially decreased significantly. However, after discharging water into the side channels in the Slovakian flood plain from May 1993 onwards the ground water levels have increased above those corresponding to pre-dam conditions. This demonstrates that a considerable recharge now takes place from the side channels. This has become possible because the running water has removed the fine material, previously clogging the bed of these river arms. In all cases the fluctuations have been reduced significantly.

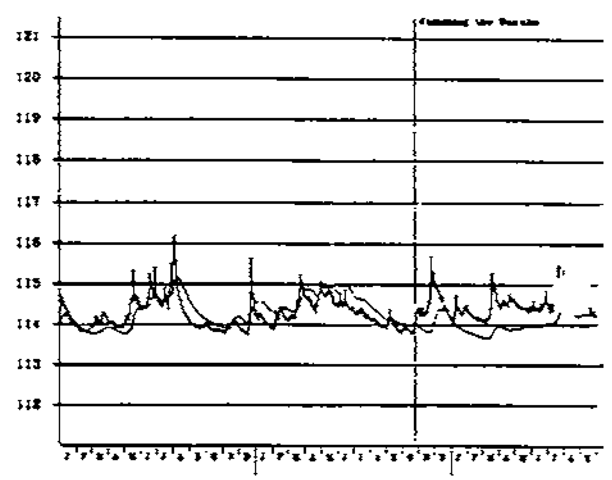




Measured and modelled values - WELL F



Measured and modelled values - WELL L9440



Measured and modelled values - WELL D9-

Fig. 6.3 **Measured and computed ground water levels from three wells in Hungary 1991-93. The computed levels correspond to pre-dam conditions.**

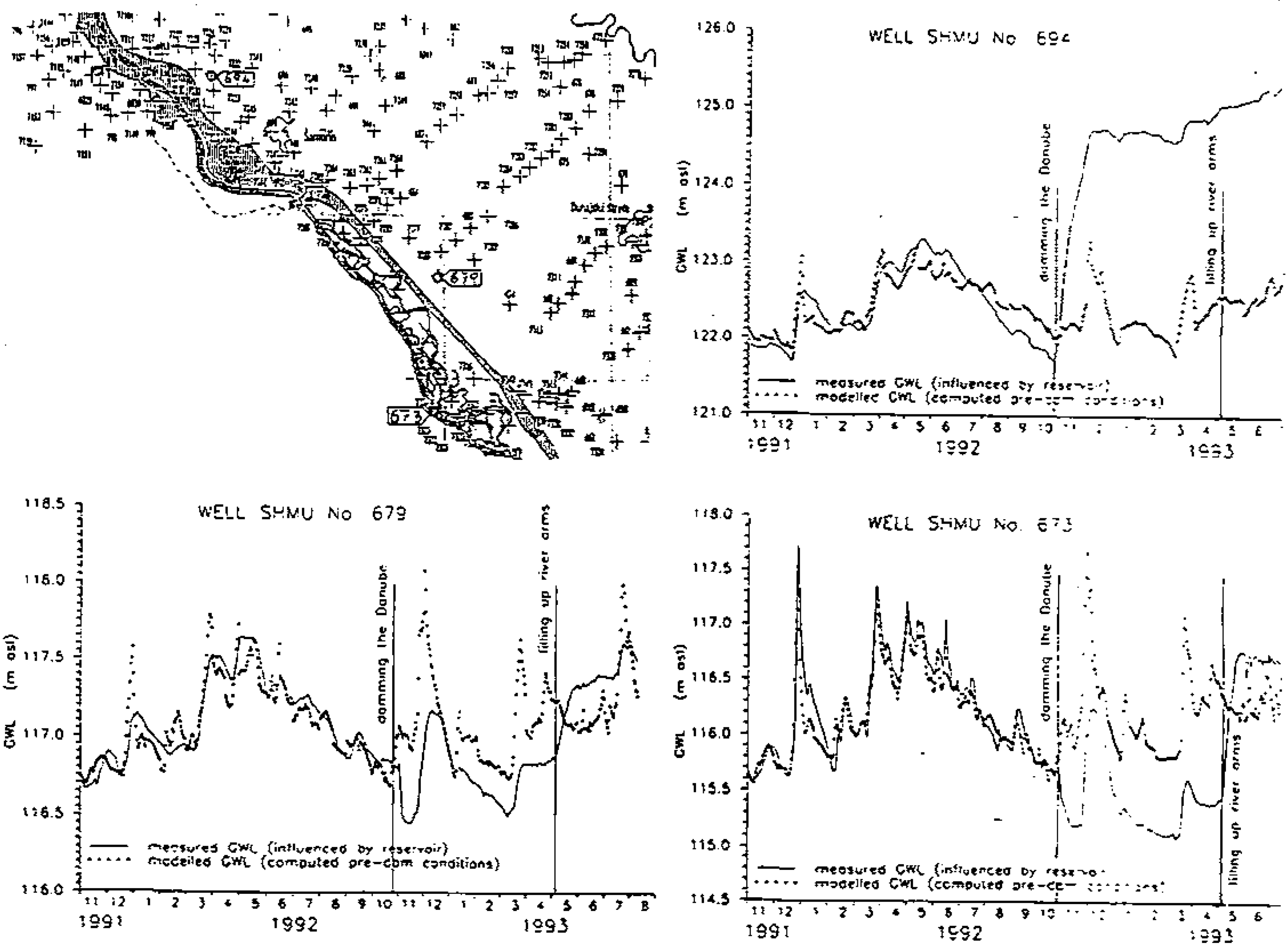


Fig. 6.4 Measured and computed ground water levels from three wells in Slovakia 1991-93. The computed levels correspond to pre-dam conditions.

For the Slovakian area the ground water levels measured on March 3, 1993 are shown in Fig. 6.5 together with calculation of the changes at that time of ground water levels due to the Gabcikovo Project. Similarly, conditions on June 30, 1993 are shown in Fig. 6.6. Hungary was not able to produce similar maps. Instead a map previously presented, ref /4/, showing an estimate of the ground water level changes as per February 8, 1993, is given in Fig. 6.7.

By comparison of Fig. 6.5 and 6.6, which represent conditions before and after putting water to the side channels on the Slovakian flood plain, it is evident that a good hydraulic connection between the side channels and the ground water system has been established. Thus, a substantial ground water recharge takes place from the side channels resulting in up to 1.5 m increased ground water levels.

From the most recent map in Fig. 6.6 it is noticed that the ground water levels on all the Slovakian territory have increased or have not been affected. The increases have mainly occurred in the upstream area close to the reservoir, i.e. in the area which have been most negatively affected by the long term trend of decreasing ground water levels.

As a similar comprehensive analysis has not been made for the Hungarian data, the conclusions with regard to impacts on ground water levels in Hungary are less certain. However, by considering Fig. 6.4 and 6.7 it appears that the ground water levels have also increased close to the reservoir (Rajka - Dunakiliti region). In the middle of Szigetköz between Dunakiliti and Asvanyraro the ground water levels have decreased in areas close to the Danube.

6.4 Adequacy of the present Monitoring System

The present monitoring of ground water levels is adequate.

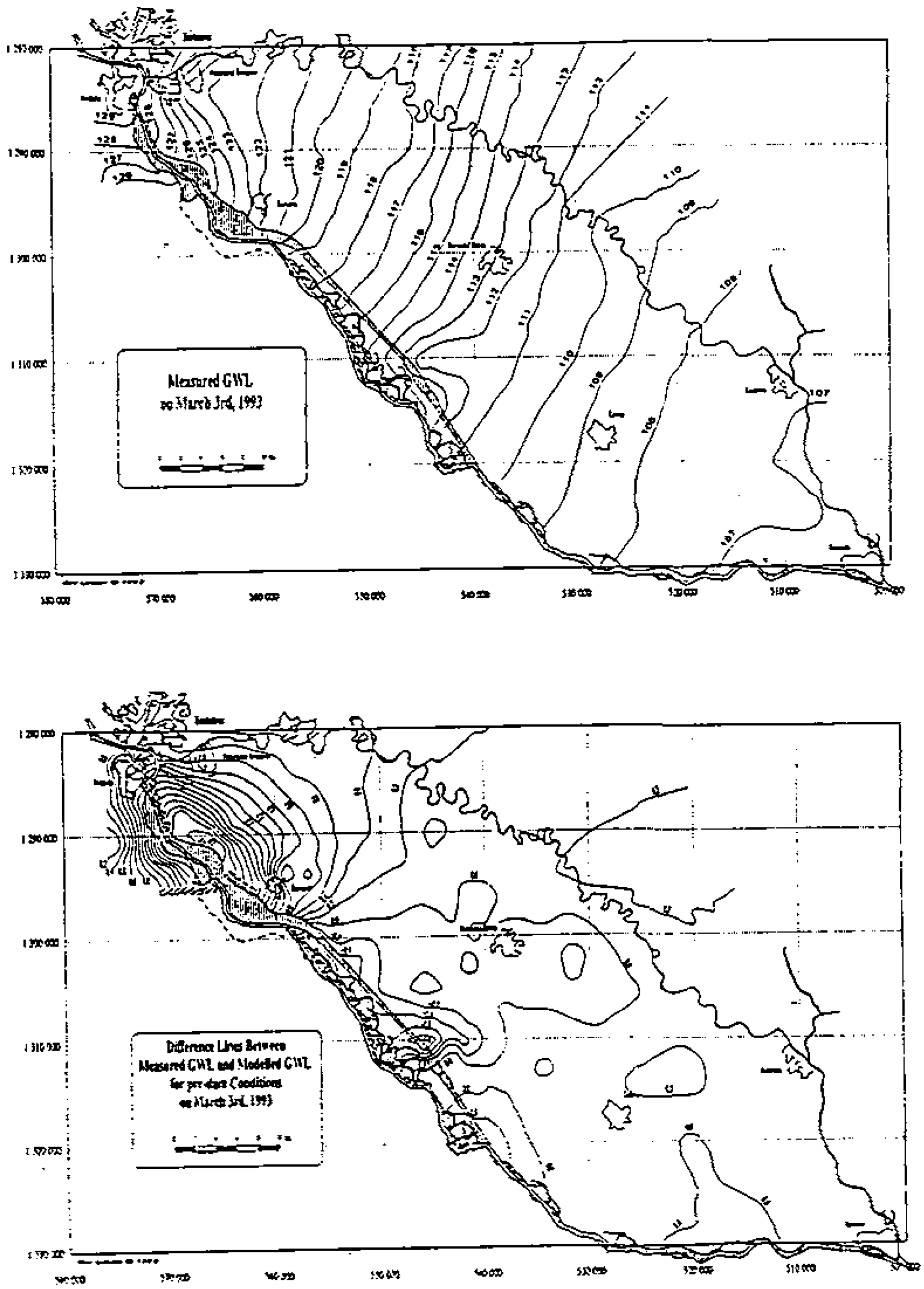
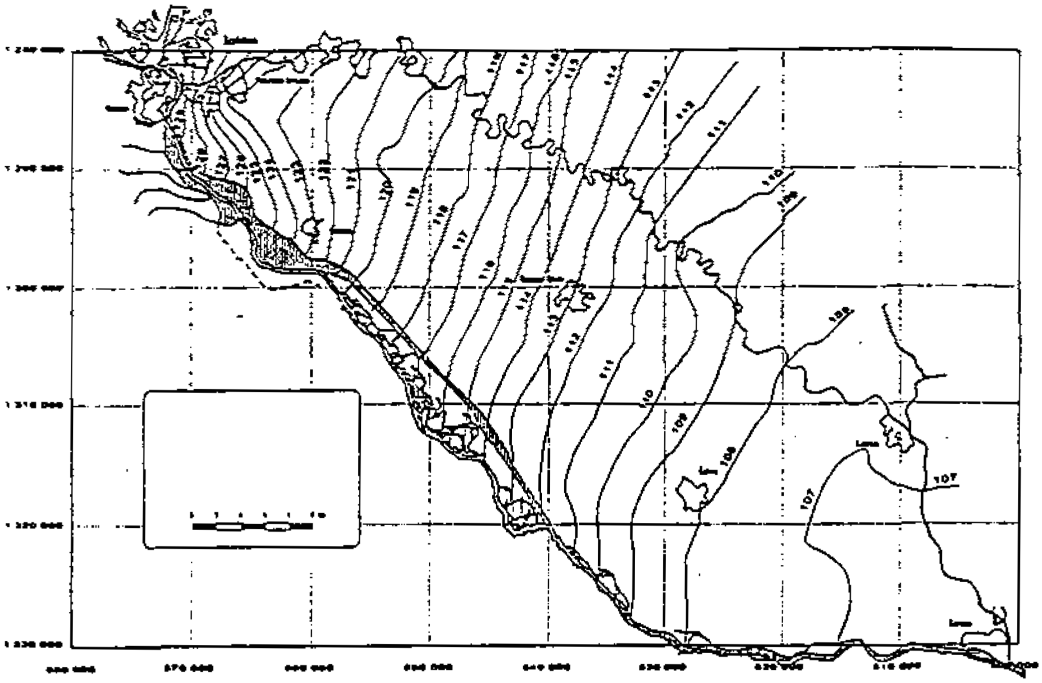
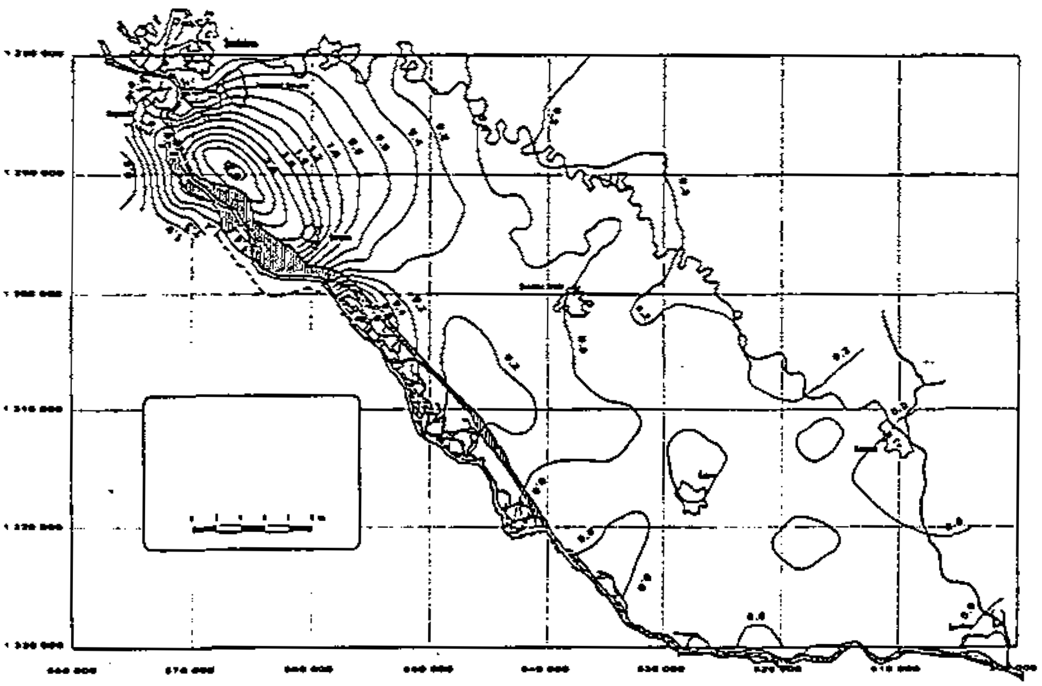


Fig. 6.5 Ground water levels measured on March 3, 1993 together with calculated changes as compared to pre-dam conditions for Slovakia.



Ground water level measured on June 30, 1993.



Increase of ground water level after 8 months since damming the Danube (June 30, 1993).

Fig. 6.6 Ground water levels measured on June 30, 1993 together with calculated changes as compared to pre-dam conditions for Slovakia.

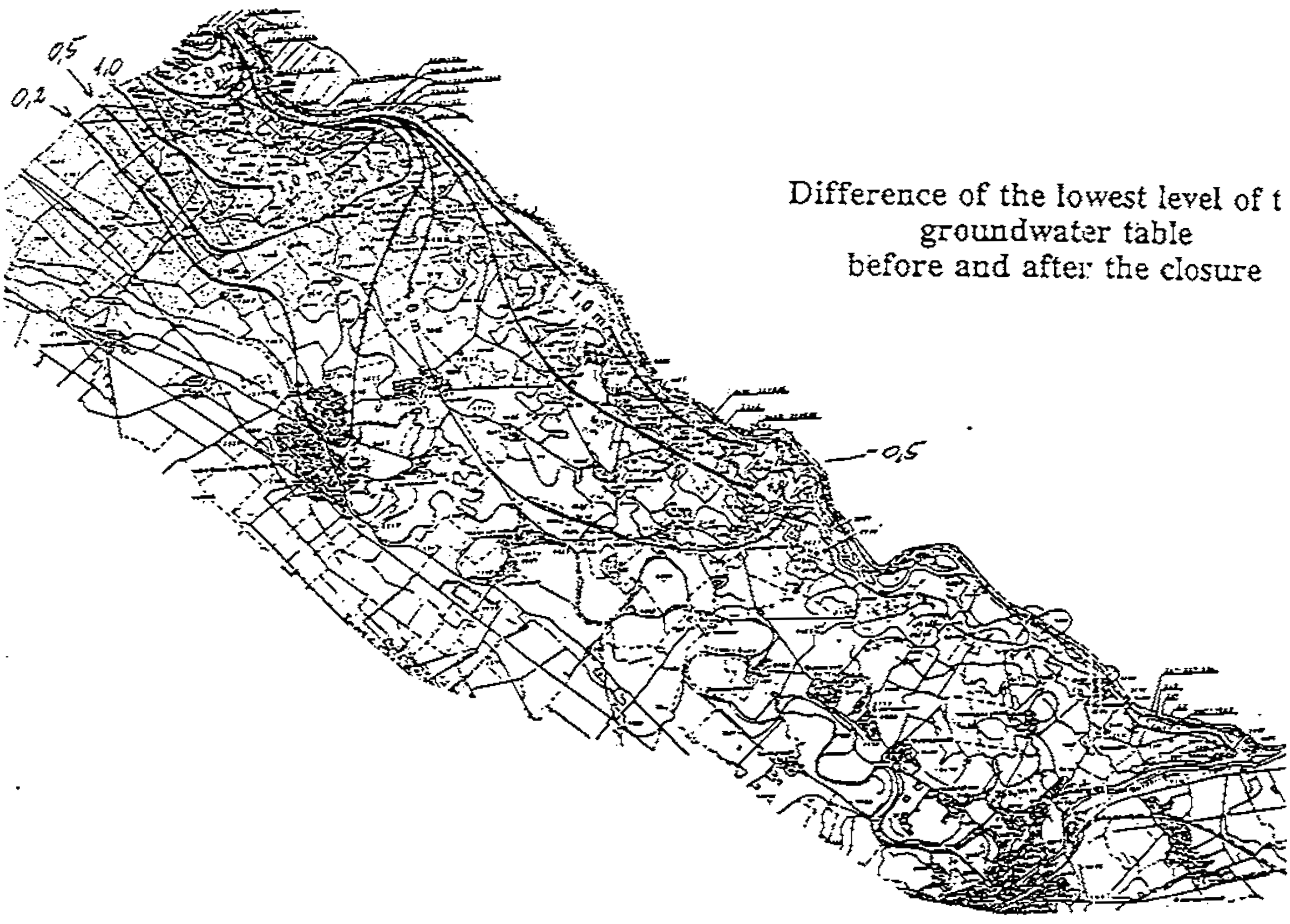


Fig. 6.7 Estimated changes in ground water levels on February 8, 1993 as compared to pre-dam conditions for Slovakia.

7. GROUND WATER QUALITY

7.1 Available Data

The amount of ground water quality data in the area is comprehensive. The network of observation stations are shown in Fig. 7.1.

In Slovakia a systematic monitoring has been carried out since 1983 on a bimonthly basis. After the damming of the Danube an extended monitoring programme with fortnightly sampling has been made in a number of wells located close to the Danube. Under the ordinary monitoring programme the following parameters are analysed: TDS_{105}, O_2, BOD_5, COD_{Mn}, Fe, Mn, NO_3^-, SO_4^{2-}, Cl^- and PO_4^{3-}. Under the extended monitoring analyses are made for more than 100 parameters including heavy metals and organic micropollutants. The Slovakian Data Report (ref /2/) shows plots of all data from the ordinary monitoring programme plus a summary of data from a single well under the extended monitoring programme.

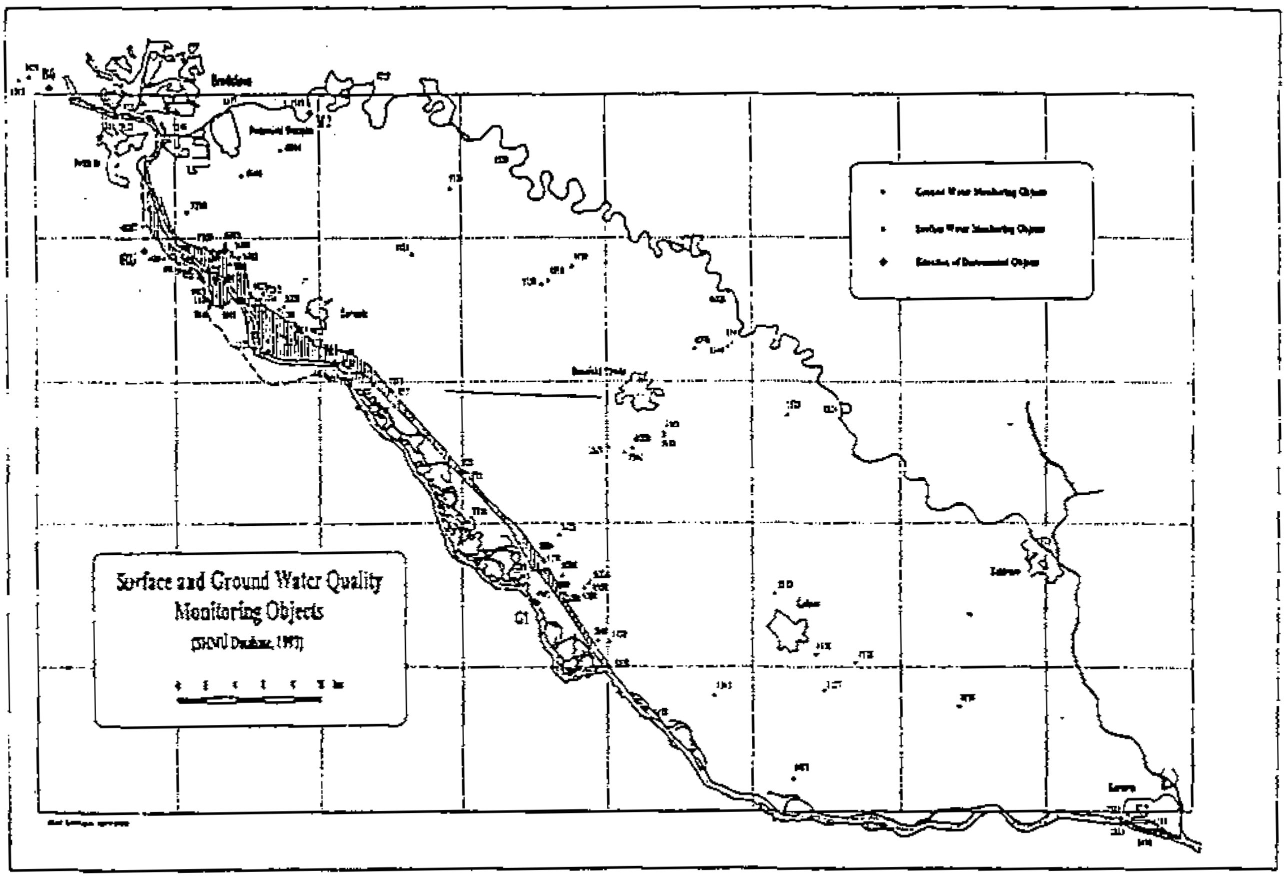
In Hungary a large amount of data is being collected on a fortnightly basis. 23 parameters are measured. The Hungarian Data Report (ref /3/) shows no ground water quality data.

7.2 Data Analyses for Long Term Trends

The ground water quality in the area dominated by the infiltration from the Danube is generally in a good state. Thus, the quality of the ground water abstracted from the water works located close to the Danube is generally excellent.

For the areas farther away from the river, where the ground water recharge partly originate from infiltration in agricultural and industrial areas, there are some problems with ground water pollution from point sources (e.g. from Slovnaft oil refinery starting in the 1960's,landfills and dumping sites) and from agrochemicals.

The data from the Slovakian ordinary monitoring programme reveal with a few exceptions no long term trends. In a couple of wells the NO_3^- concentrations show an increasing trend and in the Rusovce area, where examples of an increasing trend for TDS_{105} and a decreasing trend for the Mn concentration can be found.



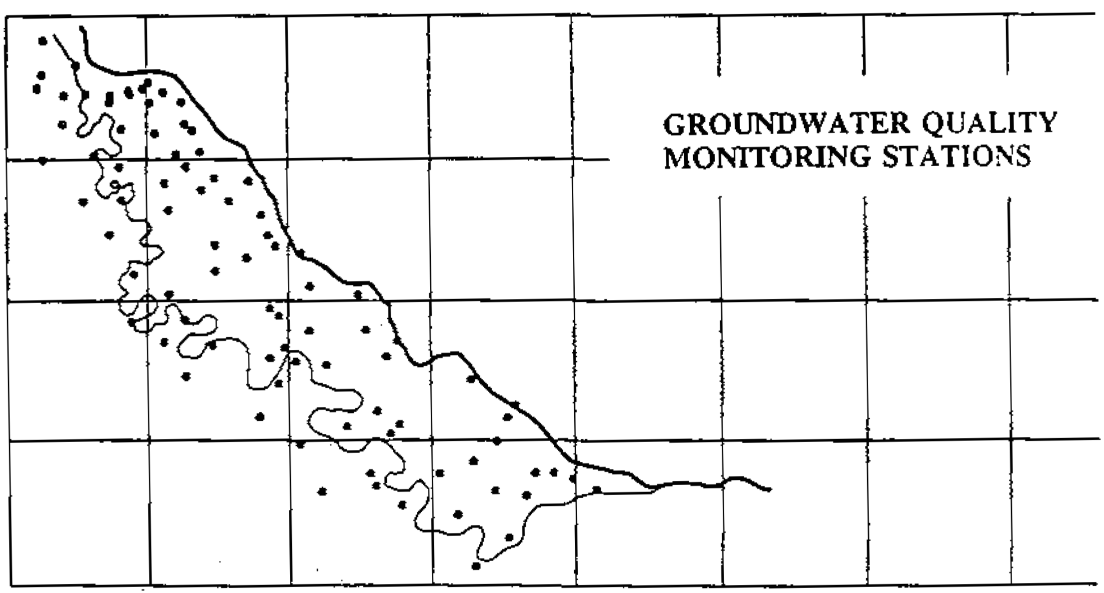


Fig. 7.1 Index map showing network of ground water quality observation wells.

7.3 Analyses of 1991-93 Data

In general no ground water quality changes can be identified after the damming of the Danube. One exception is the Rusovce area where decreases in TDS_{105} and NO_3^- can be found. These changes can be explained by a changed flow pattern in this area, which now receives its water from infiltration in the reservoir, while it in the pre-dam conditions was flowing from the inland towards the river.

The extended monitoring programme of ground water quality in Slovakia shows occurrence of organic micropollutants in some of the observation wells but not in any of the production wells used for abstraction of drinking water. There is no trend over time in these concentrations, which originate from old pollution of the ground water system.

According to the Hungarian Data Report (ref /3/) no significant changes have been detected in the ground water quality.

7.4 Adequacy of the present Monitoring System

The present monitoring of ground water quality appears adequate. However, because of the relatively slow ground water transport process, it should be emphasized that the intensive monitoring must continue for the coming years, especially with regard to areas close to the Danube where the infiltration conditions have been changed. Thus it cannot be guaranteed that a permanent situation, whether changed or unchanged as compared to pre-dam conditions, is obtained all over the area the first few years.

8. FLORA AND FAUNA

Biological field research has been done for several decades in the influenced area. There exist general overviews about the occurence of 1.000 plant species on the Slovakian and 820 plant species on the Hungarian territory. Approximately 2.800 animal species are detected on the Hungarian territory. It can be expected, that the same amount of species are found by Slovakian investigations.

It is considered that these numbers are significantly lower than the real numbers, because not all the taxa of fauna and flora were investigated (and could be investigated without enormous efforts).

8.1 Available Data

There exist investigations on the occurence of the different taxa with quite different methods. Biomonitoring stations are shown in Fig. 8.1 and described in Table 8.1 and Table 8.2 for the Hungarian and Slovakian areas, respectively.

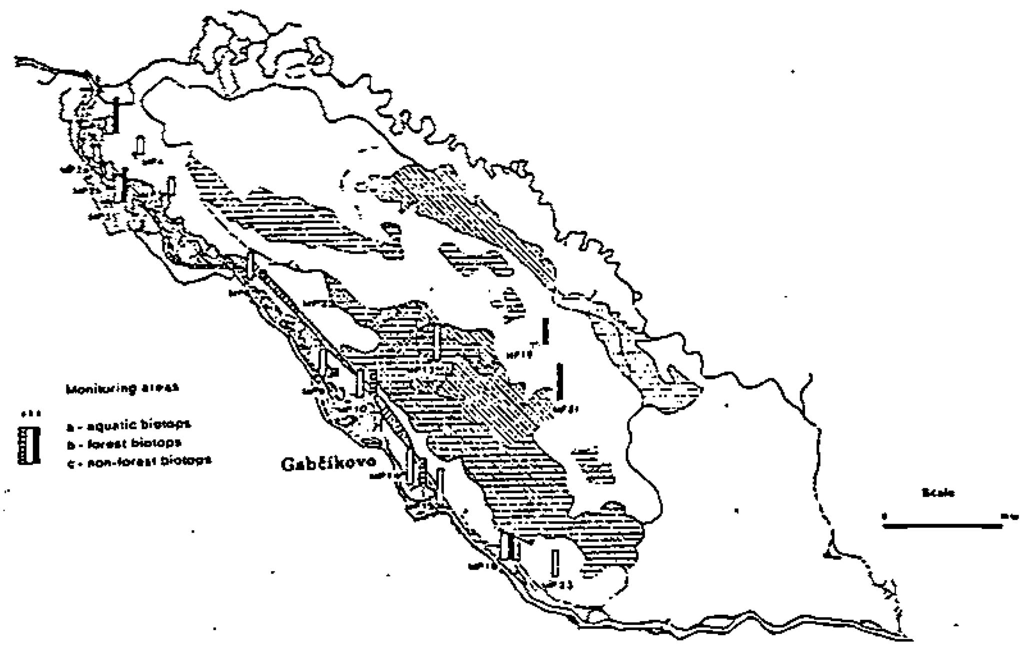
Concerning higher (vascular) plants the Slovakian Data Report (ref /2/) provides a phytocoenological map of the forests from 1960. The Hungarian Data Report (ref /3/) shows species lists of single investigation plots.

Hungary and Slovakia present in their data reports an overview of the zoobenthos and zooplankton in the main channel and in the arm system with species lists. There is an estimation on species number, biomass and the saprobity (a biologically based water quality scale ranging from 1 to 4 with 1 representing the best condition) in the Slovakian data report. The Hungarian report deals with the abundance of the different species in a 20-l-sample.

From the fish species both the Slovakian and Hungarian reports list 65 as the present number. The Slovakian report contains an estimation of the ichtyomass in different habitats.

There are less data about the terrestrial fauna. Species lists exist in Slovakian report from Collembola, Acarina, Araneae, Chilopoda, Carabidae, Staphylinidae, Curculionidae, Rhopalocera, amphibians, reptiles, bats and mammals.

Monitoring areas of flora and fauna in the territory of the Gabčíkovo Project



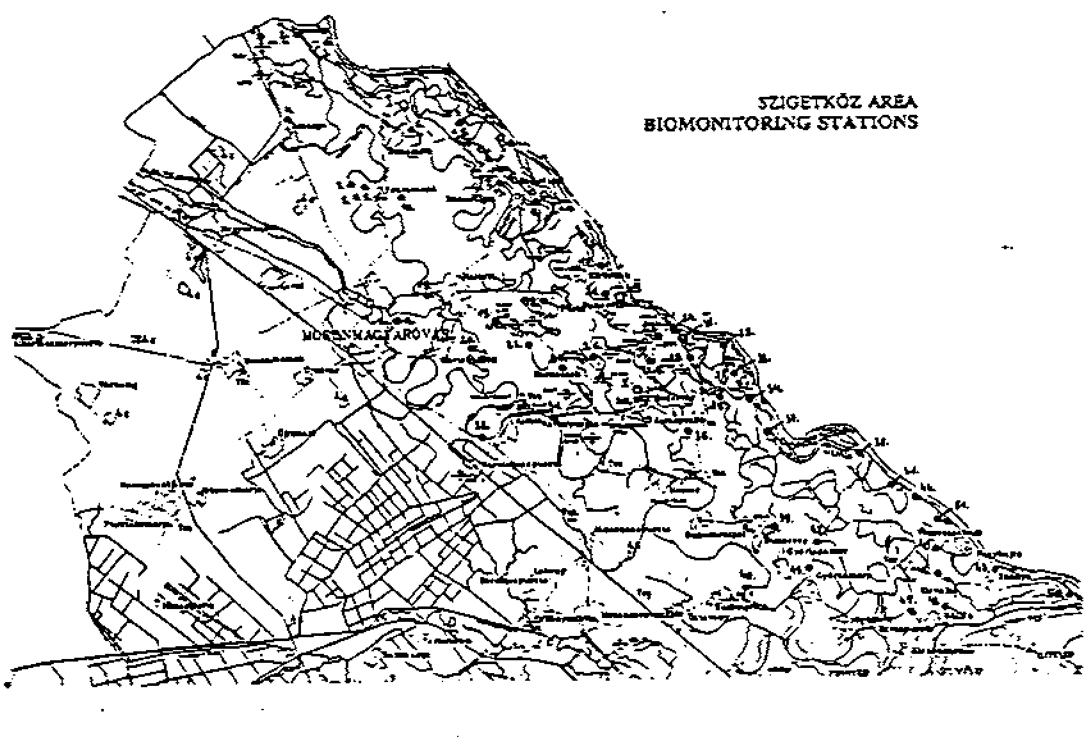


Fig. 8.1 Biomonitoring stations in Slovakia and Hungary

Table 8.1 Flora and fauna groups recorded in Hungarian biomonitoring stations 1989-1992

Animal/vegetation groups	Methods	Intensity of investigations	Number of biomonitoring station (Fig. 8.1)
Vegetation	BRAUN-BLANQUET method 20x20m + complete flora	once/year	I, II, III, IV, V
Mollusca	Hand sorting, separating from litter by sieves and washing the soil	once/year	3, 8, 9, 11, 13, 14, 15, 17, 19, 20, 23, 24, 28, 29, 30, 36, 40, 45, 46
Crustacea and Rotatoria	Plankton net of 100 um mesh size	generally monthly	23, 24, 26, 27, 28, 30, 34, 38
Macrozoobenthos	Standard FBA Pond Net, kick and sweep method	generally monthly	23, 24, 26, 27, 28, 30, 34, 38
Odonata	Hand singled, eye observation	bimonthly	2, 4, 6, 7, 10, 12, 13, 15, 16, 18, 19, 22, 27, 31, 32, 39, 42, 43
Heteroptera (aquatic and semiaquatic)	Water net	halfyearly	3, 5, 14, 15, 21, 23, 28, 36, 42
Neuropteroidea	Netting and beating of the branches of trees and shrubs, light trap	halfyearly	7, 8, 13, 16, 23, 24, 35, 36, 43, 48, 49
Coleoptera	Sweeping and beating the vegetation, shifting forest litter and debris. Collecting with mercury-vapour bulbs, hand searching (singling), pitfall trapping	From march till July monthly, once in autumn	1, 2, 8, 9, 10, 11, 17, 21, 24, 25, 30, 33, 36, 39, 41, 42, 43, 48, 50
Trichoptera	Lamping with mercury-vapour bulbs, hand singling	10 days/months	3, 5, 6, 15, 16, 17, 21, 24, 37, 39, 48
Lepidoptera	Singling with nets, light and sugar baits. Lamps used were three different types of UV lamps (125 and 250 W mercury-vapour bulbs and 160 W mixedlight bulbs)	generally monthly	1, 10, 12, 13, 16, 20, 21, 23, 31, 32, 35, 36, 42, 46, 50, 51,
Acari (Oribatida)	Samples from litter and humus soil with roots, soil moss and lichenes, bark moss and lichenes, mouldering trees, brick of grass	once/year	8, 9, 10, 14, 17, 24, 30, 48
Pisces	Electric fishing	bimonthly	3, 5, 6, 7, 11, 14, 15, 17, 24, 28, 34, 36, 37, 41, 44
Amphibia	Field observation	in spring and autumn	
Aves	Transect methods, spot recording (Danish method)	from March till July and winter	5, 9, 10, 12, 21, 23, 33, 47, 50
Mammalia	100 snap traps for 3 days	seasonally	6, 8, 9, 10, 13, 23, 35, 39, 45, 46

Table 8.2 Flora and Fauna recorded in the Slovakian Monitoring Areas

	Biomonitoring area		Main monitoring species (taxa)
1.	"Ostrov Kopac" - Pod. Biskupice	P: A:	Populus alba, Impatiens parviflora Clausilia pumila, Pterostichus strenuus, Mantis religiosa, Minois dryas
2.	"Rusovske ostrovy" Rusovce	P: A:	Populus nigra, Acer negundo, Fraxinus excelsior, Impatiens parviflora Helicella obvia, Pupilla muscorum, Lycaena dispar
3.	"Ostrovne lucky" - Cunovo	P: A:	Salix fragilis Clausilia pumila, Carychium minimum, Truncatellina cylindrica, Zygaena viciae
4.	"Topolove hony"- Pod. Biskupice	P: A:	Quercus robur, Cornus mas Clausilia pumila, Microtus arvalis
5.	"Horna vrbina"- Hamuliakovo	P:	Robinia pseudoacacia, Solidago gigantea, Populus nigra
6.	"Dunajske kriviny" - Mliecno	P: A:	Impatiens parviflora, Salix alba Zonitoides nitidus, Bembidion varium, Hyla arborea, Triturus cristatus dobrogicus
9.	"Bodicka brana" - Bodiky	P: A:	Impatiens glandulifera, Impatiens parviflora Hypochthonius rufulus, fishes and aquatic evertebrata
10.	"Kralovska luka" - Bodiky	P: A:	Leucojum aestivum, Aster novi-belgii, Trapa cococarpa, Nymphaea alba Bembidion ustulatum, Tanysphyrus lemnae, Misgurnus fossilis, Stizostedion lucioperca
13.	"Gombarovske" - Vrakun	P:	Carex nigra, Carex scutiformis, Thalictrum flavum
14.	"Istragov"- Gabcikovo	P: A:	Salix fragilis, Impatiens glandulifera, Leucojum aestivum, Phragmites australis Cochlicopa repentina, Bembidion femoratum, Gymnocephalus baloni, Leuciscus idus
15.	"Erced"- Palkovicovo	P:	Salix fragilis, Leucojum aestivum, Aster novi-belgii
18.	"Sporna zihot" - Medvedov	P: A:	Impatiens parviflora, Solidago gigantea, Populus alba, Ulmus sp., Cirsium arvense, Carex hirta Zonitoides nitidus, Amara aenea, Pterostichus vernalis, Bembidion varium, Philonthus fuscipes, Cyprinus carpio, Stizostedion volgense
19.	"Mobyla"- Dolny Bar	P:	Iris pseudacorus, Phalaris arundinacea
21.	"Karab"- Bohelov	P:	Orchis palustris, Eriophorum angustifolium, Carex nigra
23.	"Stary les"- Klucovec (Cicov)	P:	Leucojum aestivum, Aster novi-belgii, Impatiens parviflora, Populus alba, Salix fragilis

Used Methods:

a) Flora and vegetation
- semiquantitative and quantitative numeric methods
- basic dendrometric parameters
- losses of leaves (leaf area index) of forest stand

b) Fauna
- current quantitative and qualitative methods used for evaluation of given taxonomic groups of fauna (areal method, transect method, sampling after isolines and individual sampling)

Time and intensity of investigations:
Biomonitoring of flora and fauna is done on all biomonitoring areas from 1990 to 1992. Investigations are done mostly twice per year, adequately to the state of observed biotopes

Hungary can provide data about the following taxa: Mollusca, Rotatoria, Crustacea, Odonata, Heteroptera, Neuropteroidea, Coleoptera (61 families), Trichoptera, Lepidoptera, Acarina (Oribatida), Pisces, Amphibia, Aves, Mammalia (small mammals).

8.2 Data Analyses for long Term Trends

It can be estimated that forestry and agriculture together with regulation measures in the Danube and construction of dikes have caused changes in flora and fauna in former times but the data base does not allow to analyze the long term trends for most of the taxa. On the other hand in some cases it provides a good basis for analyzing the trend in the past (e.g. the phytocoenological map of 1960) and for monitoring the development in the future (e.g. investigation plots for higher plants on the Hungarian territory if these are fixed in the field).

Long term analysis with a good data base can be done with fish species. From 56 native fish species 4 are now extinct, 13 species were introduced by man.

8.3 Analyses of 1991-1993 Data

On the one hand the data base and on the other hand the long response time of natural systems only allow to quantify the influence of Variant C structures on flora and fauna on single aspects:

* For construction of the Gabcikovo scheme 3.180 ha out the 10.356 ha of Slovakian floodplain forests were seized. On the Hungarian territory the loss of alluvial forests is estimated to 1.200 ha.

* Derived from investigations of zoobenthos and zooplankton saprobity in the main channel varied in 1990-1992 between 2.5-3.0; in 1992 between 2.6-3.3.

* An increase of the relatively number of ecologically plastic, eurytopic species, introduced species and expansive species of fish is observed. The relatively number of already threatened species, mostly stenotopic species decreased.

Biomass data from nonvertebrates were in general not taken as basis for analyzing short term changes because these values normally do not allow a clear diversion of effects of the Variant C structure and parameters like temperature, amount of light or amount of rainfall.

8.4 Adequacy of the Present Monitoring System

At present a huge amount of data are collected. There is a need for application of more quantitative and semiquantitative methods that deal with (under monitoring aspects) good indicator taxa in suitable sites. The present monitoring system should be strengthened at least with the following investigations:

1. Geobotanical monitoring plots in different habitats where changes in the environmental conditions could be expected. For describing the abundance the BRAUN - BLANQUET-method should be used.
2. Mapping of the bird species in a grid system with 1-km^2 - plots covering the whole area potentially influenced by the Variant C.
3. Quantitative investigations on fish populations in selected reaches of the reservoir and the old Danube and in selected side branches/oxbow lakes by electrical fishing
4. Quantitative investigations on Carabide-beetles with BARBER-traps in different habitats undisturbed by forestry and agriculture (e.g. forests and sand banks)
5. Quantitative investigations on grasshoppers in grassland monitoring plots mowed 1 or 2 times a year (yearly at the same time)
6. Quantitative investigations on living and dead mussels and water snails in selected monitoring plots in the reservoir, the Danube and oxbow lakes/side branches.
7. Qualitative, and if possible also quantitative, monitoring of the rotary and crustacean plankton in major water bodies including the reservoir, the intake canal and the Old Danube.

The monitoring plots should be mapped in detail (1:100 - 1:1.000). Investigation plots 10x10m or 25x25m should be durable marked in the field so that the survey can be repeated on the exactly same place.

9. AGRICULTURE

The annual rainfall and evaporation amounts are of the same order of magnitude; however with significant different seasonal variations. Thus it is required with some additional water supply to the vegetation during the summer season. This extra water supply has traditionally been possible throughout the area by vertically upwards flow in the capillary zone from the ground water table to the root zone. The necessary conditions for this are that the ground water table is not too deep and that no (capillary breaking) gravel layer is located in between.

9.1 Available Data

For assessing the possible changes in capillary water supply for the agricultural production data is required on depth to ground water table and depth to gravel layer.

This information is provided by the Slovakian Data Report (ref /2/), while the Hungarian Data Report (ref /3/) does not provide any data nor analysis on this issue.

9.2 Data Analyses for Long Term Trends

Due to the general decline of the ground water table in large parts of the area during the past 40 years the conditions for capillary water supply to the root zone have decreased and the irrigation water requirements have increased correspondingly.

9.3 Analyses of 1991-93 Data

Due to the increase of ground water tables in large parts of the Slovakian area the conditions have improved. According to an estimate given in ref /2/ the requirements for irrigation from external sources is expected to decrease by about 25 % as compared to the pre-dam conditions.

No specific analyses on this issue is provided in ref /3/ for the Hungarian area. In part of the Hungarian agricultural area ground water levels have increased, while in other areas close to the main Danube the ground water levels have decreased. However, without specific analyses the impacts on agriculture in Hungary cannot be predicted with certainty.

9.4 Adequacy of the present Monitoring System

The present monitoring system is adequate as far as irrigation requirements are concerned.

10. FORESTRY

10.1 Available Data

For the Slovak territory (ref /2/) there exists a map of groups of forest types (according to Zlatnik) from 1960 in the scale 1:50,000 derived from maps in the scale 1:10,000. This represents the state before starting construction works. The distribution of groups of forest types (in %) before and after construction of the Gabcikovo dam is shown. The summarized mean annual increment of thicknes, tree height, mean losses of leaves and leaf area index from 24 monitoring areas are shown for 1991 and 1992.

The Hungarian Data Report (ref /3/) shows results of measurements of perimeter growth of 117 trunks all located in the Dunasziget area. Additional data from the Dunakiliti area could be provided.

10.2 Data Analyses for long Term Trends

Forest types change under natural conditions according to changes of the site parameters. In economically used (commercial) forests these changes are modified by selection of planted tree species. The first so-called profit forms of poplars were planted at the end of the 19th century. However these measures might represent the site conditions.

10.3 Analyses of the 1991-1993 Data

Changes in distribution of groups of forest types and its tree species composition before (1976) and after (1993) construction of the Gabcikovo dam are shown in Table 10.1 and in Fig. 10.1. for the Slovakian area. Similar figures for the Hungarian forest areas are shown in Table 10.2.

In a short time view changes in composition of tree species caused by changes in site conditions cannot be observed. Other indices must be used for monitoring short term changes.

Table 10.1 Changes in distribution of forest types in Slovakia and its tree composition before (1976) and after (1993) construction of the Gabcikovo dam.

groups of forest types	distribution (planary and percentage) of groups of forest types			tree composition	
	before construction	after construction	difference	origin	present
Corneto - Quercetum (CoQ)	185 ha 1,8%	30 ha 0,4%	155 ha	oaks, limetree, cornel, (elm)	oak, limetree, maple, cornel
Ulmeto - Fraxinetum carpineum (UFrc) hard floodplain forests	3,380 ha 32,6%	1.833 25,6%	1,547 ha	elm, oak, ash, domestic poplars, limetree, maple, (hornbeam)	ash, oak, ma[illegible], domestic poplars cultivar poplars, limetree
Ulmeto - Fraxinetum populeum (UFrp)	4,000 ha 38,6%	2,850 ha 39,7%	1,150 ha	elm, oak, ash, domestic poplars, aspan,	cultivar poplars
Querceto - Fraxinetum (QF)	1,482 ha 14,3%	1,386 ha 19.3%	1,150 ha	oak, ash, domestic poplars, aspan,	cultivar poplars
total area of transitional floodplain forests	5,482 ha 52,9%	4,236 ha 59,0%	96 ha		
Saliceto - Alnetum (SAL) soft floodplain forests	1,300 ha 12,7%	1,077 ha 15,0%	232 ha	willows, alder, domestic poplars,	willows, alder, domestic poplars cultivar poplars,
TOTAL	10,356 ha	7,176 ha	3,180 ha		

Therefore, in the Slovakian Data Report the leaf area index is used as important production-ecological characteristic and the loss of leaves in the middle of August are used. They show a significant increase of the leaf area index from 1991 to 1993 near the reservoir (Rusovce) and a decrease of the mean loss of leaves in August in the same area. There are no comparable data from the area between the reservoir and Sap/Palkovicovo and from outside the influenced area (to exclude climatical effects).

Distribution of groups of forests types in ha before (1976) and after (1993) construction of the Gabčikovo dam

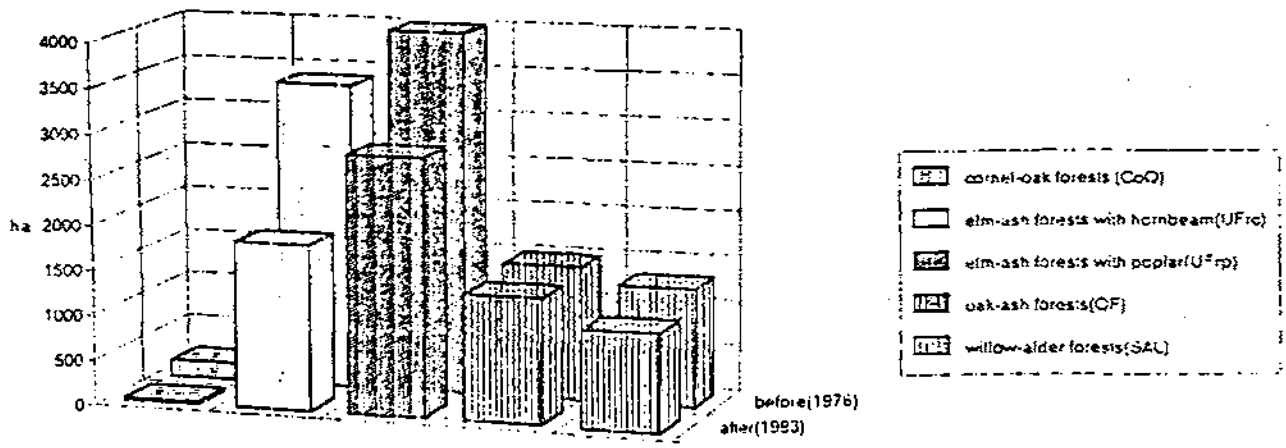


Fig. 10.1 **Distribution of forest groups in Slovakia before (1976) and after (1993) construction of the Gabcikovo dam.**

Table 10.2 **Changes in Distribution of Main Forest Habitats (according to the Zurich-Montpellier-System) in Szigetköz between 1960 and 1990.**

Main forest habitat	ha 1960	% 1960	ha 1990	% 1990
ULMENION /Fraxino-Ulmeto-Quercetum roboris; with subrelictum Querceto robori-Carpinetum	1892	22	797	11
SALICION ALBAE-FRAGILIS /with 1-2 % Alnetum glutinosae	3612	42	1668	23
cultivar ROBINIETUM + PINETUM	946	11	870	12
cultivar POPULETUM/ euroamericana hybrids	2150	25	3915	54
TOTAL	8600	100	7250	100

Changes are not due to Gabcikovo System constructions, but to economic considerations

In the Hungarian Data Report it is estimated (without evident data base) that roughly 5 % of the floodplain trees already died. The perimeter growth data were taken in Dunasziget area and near Dunakiliti. Both show a significant decrease in 1993. There are no comparable data from outside the influenced area (to exclude climatical effects)

10.4 Adequacy of the Present Monitoring System

The present monitoring system should be strengthened in the following way:

1. Mapping the forest types in the scale 1:10.000

2. Selection of "monitoring trees" (n x 10^2 Salix alba and Populus x euroamericana CV. I 214) all along the Danube on both sides from Bratislava to Sap/Palcovicovo with annual measurements/observations of height, perimeter in 1.3 m height and leaf area index.

11. ELECTRICITY PRODUCTION

The electricity production at Gabcikovo is shown in Fig. 11.1. The same figure shows the ratio between the Gabcikovo electricity production and the total electricity consumption in Slovakia as a graph.

The electricity produced at Gabcikovo goes into the Slovakian electricity distribution network.

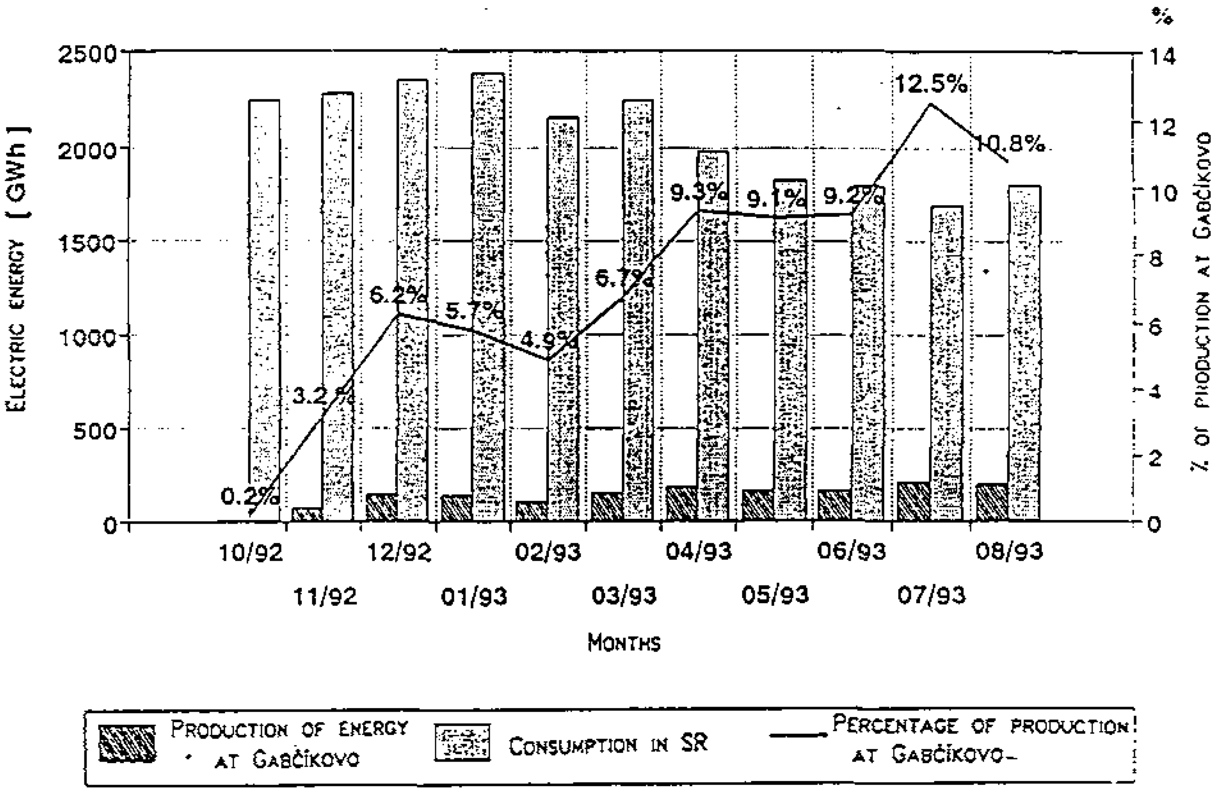


Fig. 11.1 Electricity production at Gabcikovo and its share of the total electricity consumption in Slovakia.

An illustration of the hourly variation of electricity production and the discharge through the turbines is shown for three typical days in Fig. 11.2.

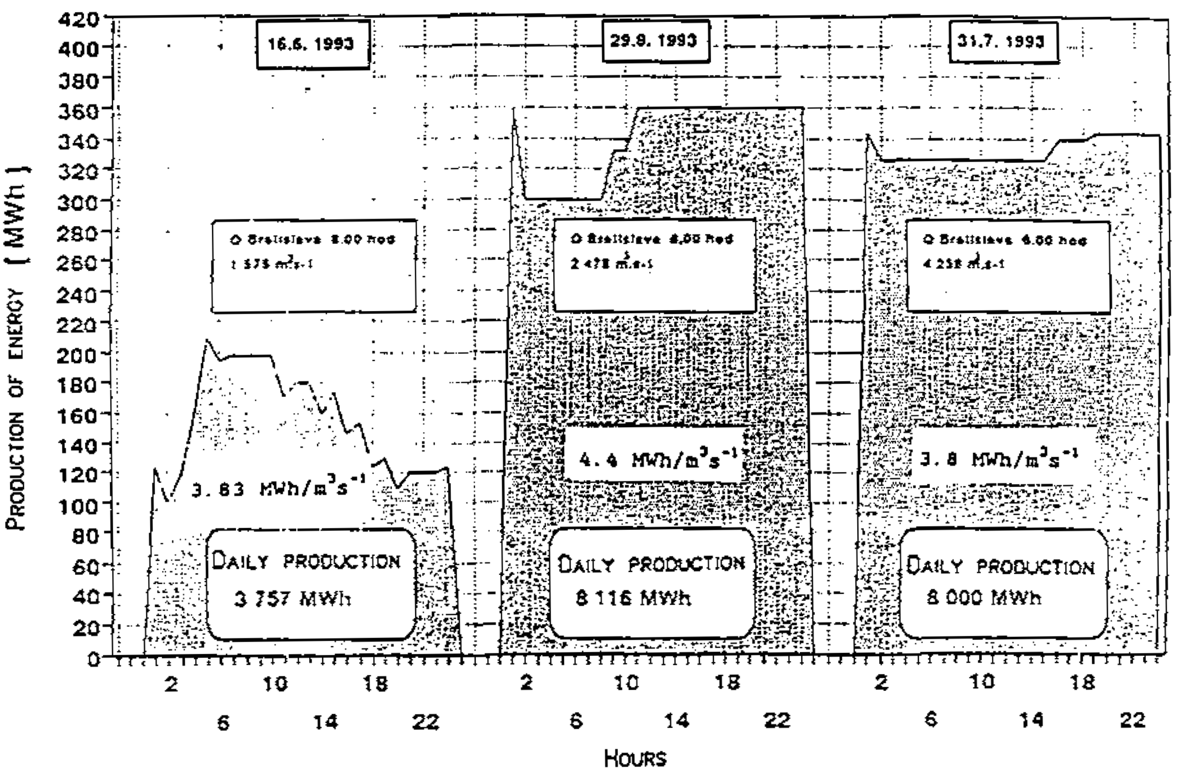


Fig. 11.2 **Hourly variation in discharge and electricity production for three typical days.**

12. OTHER PARAMETERS

The international navigation through the shiplocks at Gabcikovo has functioned since its opening on November 9, 1992. During this period the locks have been closed for 14 days.

The numbers of ships and shiplock openings are shown in the Slovakian Data Report (ref /2/). The monthly average numbers of openings of shiplocks and of ships passing have been shown for January - August 1993 in Table 12.1. It is seen from the table that for the first eight months of 1993 there has been in average 12 openings of ship locks per day and in average 31 ships have passed the locks per day.

Table 12.1 Monthly numbers of shiplock openings and ships passing at Gabcikovo, January - August 1993.

Numbers as average per day	January	February	March	April	May	June	July	August	Average Jan-Aug
Shiplock openings	5.9	8.1	7.9	11.4	12.8	15.6	15.6	17.0	11.8
Ships passing	16.1	27.9	26.2	30.7	26.5	37.2	38.7	46.3	31.2

13. SUMMARY ASSESSMENT OF IMPACTS FROM THE GABCIKOVO PROJECT

- The impacts of the Gabcikovo Project to the various parameters described in the above Chapters 2-12 may be categorized in two main groups, namely those where major general impacts have been identified and those where for various reasons no major general impacts as compared to the pre-dam conditions can be detected from the available data.

13.1 Aspects where major general impacts have been observed

As described in the above Chapters significant general impacts have been identified for the following parameters:

* discharges;
* surface water levels;
* sediment transport and sedimentation/erosion;
* ground water levels; and
* electricity production.

The impacts are summarized in the following.

Discharge

The Gabcikovo Project has had a very large impact on the discharge regime in the Danube between the dam at Cunovo and the downstream confluence at Sap/Palkovicovo. In this reach (the Old Danube) the discharge has in 1993 been reduced to in average about 400 m^3/s corresponding to about 20 % as compared to the pre-dam condition.

As an effect of the project the discharges in the Little Danube and the Mosoni Danube have been increased by 10 - 20 m^3/s, so that Mosoni Danube now permanently carries discharge. Finally, water is being provided to the side channels on both the Slovakian and Hungarian flood plains through new structures.

Surface water level

The Gabcikovo Project has had a very large impact on the water level regime in the Danube between Bratislava and the downstream confluence at Sap/Palkovicovo.

At Bratislava the water levels during low flow periods have increased by 1-2 m as compared to pre-dam conditions, i.e. to a level corresponding to the situation 40 years ago.

In the upstream part of the Old Danube the 1993 water levels have been reduced by 2-4 m as compared to pre-dam conditions, and have thus reached a level 2 m below the lowest ever recorded values. In addition, the characteristic natural dynamics of the water level fluctuations have been changed (reduced) significantly.

Sediment transport and sedimentation/erosion

Significant erosion occurred downstream the Cunovo structures under the November 1992 flood event. This material has been deposited downstream in the Old Danube. Sedimentation of fine material/silt can be seen in the Old Danube. Most likely, sedimentation of the total bed load and a substantial part of the suspended load have occurred in the reservoir. However, there are presently not sufficient data to quantitatively assess such impacts.

Ground water level

The Gabcikovo Project has had a significant impact on the ground water levels in the region. Initially the ground water levels were reduced very much close to the Old Danube and increased significantly close to the reservoir. The inundation of the side channels on the Slovak flood plains has subsequently significantly increased the ground water levels in the Slovak area.

In June/July 1993 the situation in Slovakia shows that over the entire area the ground water levels have increased or have not been affected. The increases have mainly occurred in the upstream area close to the reservoir, i.e. in the area which have been most negatively affected by the long term trend of decreasing ground water levels. On the Hungarian side, where comprehensive impact assessments have not been completed, it appears that the ground water levels have also increased close to the reservoir (Rajka - Dunakiliti region). Furthermore, it appears that in the middle part of Szigetköz between Dunakiliti and Asvanyraro the ground water levels have decreased in the areas close to the main Danube.

On both sides the ground water level fluctuations have been reduced significantly.

Electricity production

The Gabcikovo hydropower plant has produced 150 - 200 Gwh/month in 1993. This corresponds to about 10% of Slovakia's electricity consumption.

13.2 Aspects where minor impacts have been observed or no significant impacts can be detected from the available data

As described in the above Chapters no general significant impacts could be detected on the basis of the available data for the following parameters:

* surface water quality;
* ground water quality;
* flora and fauna;
* agriculture; and
* forestry.

For some of the parameters significant local changes have been identified. For other parameters the data availability and/or the time period have not been sufficient to derive firm conclusions. Finally, for some parameters no significant general impacts are expected.

The conclusions found for each of the parameters are summarized in the following.

Surface water quality

With exception of November - December 1992, when sudden changes of regime and a high flood event occurred, no significant changes in surface water quality parameters as compared to pre-dam conditions can be detected after damming the Danube.

Ground water quality

In general, no significant ground water quality changes can be identified after the damming of the Danube. One exception is the Rusovce area where some parameters (e.g. Total Dissolved Solids and nitrate) have changed due to changes in the flow pattern. No changes in concentrations of heavy metals nor organic micropollutants have been detected.

Flora and fauna

Due to insufficient data availability and due to the long response time of natural systems with regard to flora and fauna, no major general impacts have been identified. However, on the following aspects significant impacts have occurred: removal of about 4,500 ha floodplain forest under the construction phase; saprobity values in the Old Danube have slightly increased; and some changes in the occurrence of certain species have been noticed.

Agriculture

Due to increases of ground water tables on the Slovak territory a slight increase in the capillary water supply for Slovakian agricultural areas has taken place. In Hungary, where comprehensive assessments have not been made, the impacts on agriculture are uncertain.

Forestry

The leaf area index and the perimeter growth are positively correlated and the loss of leaves in the middle of August is negatively correlated to increase of ground water levels. Hence, the impacts on forestry depends on the impacts on ground water levels, i.e the forestry has been positively influenced in Slovakia and negatively in Hungary.

14. RECOMMENDATIONS FOR STRENGTHENING OF MONITORING SYSTEM

- A comprehensive monitoring programme has been carried out on a routine basis for many years (decades) in both countries. Furthermore, extended programmes have been established to monitor in greater details the conditions after the damming of the Danube.

The Working Group finds the present monitoring system, i.e. the extended programmes in both countries, generally to be relevant and recommend it to be continued. In many fields the present monitoring system appears adequate, while in other fields there are clear needs for a strengthening.

The strengthening comprises two different components, namely:

* aspects requiring more measurements, either in terms of measurements of new parameters or more measurements (in time and space) of already measured parameters; and

* aspects where discrepancies between Slovakian and Hungarian data have been detected, and where coordination efforts therefore are required.

14.1 Aspects requiring more Measurements

Surface water levels

There is a need for a new monitoring programme on measurements of surface water levels in the side channels on the flood plains both in Hungary and in Slovakia. At stations, where substantial fluctuations within a day occur, it is recommended to substitute manual measurement practises with automatic recorders.

Surface water quality

There is a need for a new monitoring programme on measurements of surface water quality in the side channels on the flood plains both in Hungary and in Slovakia.

Sediment transport and sedimentation/erosion

There is a need for establishment of a permanent sediment transport measurement programme comprising both bed load and suspended load measurements at the following locations:

(1) Upstream the reservoir.

(2) In the reservoir.

(3) In the Old Danube.

(4) In the side channels of the Hungarian and Slovakian flood plains.

(5) Downstream the confluence at Sap/Palkovicovo.

Furthermore, there is a need for establishment of permanent programmes for monitoring river bed and reservoir topography.

Ground water quality

The intensive monitoring must be continued for the coming years, especially with regard to areas close to the Danube where the infiltration conditions have been changed. Depending on the development of the measured ground water quality parameters it may be required to add more observations in the future.

Flora and fauna

The present monitoring system should be strengthened with the following investigations:

(1) Geobotanical monitoring plots in different habitats where changes in the environmental conditions could be expected. For describing the abundance the BRAUN - BLANQUET-method should be used.

(2) Mapping of the bird species in a grid system with 1-km^2 - plots covering the whole area potentially influenced by the Variant C.

(3) Quantitative investigations on fish populations in selected reaches of the reservoir and the old Danube and in selected side branches/oxbow lakes by electrical fishing

(4) Quantitative investigations on Carabide-beetles with BARBER-traps in different habitats undisturbed by forestry and agriculture (e.g. forests and sand banks)

(5) Quantitative investigations on grasshoppers in grassland monitoring plots mowed 1 or 2 times a year (yearly at the same time)

(6) Quantitative investigations on living and dead mussels and water snails in selected monitoring plots in the reservoir, the Danube and oxbow lakes/side branches.

(7) Qualitative, and if possible also quantitative, monitoring of the rotary and crustacean plankton in major water bodies including the reservoir, the intake canal and the Old Danube.

The monitoring plots should be mapped in detail (1:100 - 1:1.000). Investigation plots 10x10m or 25x25m should be durable marked in the field so that the survey can be repeated on the exactly same place.

Forestry

The present monitoring system should be strengthened with the following investigations:

(1) Mapping the forest types in the scale 1:10.000

(2) Selection of "monitoring trees" (n x 10^2 Salix alba and Populus x euroamericana CV. I 214) all along the Danube on both sides from Bratislava to Sap/Palcovicovo with annual measurements/observations of height, perimeter in 1.3 m height and leaf area index.

14.2 Aspects requiring coordination Efforts

For obtaining firm conclusions on the discharge uncertainties the following checks are required to be carried out by joint Hungarian-Slovakian teams:

(1) Check on discharge calibration curve at the bypass weir at Cunovo.

(2) Check on discharge calibration curve at the turbines at Gabcikovo.

(3) Check of discharge rating curves at Rajka and Dunaremete.

Budapest, 2. November 1993

Johann Schreiner

Igor Mucha

Gabor Vida

Jan M. van Geest

Jens Christian Refsgaard

15. REFERENCES

/1/ Working Group of independent Experts on Variant C of the Gabcikovo-Nagymaros Project. Final Report. Budapest, November 1992.

/2/ Data Report prepared by Slovakia as input to the present Working Group. Volumes on
- Surface and Ground Water Regime in the Slovak Part of the Danube Alluvium
- Surface Water and Ground Water Quality, Part 1/2
- Surface Water and Ground Water Quality, Part 2/2
- Ground Water Level Data, Part 1
- Ground Water Level Data, Part 2
- Sediment Transport and Sedimentation/Erosion (in Slovak)
- Irrigation water and agriculture
- Floodplain forests influenced by construction of the Gabcikovo dam
- Electricity Production and Navigation

Bratislava, October 15, 1993.

/3/ Data Report prepared by Hungary as input to the present Working Group. Volume on
- Summary Report

Budapest, October 21, 1993.

/4/ Hydrographic data taken in the period taken after the closure of the Danube. Ministry of Environment and Regional Policy, Hungary, Budapest, may 1993.

Annex 20

(Extracts)

Commission of the European Communities, Czech and Slovak Federal Republic, Republic of Hungary

Fact Finding Mission on Variant "C" of the Gabčíkovo-Nagymaros Project, Mission report of 31 October 1992

COMMISSION OF THE EUROPEAN COMMUNITIES
CZECH AND SLOVAK FEDERATIVE REPUBLIC
REPUBLIC OF HUNGARY

FACT FINDING MISSION ON VARIANT C OF THE GABCIKOVO-NAGYMAROS PROJECT

MISSION REPORT

Bratislava
October 31, 1992

LIST OF CONTENT

EXECUTIVE SUMMARY

In connection with trilateral negotiations held in London on October 28 between the European Commission (CEC), the Czech and Slovak Federative Republic (CSFR) and Hungary on Variant C of the Gabcikovo-Nagymaros project it was decided to carry out a Fact Finding Mission composed of one expert from each of the three parties.

The Mission met first time on October 29 in Györ, carried out an on-site inspection of the ongoing work on October 30 and held the concluding meetings in Bratislava on October 30-31, 1992.

Very significant construction activities are presently going on. The scheduled completion of the Gabcikovo complex and the structures of the variant C project are summarized below :

SCHEDULED COMPLETION	1/11-92	15/11-92	1/1-93	1/3-93	1995
GABCIKOVO COMPLEX					
Ship locks (finished)					
Power station incl.					
1 turbine	X				
3 turbines			X		
5 turbines				X	
VARIANT C COMPLEX					
Phase 1					
By-pass weir			X		
Closing dams, dike		X			
Floodplain weir			X		
Mosoni by-pass weir	X				
Phase 2					
Ship lock, weir and power station					X

The design flood discharge for the final Variant C is based on a 10,000 year flood event, whereas a 100 year (1 % risk of per year) is accepted during the construction period.

According to the scheduled completion the structures are expected to be ready and fully fortified to resist the design flood without large damages as follows:
- November 15, 1992: Winter design flood (6000 m^3/s)
- March 1, 1993: Summer design flood (10600 m^3/s)

It is technically possible to direct the main part of the discharge to the old Danube around January 1, 1993.

Should a flood occur now before the connecting dams and dike are fully fortified, the constructions could be damaged from erosion.

It is not likely that a flood would give rise to an extraordinary flooding hazard in areas outside the main existing dikes.

The closure of the Danube and the subsequent separation of the flow into two parts resulting in smaller discharge in the Danube has had significant immediate environmental impacts (groundwater and floodplain ecology) as well as a termination of the navigation for a period of approximately 11 days.

In theory, the ongoing activities with Variant C could be removed. However, in practise this will cause significant environmental problems. The cost of removing the structures are roughly estimated to at least 30 % of the construction costs.

A number of possible scenarios are described in the report. Scenarios for stopping of work for 1, 3 and 12 months and of alternative operation strategies (directing the main discharge to old Danube or to Gabcikovo) have been elaborated with respect to which work has to be completed to protect the structures against flood as well as to environmental impacts. The different scenarios have furthermore different organisational and economical implications.

The members of the mission agree to the content of the Mission Report. In addition, both the CSFR and the Hungarian representative have prepared separate statements, enclosed as appendices E and F of Mission Report, containing more specific proposals.

up to 250 m^3/s from the power canal to a river arm close to Dobrohost.

After completion of variant C the full complex of structures can provide comprehensive possibilities for regulating the discharges both in low flow and flood situations.

4.2 Environmental impacts

The major environmental consequences are related to the groundwater resources and to the ecology in the floodplain connected to the existing Danube. Both the groundwater system and the floodplain ecology is heavily dependent on the water level (and its variation) in the existing Danube river.

Impacts for groundwater in general and floodplain ecology.

The immediate effects on the groundwater of a smaller discharge in the Danube is a lowering of the groundwater table in the areas close to the river at both the Czecho-Slovakian and the Hungarian sides. Such lowering of the ground water table will have negative impacts on the floodplain ecology (see below) and to some extent also on the agriculture. The long term effects may include changes in the ground water quality.

The effects on floodplain ecology is a result both of the lowering of the groundwater table, resulting in poorer water supply to the riverside vegetation, and of a less frequent inundation of the flood plain.

Thus, the environmental impacts of reducing the discharge in the Danube are negative, unless proper remedial actions are taken. CSFR has included a budget of 2.4 billion CSK for construction of underwater structures as part of Phase 2 of the Variant C. Below is indicated some possible elements in a scheme for remedial measures:

* Small underwater weirs in the main rivers to increase the water levels. This can ensure that the groundwater table will not be lowered in average over time.

* Gate operation to vary discharges, so that a main part of the dynamics of the hydrological system with water table fluctuations can be maintained.

* Opening of the connection between the main Danube channel and the side channels, (meanders). Today these connections has (for navigation purpose) been completely closed for discharges less than 2000 m^3/s. The dynamics in these stagnant river arms is poor

slided into the Danube;

- the water has disappeared from the ports between the river sections 1811-1850 (Ásványráró, Dunaremete, Dunakiliti);
- the ecological balance of the side branches has become disturbed as water disappeared from the branches.

Impacts for Bratislava water supply

In case the navigation channel is open but without allowing discharge to the turbines the water in the d/s part of the reservoir near Samorin will be practically stagnant. Thus in this part of the reservoir significant eutrophication and sedimentation of organic matter (algae) will take place all over the reservoir. As a result of this the groundwater quality in the area in general and for the Samorin Water Works in particular are seriously threatened. The Samorin Water Works today produces a main part of the water supply for Bratislava. The groundwater quality is not likely to be negatively affected if a significant discharge is maintained through this part of the reservoir into the navigation channel and power canal. This reservoir has been designed and constructed with special consideration to avoiding sedimentation in the parts of the reservoir from where the infiltrating water travels to the groundwater wells fields of Samorin Water Works.

General remark

Finally, it is important to emphasize that the environmental conditions in certain respects are deteriorating today due to river bed erosion and thus lower ground water tables (decline varying from approximately 2 m over the last 30 years near Bratislava to approximately status quo near Komarno). Thus, the riverside vegetation is slowly drying out resulting in significant changes in vegetation species etc, and the conditions for agricultural water supply through capillary rise from the low ground water tables are no longer good enough and hence more irrigation is required. It is realized that sudden changes as a consequence of e.g. the Gabcikovo - Nagymaros project will occur immediately, and that it will take some time until a new ecological balance develops. However, the "status quo" situation (i.e. pre-dam conditions) is neither a stationary nor a natural situation, but rather a (slower) transition from one cultural landscape to another one with the inherent consequences of this on the ecological conditions.

Annex 21

Project designs examined prior to the acceptance of the G/N System

UNOFFICIAL TRANSLATION

BRIEF DESCRIPTION

of alternatives and variants of the Hydropower Project Scheme Gabčíkovo-Nagymaros, worked out over the years 1952-1967 for the common /joint/ investment task

Alt.structure	Name	rkm	altitude of the upper level /m/	Note
1 river struct.			136,0	3 river structures
2 river struct.	Bratislava	1864,5	136,0	6 river structures
river struct.	Čuňovo	1854,35	131,0	
river struct.	Dobrohošť	1840,5	125,5	
river struct.	Dunaremete	1825,3	120,5	
river struct.	Palkovičovo	1809,97	116,5	
river struct.	Komárno	1772,2	112,0	
3 weir	Bratislava	1864,0	136,0	Leftbank diversion 48 km long, outlet at Palkovičovo
canal struct.	Šamorín	-	136,0	
canal struct.	Gabčíkovo	-	124,0	
river struct.	Komárno	1772,2	112,0	
4 weir	Bratislava	1865,0	136,0	Leftbank diversion 48 km long, outlet at Palkovičovo, river bed dredging down to Zlatná
canal struct.	Šamorín	-	136,0	
canal struct.	Gabčíkovo	-	124,0	
5 weir	Bratislava	1864,0	136,0	Leftbank diversion 48 km long, outlet at Palkovičovo
canal struct.	Šuľany	-	136,0	
canal struct.	Komárno	1772,2	112,0	
6 weir	Bratislava	1864,0	136,0	Leftbank diversion 63 km long, outlet at Číčov. River bed dredging down to Zlatná
canal struct.	Dobrohošt	-	136,0	
canal struct.	Číčov	-	117,0	
7 weir	Bratislava	1864,0	136,0	Leftbank deversion 63 km long, outlet at Číčov. River bed dredging to Zlatná
canal struct.	Hamuliakovo	-	136,0	
canal struct.	Topoľovec	-	123,2	
8 weir	Bratislava	1864,0	136,0	Leftbank diversion 63 km long, outlet at Číčov, bed dredging to Zlatná
canal struct.	Bratislava	-	136,0	
canal struct.	Gabčíkovo	-	126,3	
9 weir	Bratislava	1869,3	136,5	Danube channel guided from weir through Petržalka.Leftbank diversion 63 km long, outlet at Číčov.Bed dredging to Zlatná
canal struct.	Dobrohošť	-	136,5	
canal struct.	Číčov	-	117,0	
10 weir	Bratislava	1871,0	136,4	Danube channel guided beyound Petržalka.Leftbank diversion 64 km long,outlet at Číčov. Channel deepening to Zlatná
canal struct.	Bratislava			
canal struct.	Bodíky			
11 weir	Bratislava	1864,0	136,0	Leftbank diversion 33 km long,outlet at Šuľany,channel deepening to Zlatná
canal struct.	Dobrohošť	-	136,0	
canal struct.	Číčov	-	118,5	

Alt.	structure	Name	rkm	altitude of the upper level /m/	Note
12	weir	Hamuliakovo	1853,5	136,0	Leftbank diversion 39 km
	canal struct.	Hamuliakovo	-	136,0	long, outlet at Palkovičovo
	canal struct.	Topoľovec	-	123,3	channel deepening to Zlatná
13	river struct.	Bratislava	1864,0	136,0	Leftbank diversion 29 km
	weir	Hrušov	1841,7	126,5	long, outlet at Palkovičovo
	canal struct.	Gabčíkovo	-	126,5	channel deepening to Zlatná
14	Leftbank diversion river structure				Diversion canal outlet rkm 1865,5 mouth rkm 1810 length 48 km
	weir	Bratislava	1865	134,0	
	power plant	Šuľany	30,5/1832	132,7 131,7/2000/	
15	Leftbank diversion river power project				
	weir	Bratislava	1865	134,0	outlet: 1865,5
	1.power plant	Vojka	25,0/1837	134,0- -131,5	mouthing:1810,0
	2.power plant	Palkovičovo	48,0/1811		
16	Rightbank diversion river power project				
	Weir	Bratislava	1861,5	144,0	outlet: 1862
	power plant	Halászi	28,0/1835	133,8- 132.7 /2000/	mouthing:1814 length: 48,5
17	River cascade				
	1.Power plant	Jarovce	1861	133,5	2100 m3/s
	2.Power plant	Rajka	1848	127,5	2100 m3/s
	3.Power plant	Vojka	1835,5	123,0	2100 m3/s
	4.Power plant	Lipót	1825	118,2	2000 m3/s
	5.Power plant	Nagybajcs	1804	113,6	2000 m3/s
18	Right-and leftbank diversion river power project				
	rightbank weir	Petržalka	1861	134,0	Outlet: 1862
	power plant	Halászi	28,0/1834	133,9 -132,6 /1000/	mouthing: 1814 length 48,5
	leftbank weir	Bratislava	1865	134,0	outlet: 1965
	power plant	Šuľany	30,5/1832	133,9- -132,3 /1000/	mouthing: 1811 lenght: 48,0
19	Rightbank diversion river power project				
	weir	Bratislava	1864	136,0	Outlet: 1862
	power plant	Cikolasziget	27,0/1836	135,9- -134,8 /2000/	mouthing: 1814 length: 48,5
20	Rightbank diversion river power project				
	weir	Bratislava	1864	136,0	Outlet: 1862
	1. Power plant	Feketeerdo	23,0/1840	135,9- 134,9	mouthing: 1840
	2. Power plant	Hédervár	40,5/1821	124,9-124,9 /2000/	

Alt.structure	Name	rkm	elevation of upper level /m/	Note
a1-a3 weir	Bratislava	1864,0	132,0 133,0 134,0	Leftbank diversion 48 km long, outlet at Palkovičovo, channel deepening to Zlatná
canal struct.	Čilistov	/17,0/	detto	
canal struct.	Gabčíkovo	/43,6/	121,9	
a4-a9 Diversion canal strting at rkm 1864, relieve branch passes behind Petržalka /var.4-6/, or eventually a cut-off from the structure Wolfsthal-Bratislava /var.7-9/.				
canal struct.	Čilistov	/17,0/	132,0 133,0 134,0	Leftbank diversion 48 km long, outlet at Palkovičovo. Channel deepening to Zlatná
canal.struct.	Gabčíkovo	/43,6/	121,9	
a10 weir	Bratislava	1864,0	132,0	Leftbnak diversion 48 km long to Palkovičovo. Channel deepening to Zlatná
canal struct.	Baka	/27,0/		
bi-b4 weir	Bratislava	1864,0	133,5 134,5 135,0 136,0	Solution with cascade Heinburg
canal struct.	Čilistov	/17,0/	detto	Leftbank deversion 48 km long, outlet at Palkovičovo
canal struct.	Gabčíkovo	/43,6/	121,9	Channel deepening to Zlatná
c1-c4 weir	Bratislava	1864,0	132,0 131,0	Solution in two variants deepening of tailrace of Wolfsthal-Bratislava river project
canal struct.	Baka	-	detto	Leftbank diversion 38 km long, outlet at Palkovičovo
In addition a solution was worked out with three river structures /steps/ and alternative solution of diversion with one river structure.				
river struct.	Hamuliakovo	1843,3	132,0	
river struct.	Vojka	1835,0	125,0	
river struct.	Čičov	1795,0	116,5	
weir	Hamuliakovo	1853,2	131,5	Leftbank diversion 39 km long, outlet at Palkovičovo. Channel deepening to Zlatná
canal struct.	Baka	/27,0/	detto	
d1 double-stage river power project				
1.Power plant	Kismaros	1690 /1500/	107,2	Váci branch of the Danube
2.Power plant	Pócsmegyer	18	107,1- -106,75 /1520/	Szentendre Danube branch
d2 double-stage river power project				
1.power plant	Kisoroszi	1	107,35 /1200/	Szentendre Danube branch
2.power plant	Ujpest	1662	107,35 /2400/	Váci Danube branch
d3 river power Project	Nagymaros	1696,25	108,0- -108,5 /3000-3600/	Power plant divided in two parts

21	River power project Komárno		1772	112,0 /2400/	
22	River power project	Visegrád	1696,5	108,5 /2500/	rightbank unif-power plant
23	River power project	Visegrád	1696,5	108,5 /2500/	divided power plant
24	River power project	Visegrád	1696,5	108,5 /2500/	pier divided power plant
25	River power project	Nagymaros	1696,5	108,5 /3000/	unified power plant on the right river bank

All studied alternatives assumed, that the downstream level of the lowest structure will link up to the top-water level /backwater/ of the river project Nagymaros, situated in km 1696,25 with water surface elevation 108,0 m above sea level /a.s.l./ /Hungarian system/. This water surface elevation was defined on the basis of extensive studies and variants with backwater elevations was defined on the basis of extensive studies and variants with backwater elevations 107, 108 and 109 m a.s.l.

A study of the location of this river project in the reach Chľaba - Nagymaros, or eventually Vác - Budapest, had been worked out by the Hungarian party and was approved by governmental delegation of Hungary and ČSSR on 02.08.1952 in Budapest, on 10.07.1954 in Prague, and later on 07.10.1958 in Prague.

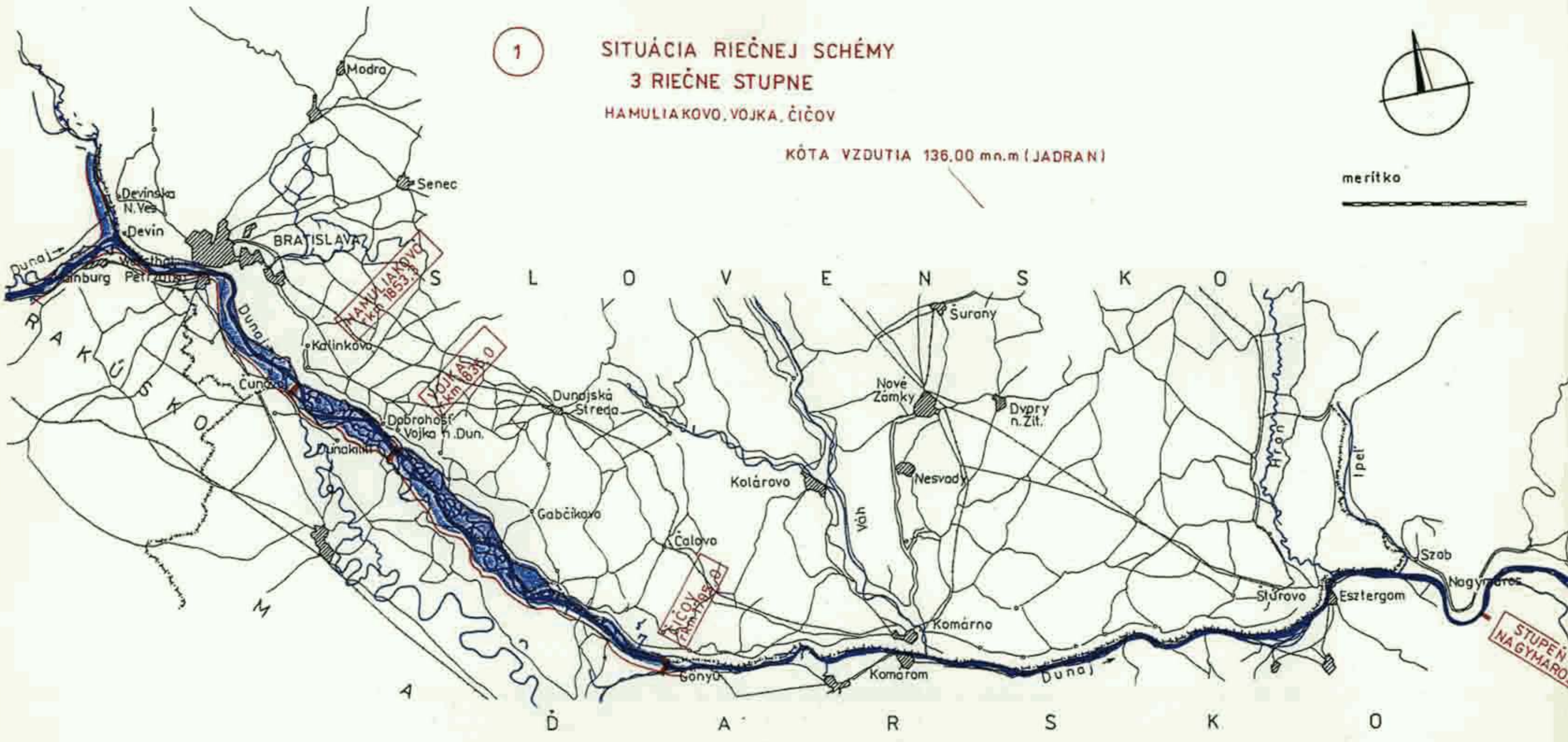
Elaborated solutions had been consulted by the Czechoslovak party with Soviet experts in Moscow on September 1955, and from 13 alternatives the alternative 4, with diversion Bratislava - Palkovičovo, was recomended.

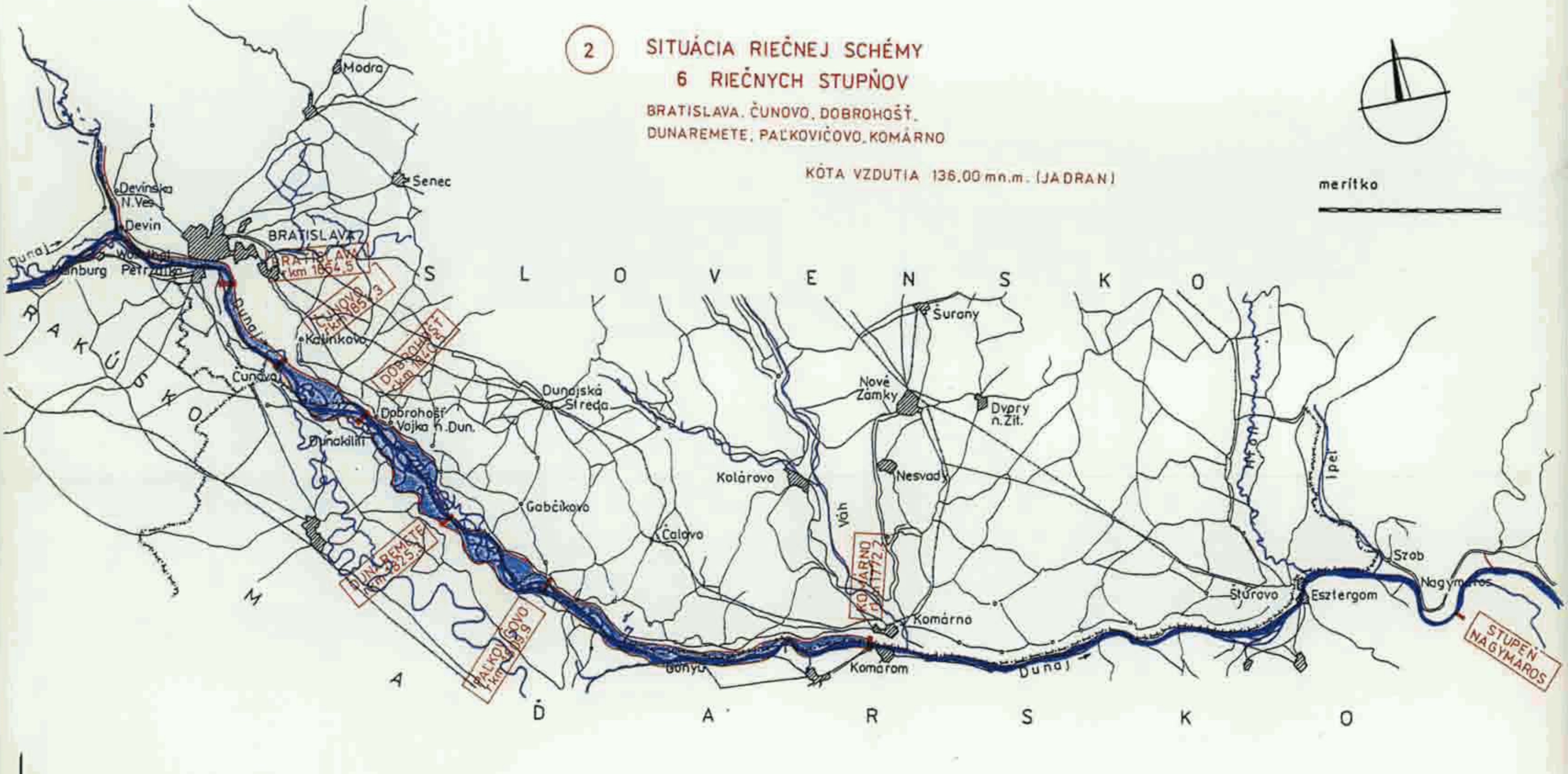
Preparation of the joint Czechoslovak - Austrian river project started in 1955 and an agreement /treaty/ was signed in Prague on 30.04.1957 about the utilization of the common Czechoslovak - Austrian Danube reach by means of construction of a river power project Wolfsthal - Bratislava in rkm 1873,3, with backwater elevation 140,0 m a.s.l. Investment task concerning this river project was approved by the Governmental Decree No.892 on 01.10.1958 and by the end of 1959 a contractual project had beeen worked out. This river project was considered as a basis, of starting point in dealing with the Czechoslovak - Hungarian reach of the Danube.

After decision on the river project Wolfsthal - Bratislava following alternatives had been worked out for the common Czechoslovak - Hungarian reach of the Danube /elevations are quoted in ČS or Hung. Heights/.

(1) SITUÁCIA RIEČNEJ SCHÉMY
3 RIEČNE STUPNE
HAMULIAKOVO, VOJKA, ČIČOV

KÓTA VZDUTIA 136,00 mn.m (JADRAN)

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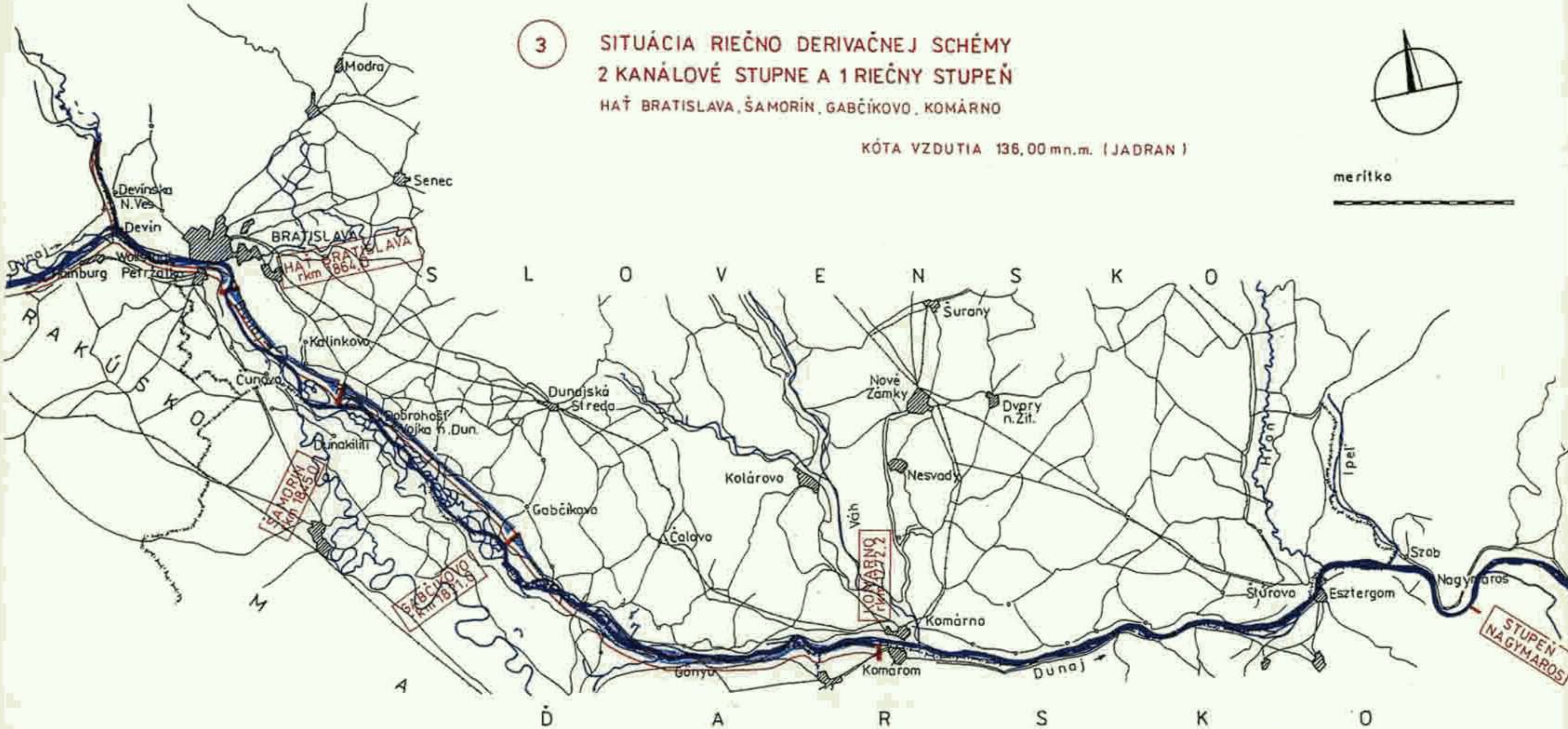
SITUÁCIA RIEČNEJ SCHÉMY
6 RIEČNYCH STUPŇOV
BRATISLAVA, ČUNOVO, DOBROHOŠŤ,
DUNAREMETE, PAĽKOVIČOVO, KOMÁRNO
KÓTA VZDUTIA 136,00 mn.m. (JADRAN)
merítko
S L O V E N S K O
M A Ď A R S K O
Modra
Senec
Devínska N.Ves
Devín
BRATISLAVA
Petržalka
Dunaj
Kalinkovo
Čunovo
Dobrohošť
Vojka n.Dun.
Dunakiliti
Dunajská Streda
Gabčíkovo
Čalovo
Kolárovo
Váh
Nové Zámky
Šurany
Dvory n.Žit.
Nesvady
Komárno
Komárom
Gönyü
Štúrovo
Esztergom
Szob
Ipeľ
Hron
STUPEŇ NAGYMAROS

3 SITUÁCIA RIEČNO DERIVAČNEJ SCHÉMY
2 KANÁLOVÉ STUPNE A 1 RIEČNY STUPEŇ
HAŤ BRATISLAVA, ŠAMORÍN, GABČÍKOVO, KOMÁRNO

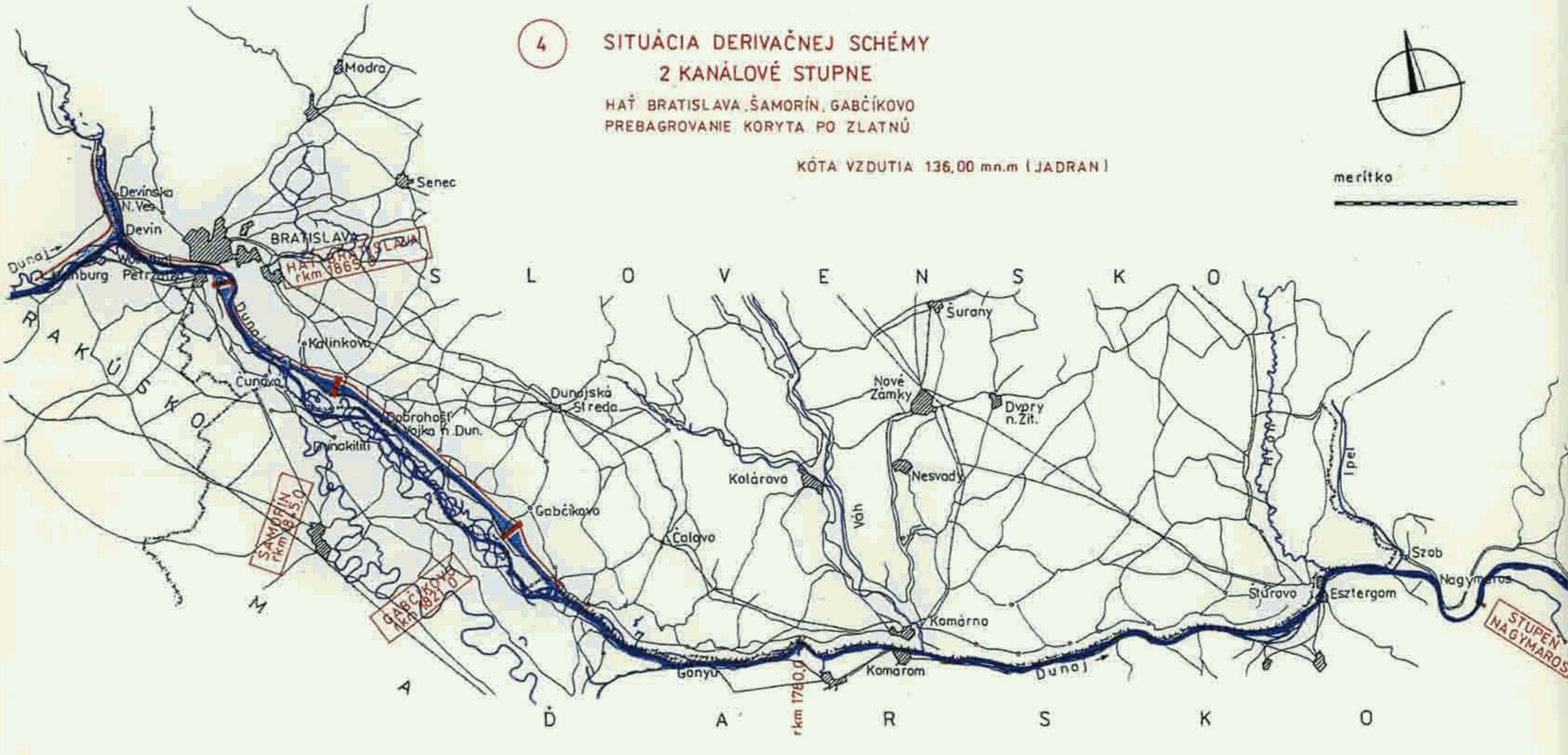
KÓTA VZDUTIA 136,00 mn.m. (JADRAN)



408

4 SITUÁCIA DERIVAČNEJ SCHÉMY
2 KANÁLOVÉ STUPNE
HAŤ BRATISLAVA, ŠAMORÍN, GABČÍKOVO
PREBAGROVANIE KORYTA PO ZLATNÚ

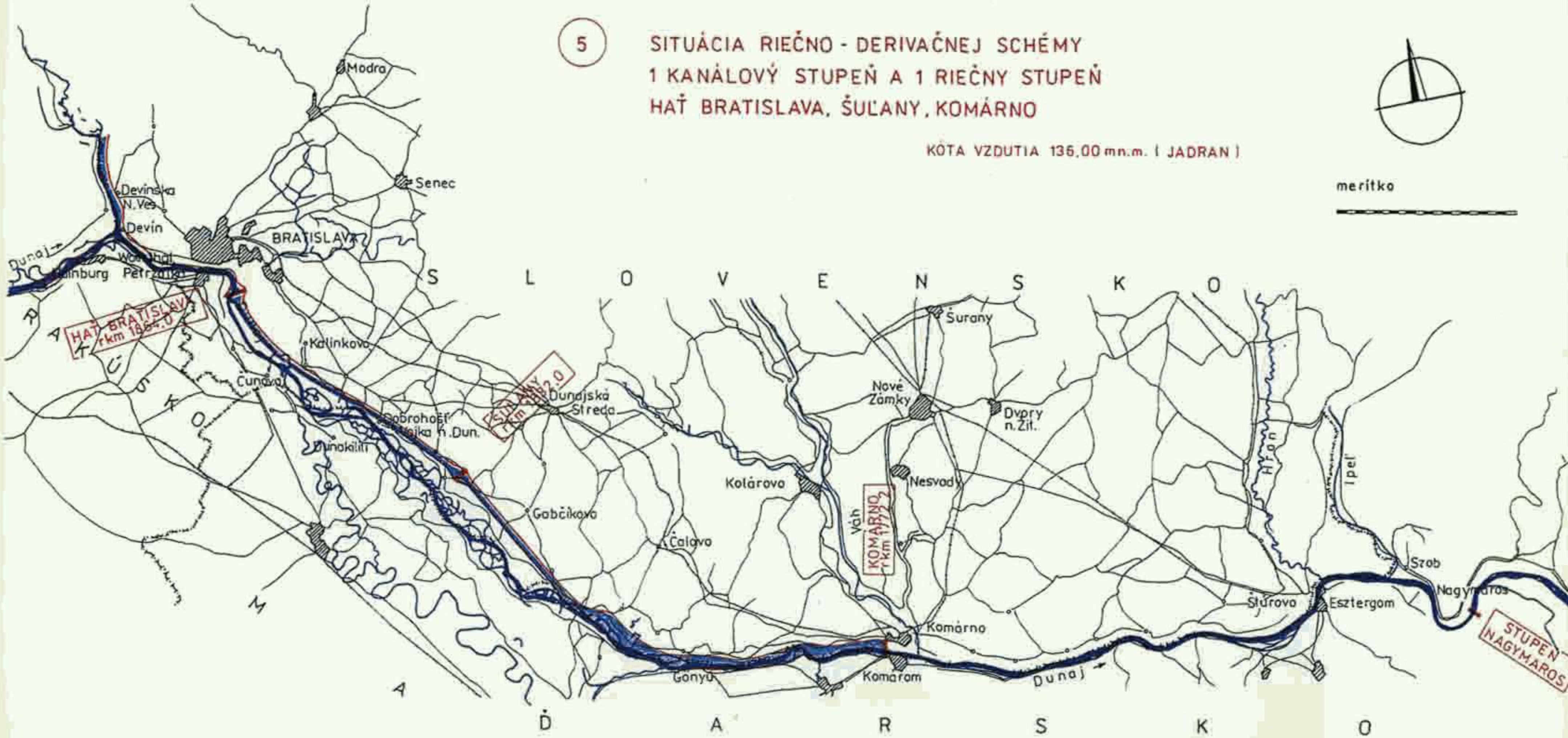
KÓTA VZDUTIA 136,00 mn.m (JADRAN)



5

SITUÁCIA RIEČNO - DERIVAČNEJ SCHÉMY
1 KANÁLOVÝ STUPEŇ A 1 RIEČNY STUPEŇ
HAŤ BRATISLAVA, ŠUĽANY, KOMÁRNO

KÓTA VZDUTIA 136,00 mn.m. (JADRAN)



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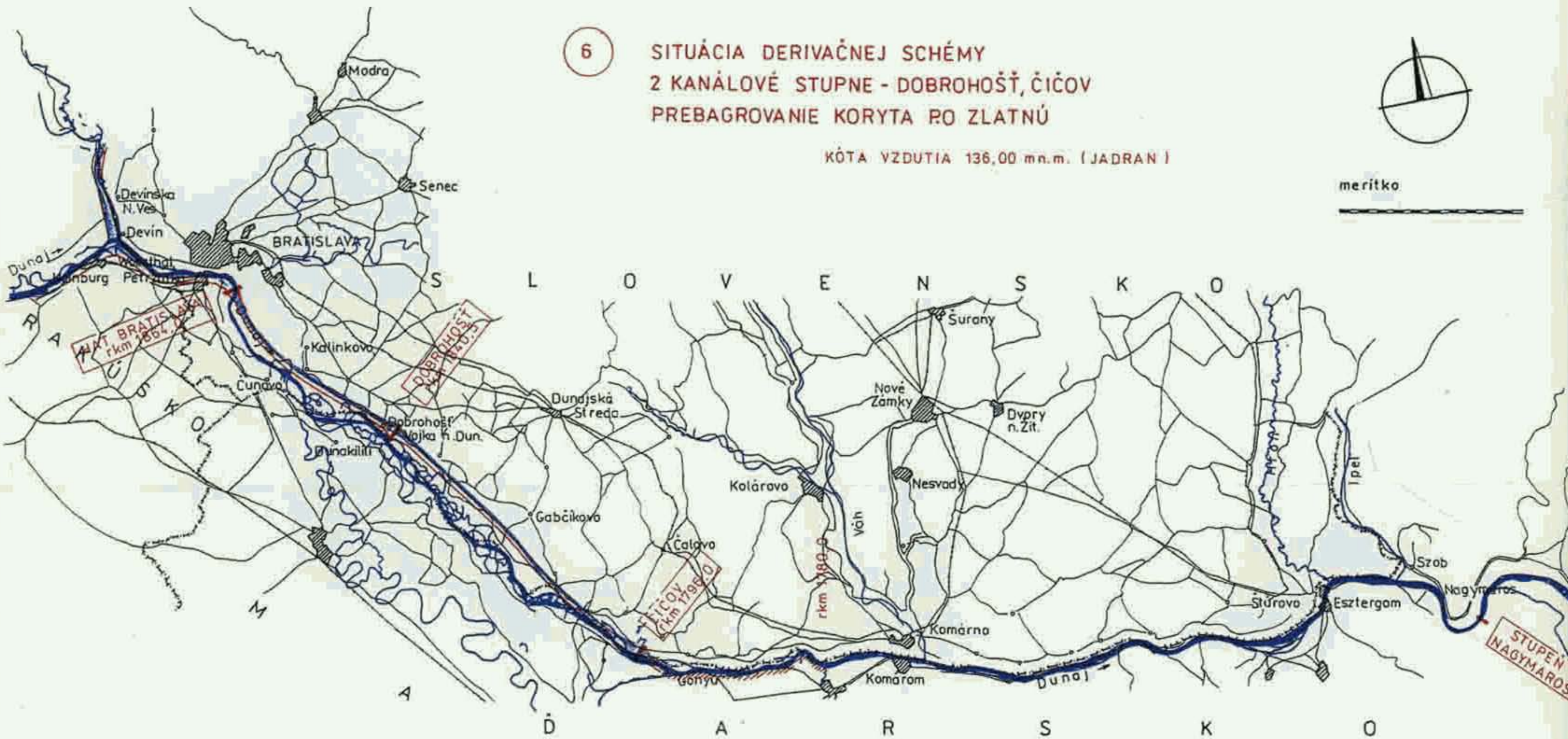
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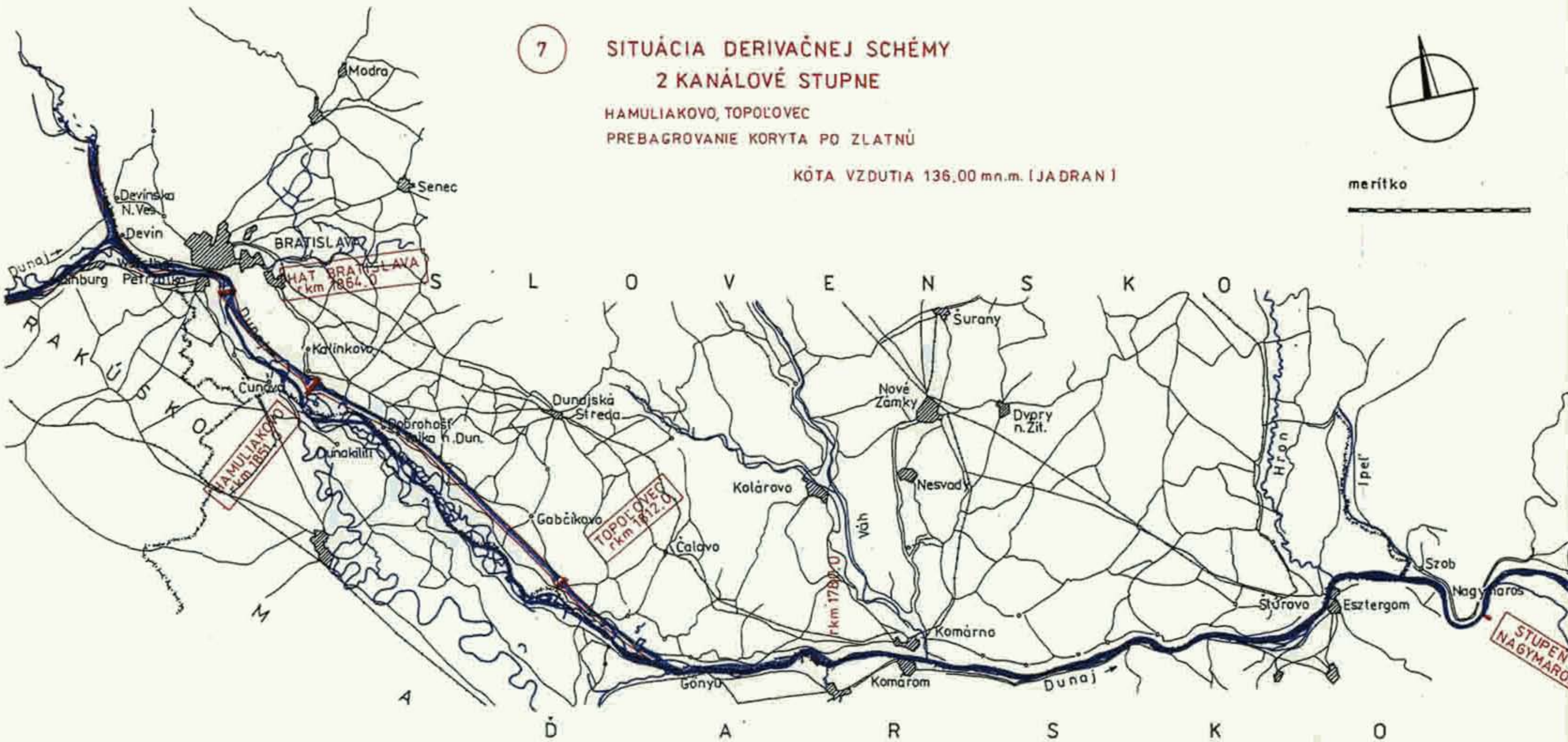
SITUÁCIA DERIVAČNEJ SCHÉMY
2 KANÁLOVÉ STUPNE - DOBROHOŠŤ, ČIČOV
PREBAGROVANIE KORYTA P.O ZLATNÚ
KÓTA VZDUTIA 136,00 mn.m. (JADRAN)
meritko
S L O V E N S K O
M A Ď A R S K O
Modra
Senec
Devínska N. Ves
Devín
BRATISLAVA
Dunaj
Kalinkovo
Čunovo
Dunakiliti
Dobrohošť
Vojka n. Dun.
Dunajská Streda
Gabčíkovo
Čalovo
Kolárovo
Váh
Nové Zámky
Šurany
Dvpry n. Žit.
Nesvady
Komárno
Komárom
Gönyü
Štúrovo
Esztergom
Ipeľ
Szob
ČIČOV rkm 1798,0
rkm 1780,0
DOBROHOŠŤ rkm 1840,3
STUPEŇ NAGYMAROS

7 SITUÁCIA DERIVAČNEJ SCHÉMY 2 KANÁLOVÉ STUPNE

HAMULIAKOVO, TOPOĽOVEC

PREBAGROVANIE KORYTA PO ZLATNÚ

KÓTA VZDUTIA 136,00 mn.m. [JADRAN]



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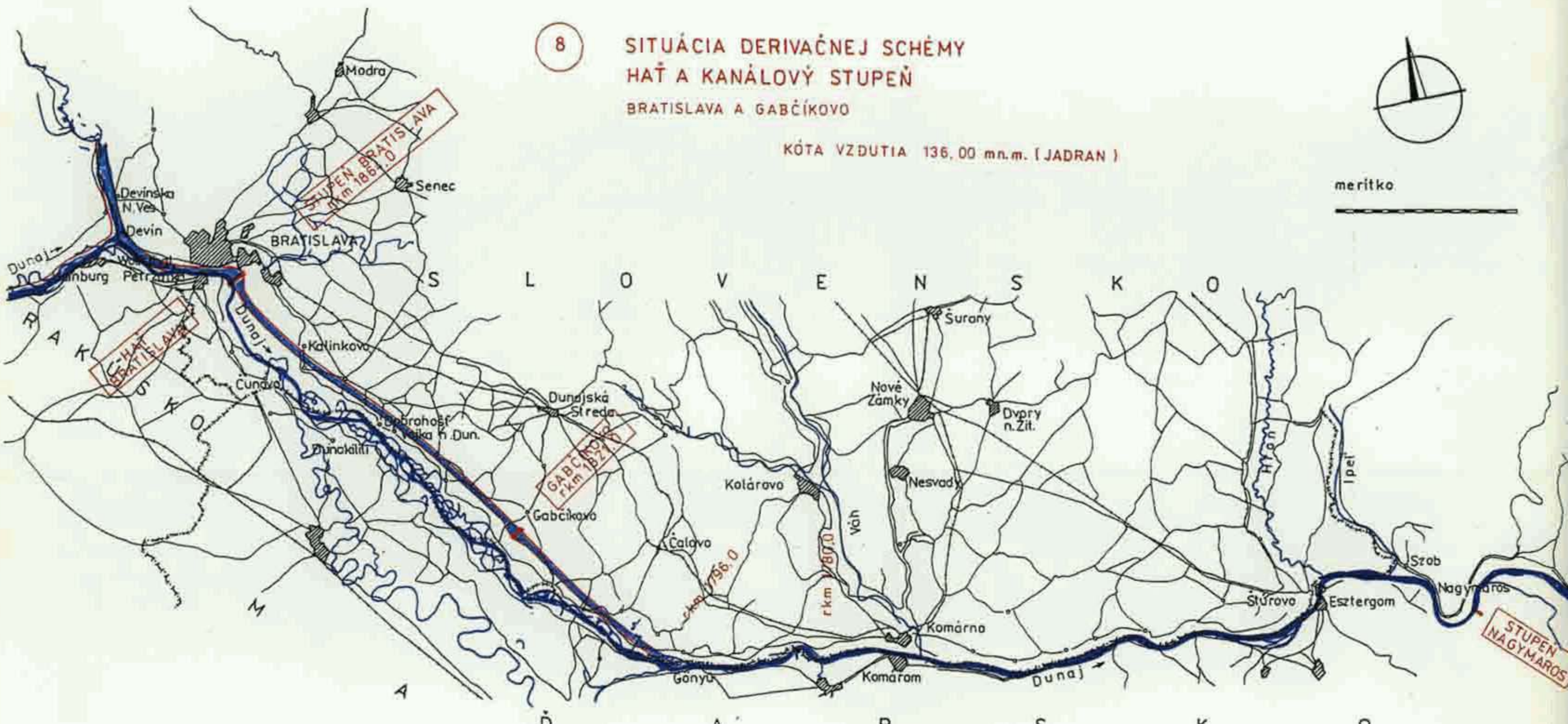
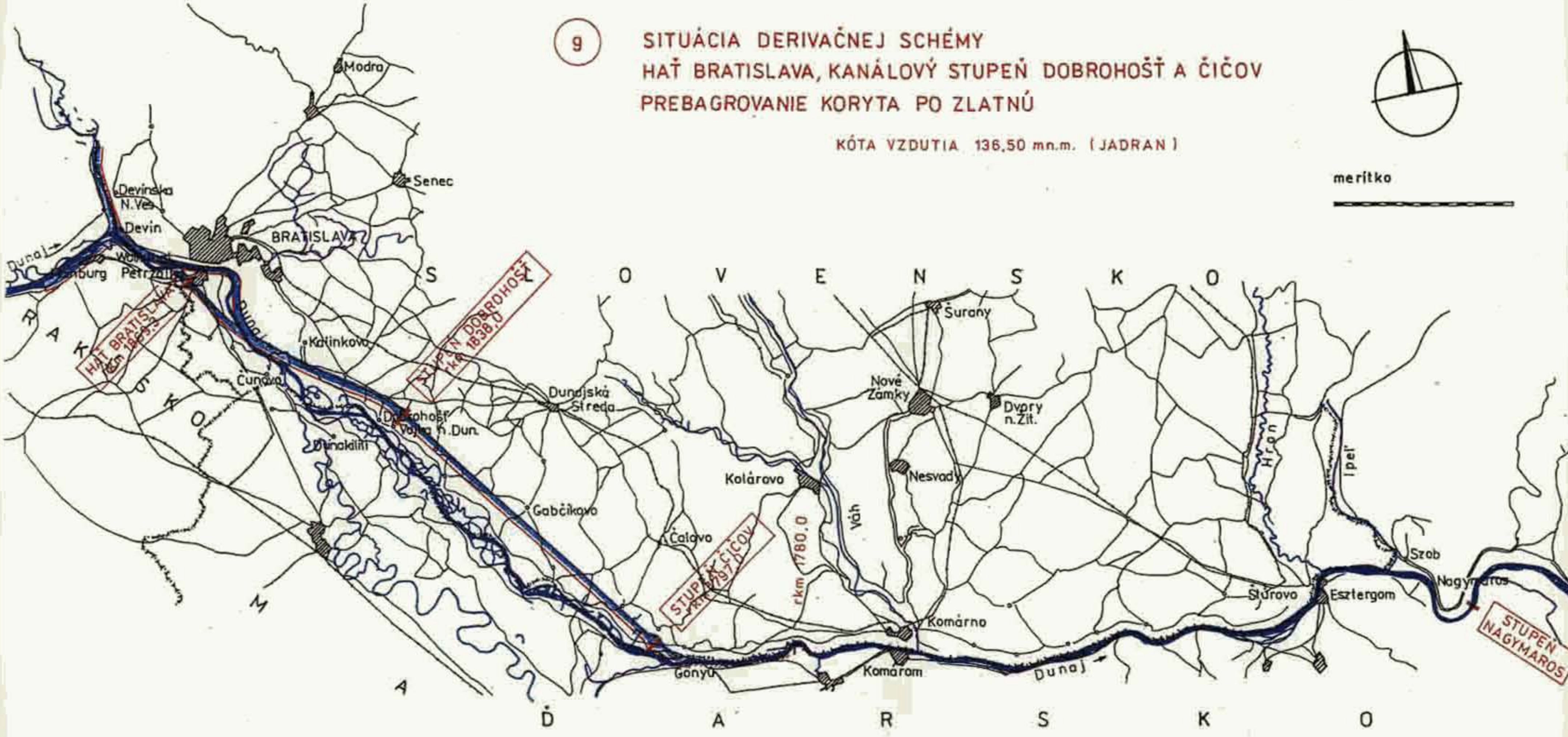


8
SITUÁCIA DERIVAČNEJ SCHÉMY
HAŤ A KANÁLOVÝ STUPEŇ
BRATISLAVA A GABČÍKOVO
KÓTA VZDUTIA 136,00 mn.m. (JADRAN)
meritko
S L O V E N S K O
R A K Ú S K O
M A Ď A R S K O
Modra
Senec
Devínska N. Ves
Devín
BRATISLAVA
Dunaj
Kalinkovo
Čunovo
Dunajská Streda
Gabčíkovo
Čalovo
Kolárovo
Nové Zámky
Šurany
Dvory n. Žit.
Nesvady
Váh
Komárno
Komárom
Gönyü
Hron
Ipeľ
Štúrovo
Esztergom
Szob
STUPEŇ NAGYMAROS
rkm 1796,0
rkm 1780,0

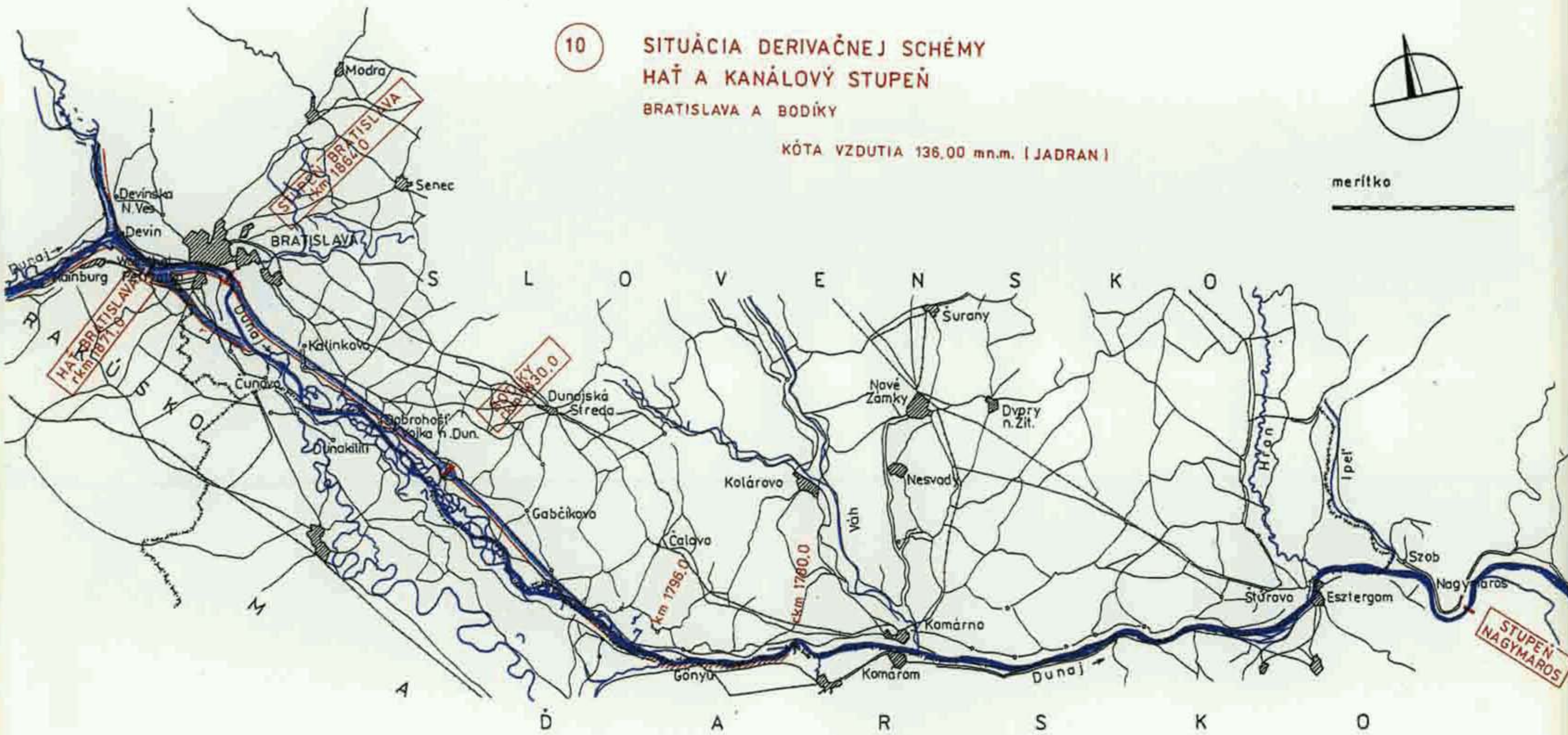
(9) SITUÁCIA DERIVAČNEJ SCHÉMY
HAŤ BRATISLAVA, KANÁLOVÝ STUPEŇ DOBROHOŠŤ A ČIČOV
PREBAGROVANIE KORYTA PO ZLATNÚ

KÓTA VZDUTIA 136,50 mn.m. (JADRAN)



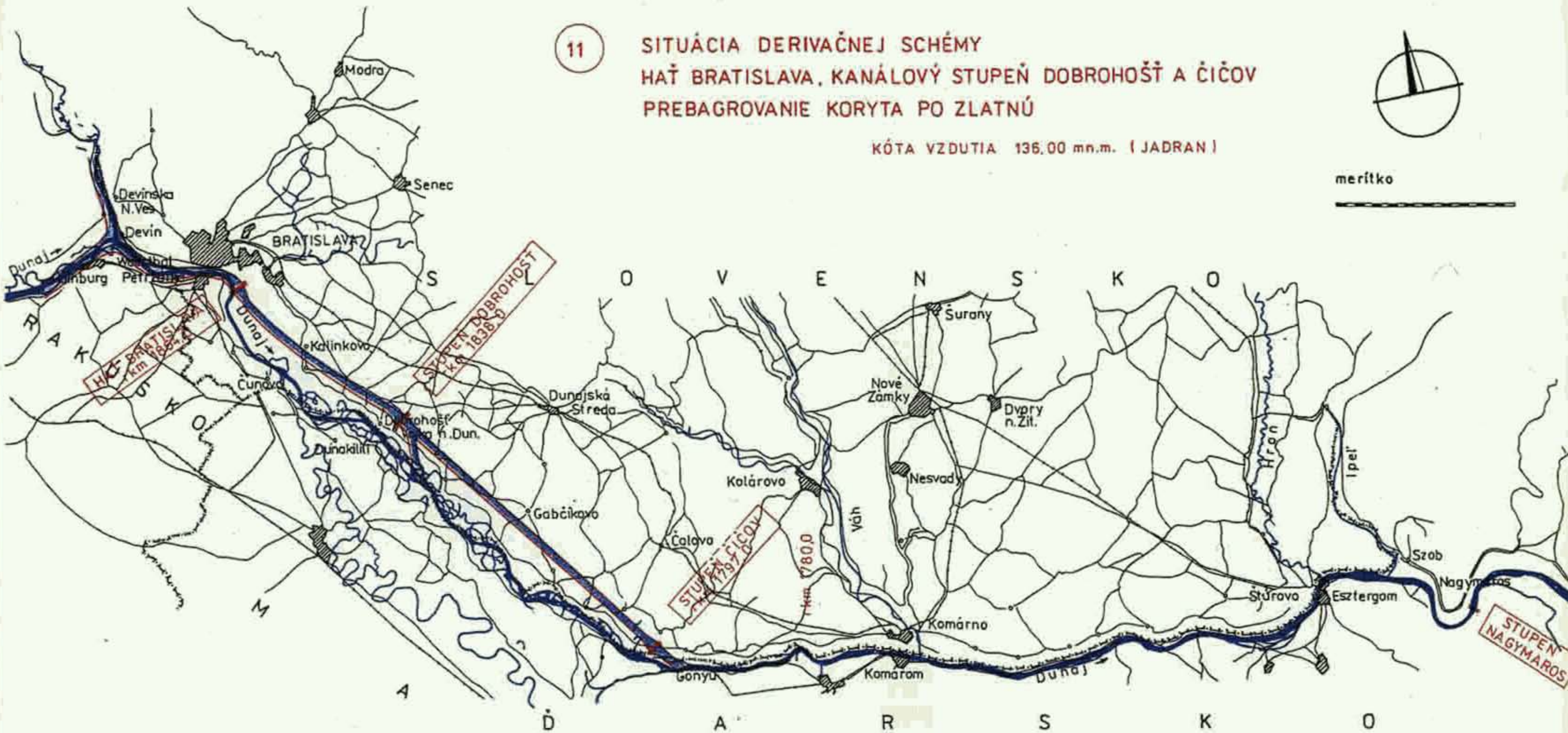
(10) SITUÁCIA DERIVAČNEJ SCHÉMY
HAŤ A KANÁLOVÝ STUPEŇ
BRATISLAVA A BODÍKY

KÓTA VZDUTIA 136,00 mn.m. (JADRAN)



(11) SITUÁCIA DERIVAČNEJ SCHÉMY
HAŤ BRATISLAVA, KANÁLOVÝ STUPEŇ DOBROHOŠŤ A ČIČOV
PREBAGROVANIE KORYTA PO ZLATNÚ

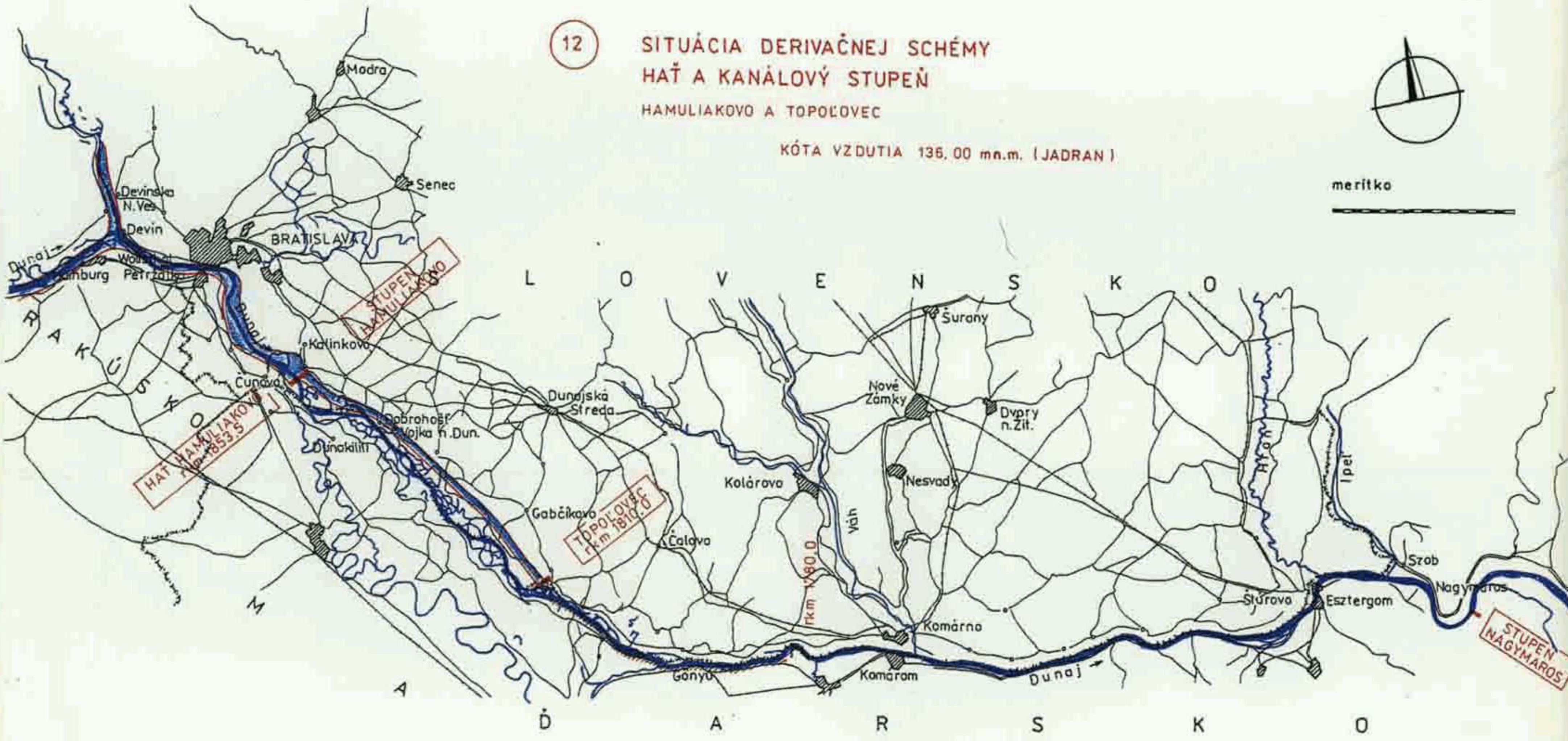
KÓTA VZDUTIA 136,00 mn.m. (JADRAN)



4'6

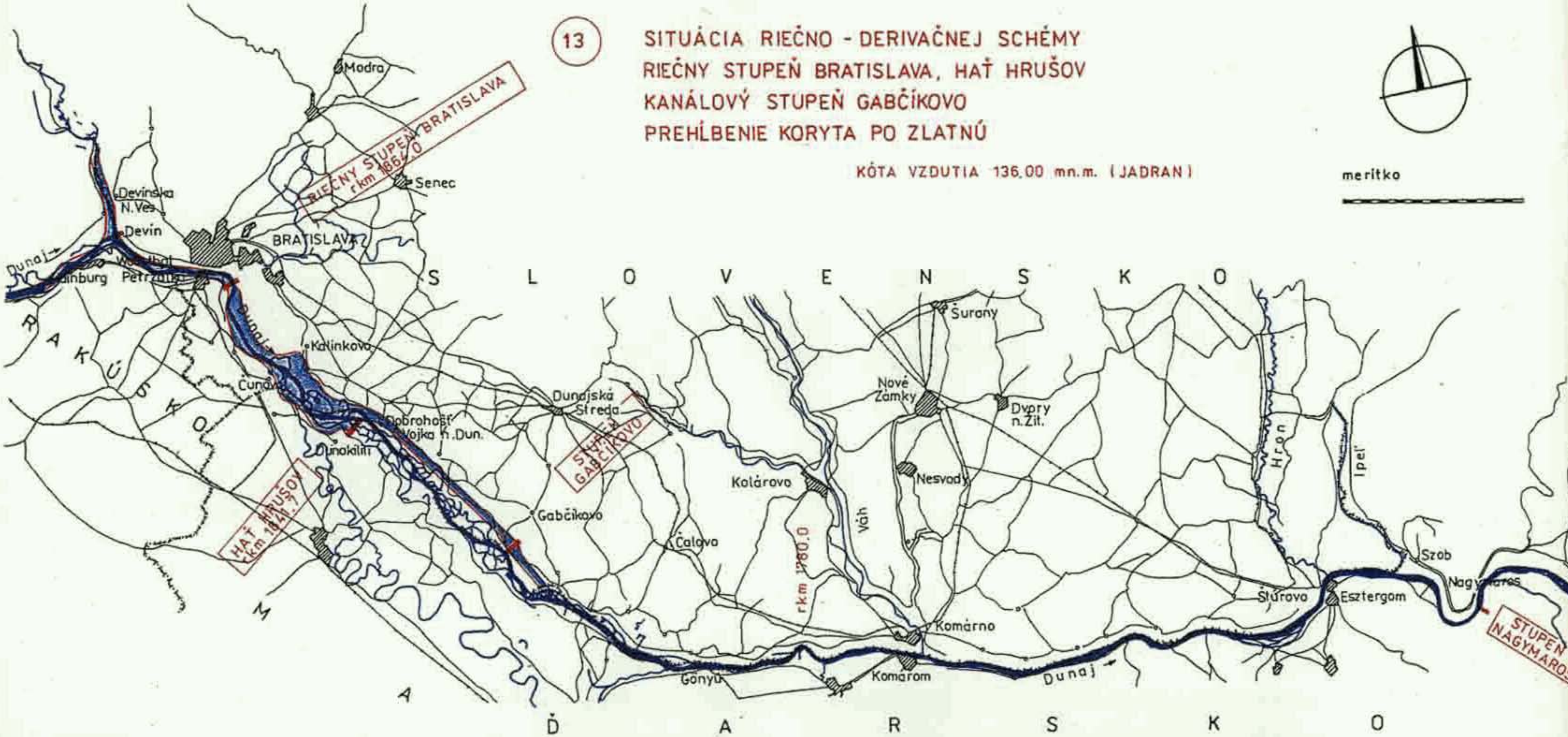
12 SITUÁCIA DERIVAČNEJ SCHÉMY
HAŤ A KANÁLOVÝ STUPEŇ
HAMULIAKOVO A TOPOĽOVEC

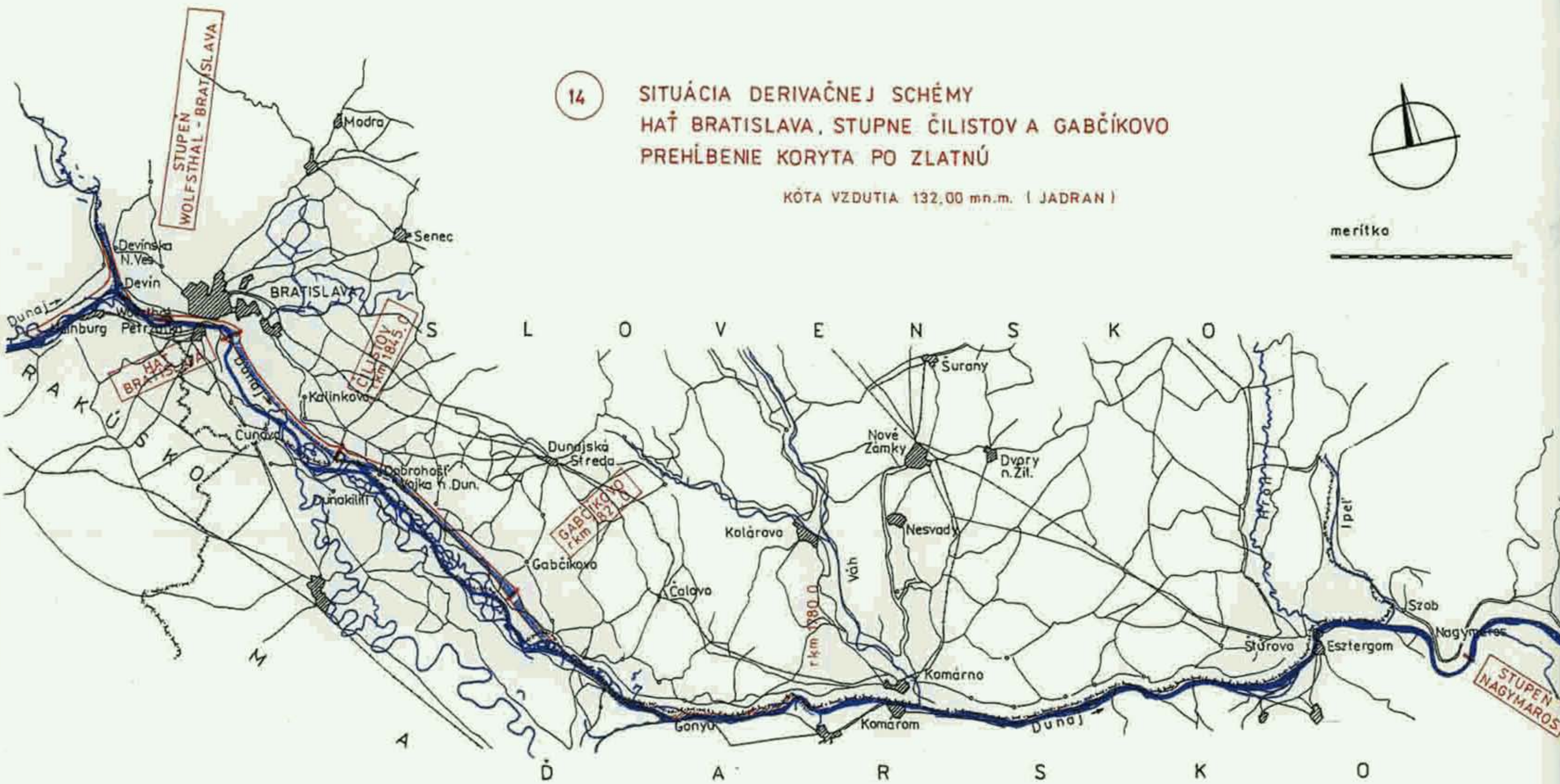
KÓTA VZDUTIA 136,00 m.n.m. (JADRAN)



(13) SITUÁCIA RIEČNO - DERIVAČNEJ SCHÉMY
RIEČNY STUPEŇ BRATISLAVA, HAŤ HRUŠOV
KANÁLOVÝ STUPEŇ GABČÍKOVO
PREHĹBENIE KORYTA PO ZLATNÚ

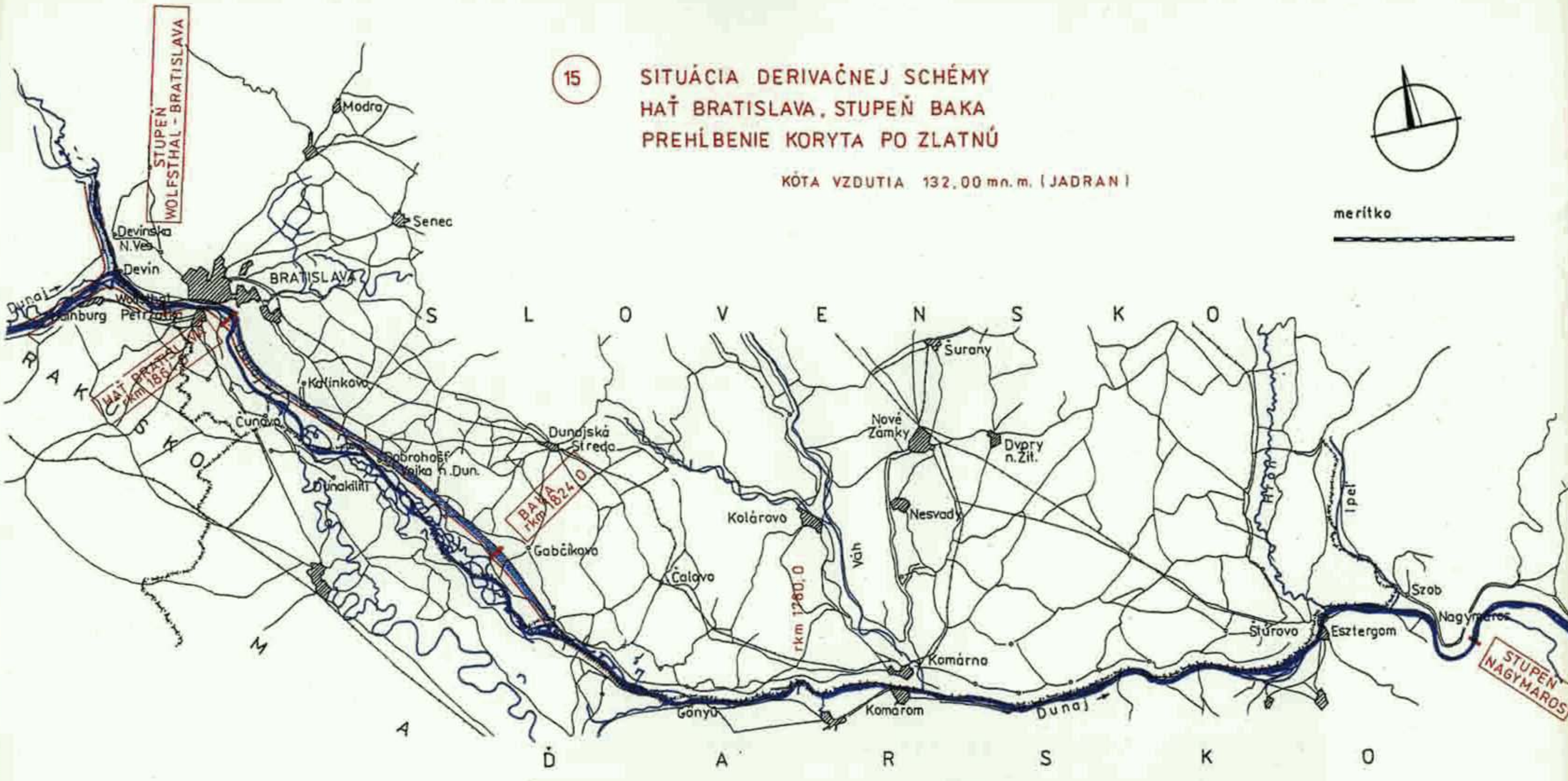
KÓTA VZDUTIA 136,00 mn.m. (JADRAN)




14
SITUÁCIA DERIVAČNEJ SCHÉMY
HAŤ BRATISLAVA, STUPNE ČILISTOV A GABČÍKOVO
PREHĹBENIE KORYTA PO ZLATNÚ
KÓTA VZDUTIA 132,00 mn.m. (JADRAN)
merítko
STUPEŇ WOLFSTHAL - BRATISLAVA
HAŤ BRATISLAVA
ČILISTOV rkm 1845,0
GABČÍKOVO rkm 1821,0
rkm 1780,0
STUPEŇ NAGYMAROS
S L O V E N S K O
R A K Ú S K O
M A Ď A R S K O
Dunaj
Devínska N. Ves
Devín
Petržalka
BRATISLAVA
Modra
Senec
Kalinkovo
Čunovo
Dobrohošť
Vojka n. Dun.
Dunakiliti
Dunajská Streda
Gabčíkovo
Čalovo
Kolárovo
Váh
Nové Zámky
Šurany
Dvory n. Žit.
Nesvady
Komárno
Komárom
Gönyü
Hron
Ipeľ
Štúrovo
Esztergom
Szob
Nagymaros

15 SITUÁCIA DERIVAČNEJ SCHÉMY
HAŤ BRATISLAVA, STUPEŇ BAKA
PREHĹBENIE KORYTA PO ZLATNÚ

KÓTA VZDUTIA 132,00 mn.m. (JADRAN)



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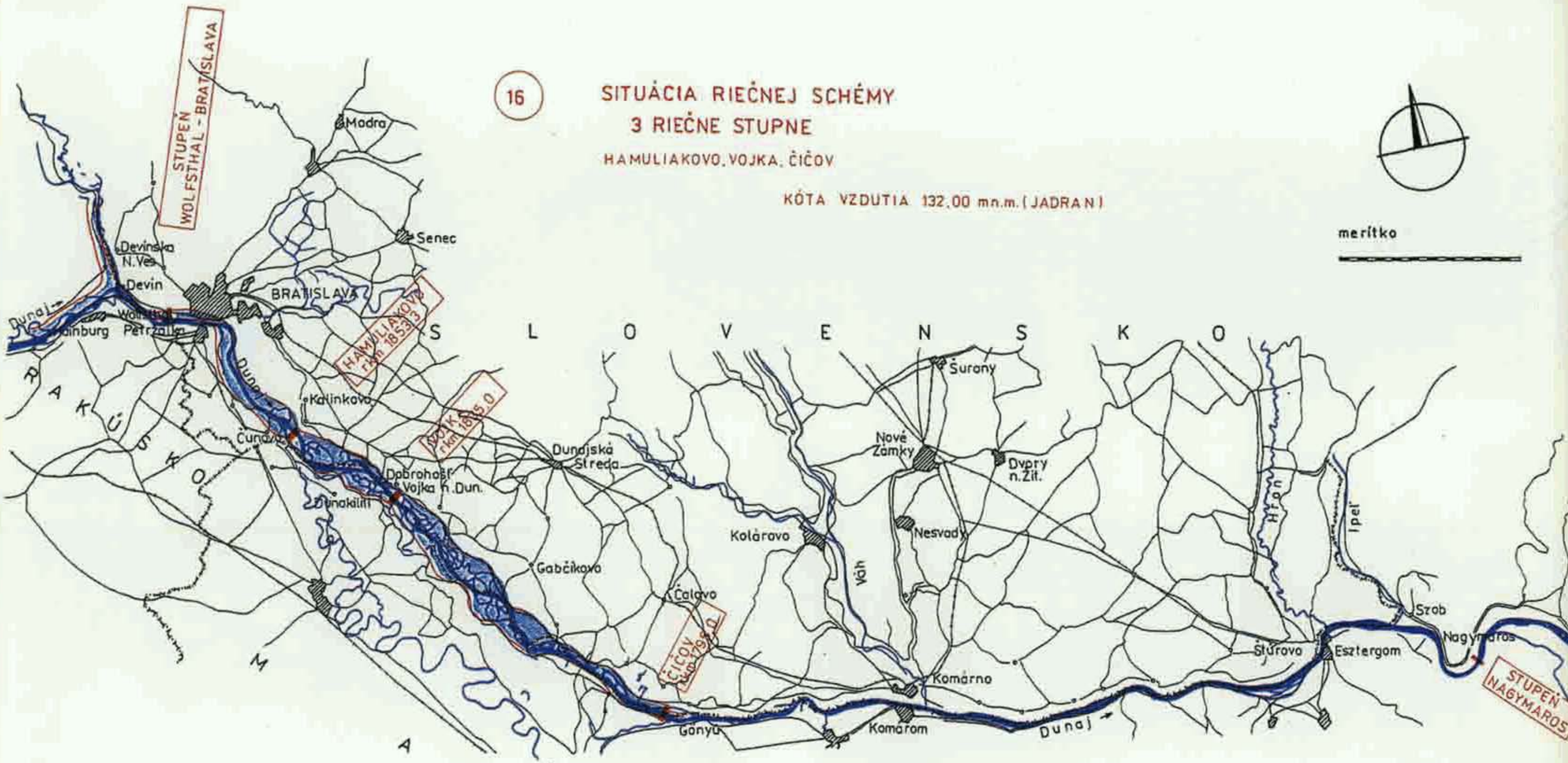
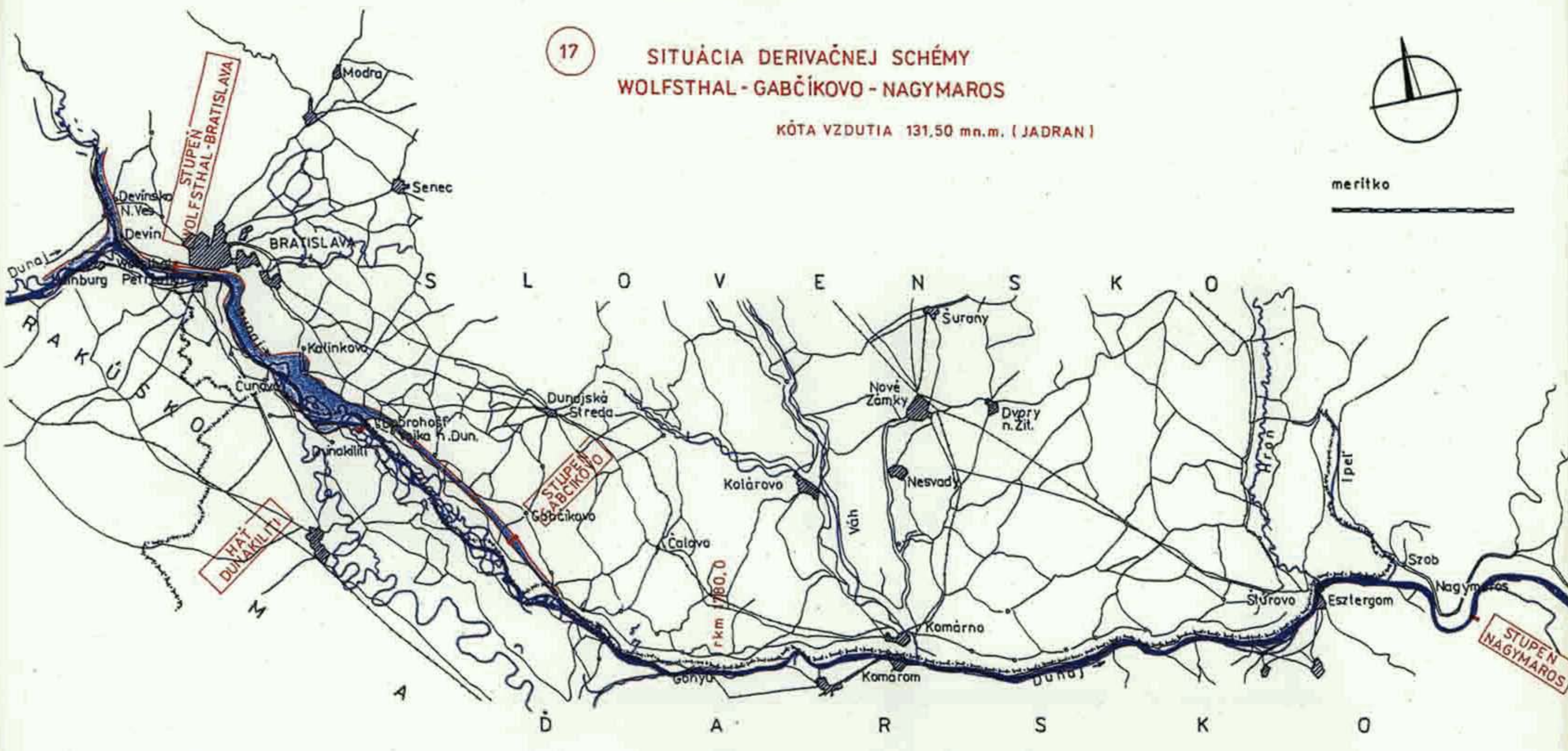
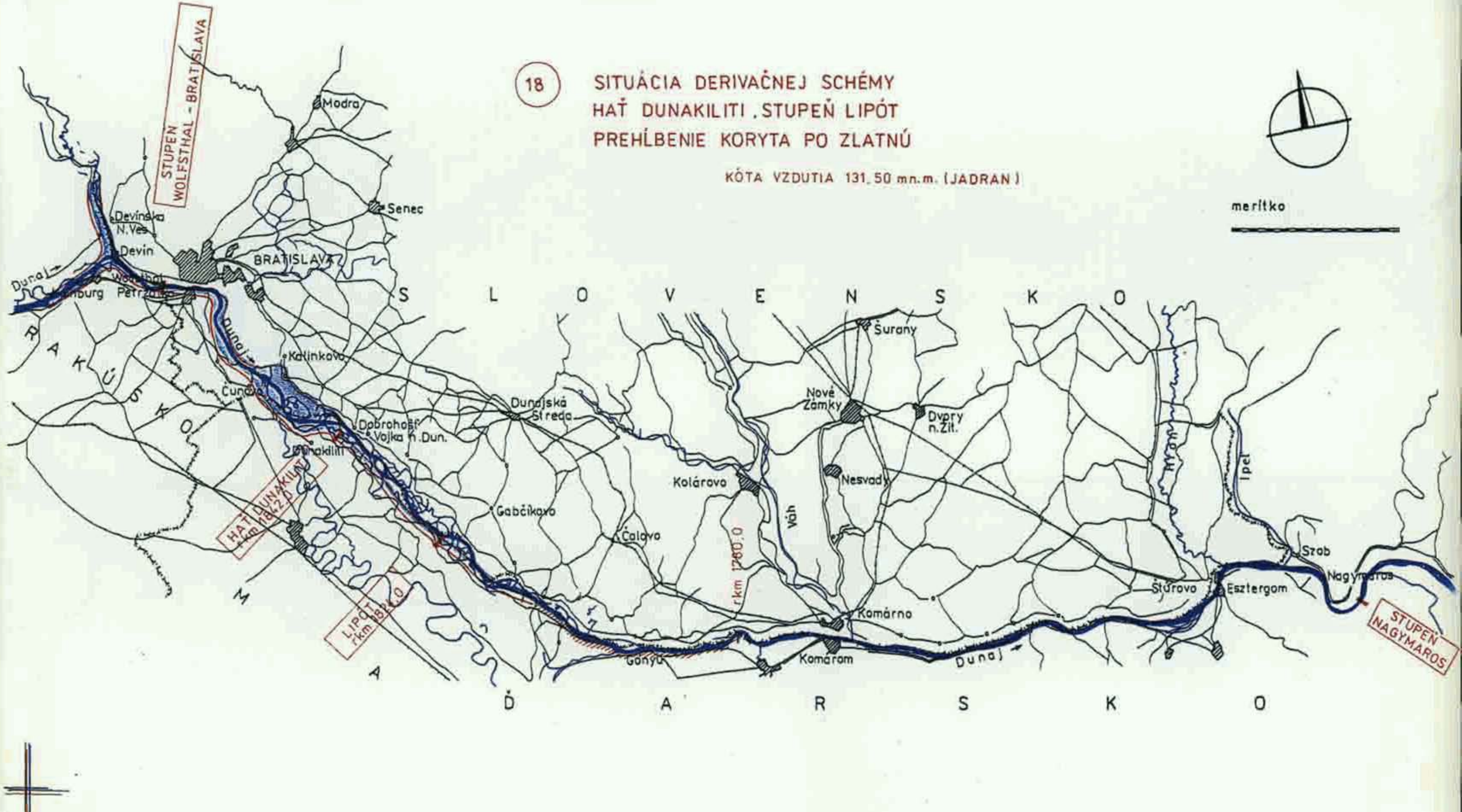

16
SITUÁCIA RIEČNEJ SCHÉMY
3 RIEČNE STUPNE
HAMULIAKOVO, VOJKA, ČIČOV
KÓTA VZDUTIA 132,00 mn.m. (JADRAN)
mierka
STUPEŇ WOLFSTHAL - BRATISLAVA
HAMULIAKOVO rkm 1853,3
VOJKA rkm 1835,0
ČIČOV rkm 1798,0
STUPEŇ NAGYMAROS
SLOVENSKO
RAKÚSKO
MAĎARSKO
Dunaj
Váh
Hron
Ipeľ
Madra
Senec
Devínska N. Ves
Devín
BRATISLAVA
Petržalka
Kalinkovo
Čunovo
Dunakiliti
Dobrohošť
Vojka n. Dun.
Dunajská Streda
Gabčíkovo
Čalovo
Kolárovo
Nové Zámky
Šurany
Dvory n. Žit.
Nesvady
Komárno
Komárom
Gönyü
Štúrovo
Esztergom
Szob
Nagymaros


17
SITUÁCIA DERIVAČNEJ SCHÉMY
WOLFSTHAL - GABČÍKOVO - NAGYMAROS
KÓTA VZDUTIA 131,50 mn.m. (JADRAN)
meritko
SLOVENSKO
MAĎARSKO
RAKÚSKO
STUPEŇ WOLFSTHAL-BRATISLAVA
STUPEŇ GABČÍKOVO
HÁŤ DUNAKILITI
STUPEŇ NAGYMAROS
rkm 1780,0
Dunaj
Modra
Senec
Devínska N. Ves
Devín
BRATISLAVA
Petržalka
Kalinkovo
Čunovo
Dunakiliti
Dunajská Streda
Gabčíkovo
Čalovo
Kolárovo
Váh
Nové Zámky
Šurany
Dvory n. Žit.
Nesvady
Komárno
Komárom
Gönyü
Hron
Ipeľ
Štúrovo
Esztergom
Szob
Nagymaros

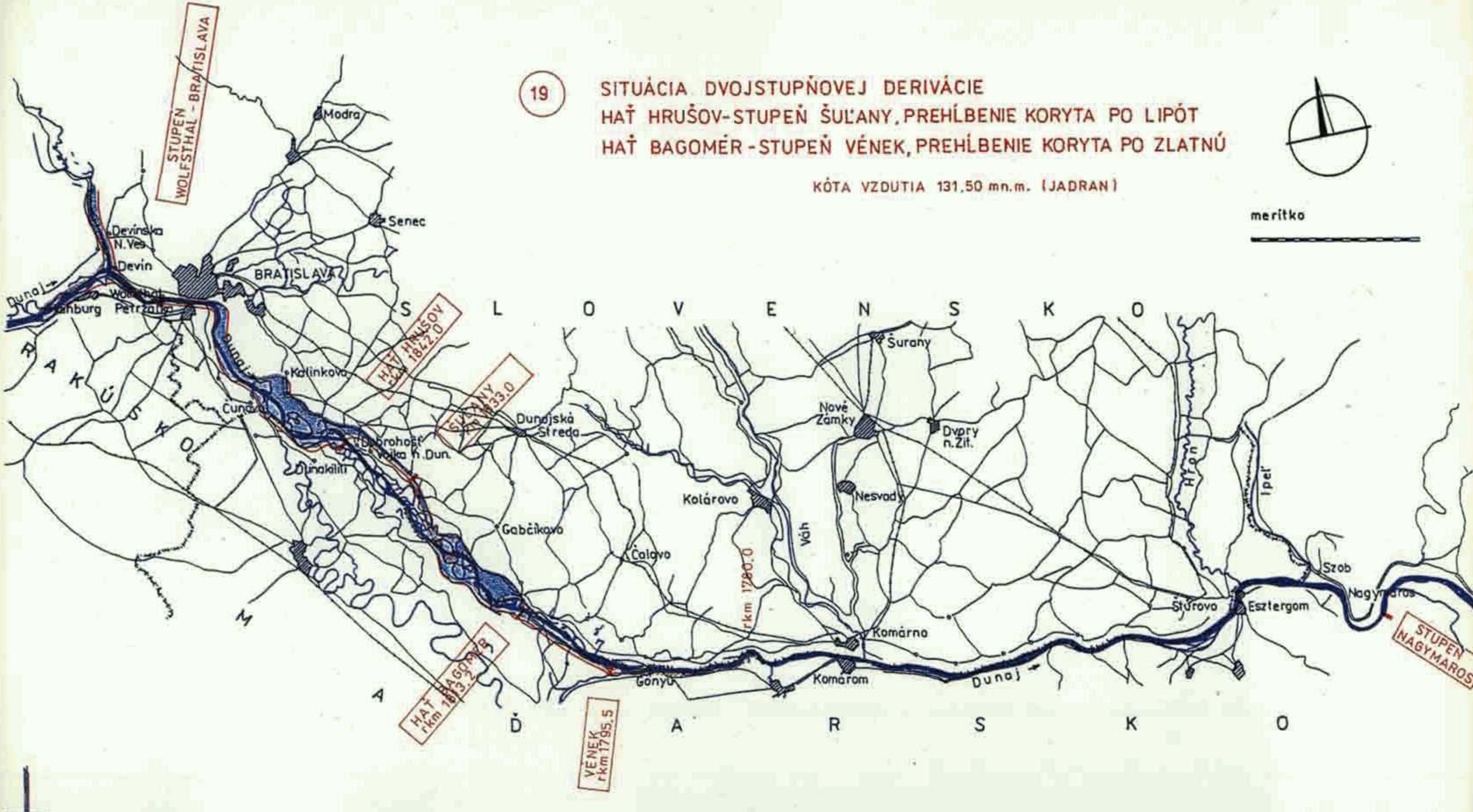
(18) SITUÁCIA DERIVAČNEJ SCHÉMY
HAŤ DUNAKILITI , STUPEŇ LIPÓT
PREHĹBENIE KORYTA PO ZLATNÚ

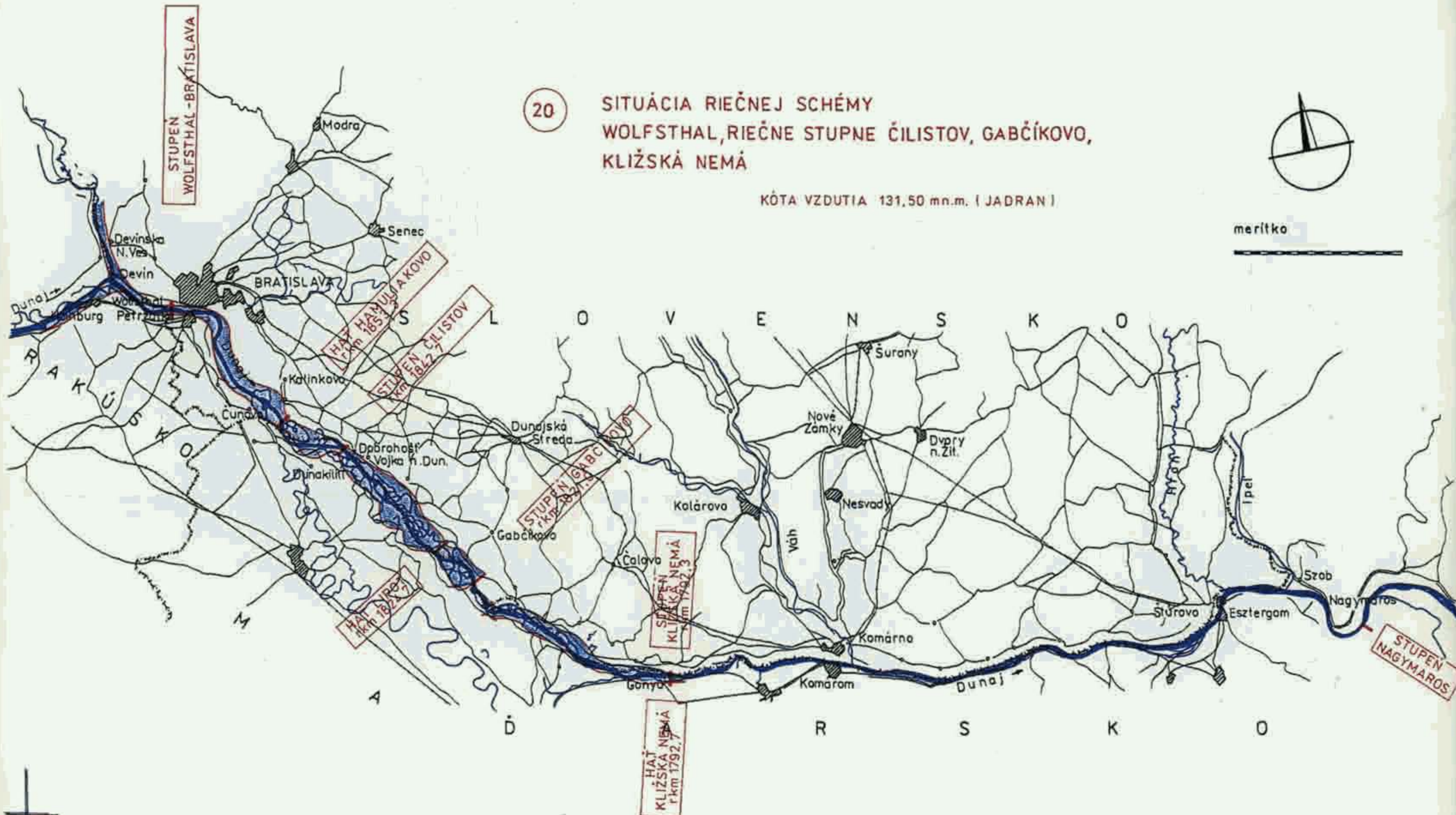
KÓTA VZDUTIA 131, 50 mn.m. (JADRAN)



(19) SITUÁCIA DVOJSTUPŇOVEJ DERIVÁCIE
HAŤ HRUŠOV-STUPEŇ ŠUĽANY, PREHĹBENIE KORYTA PO LIPÓT
HAŤ BAGOMÉR-STUPEŇ VÉNEK, PREHĹBENIE KORYTA PO ZLATNÚ

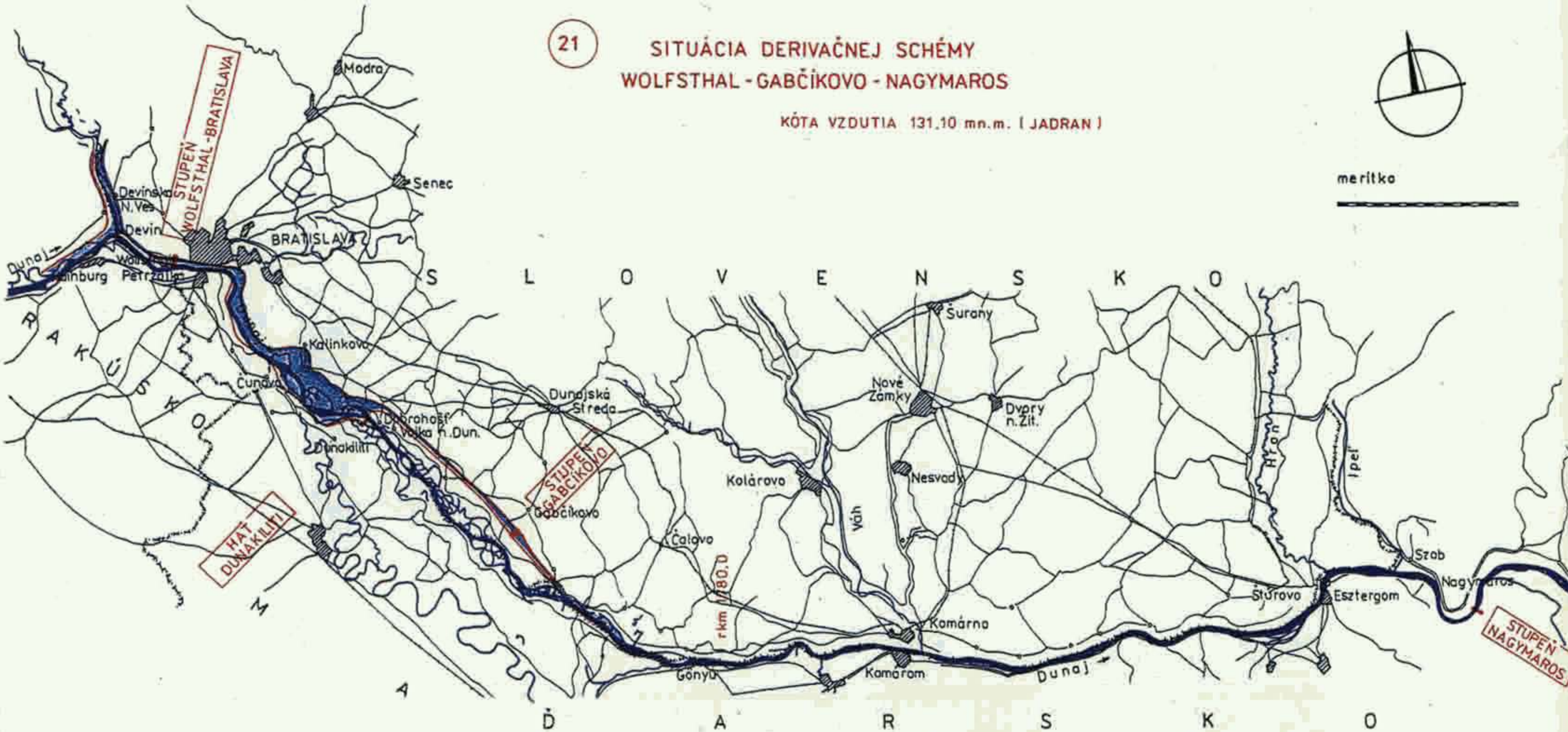
KÓTA VZDUTIA 131,50 mn.m. (JADRAN)




20
SITUÁCIA RIEČNEJ SCHÉMY
WOLFSTHAL, RIEČNE STUPNE ČILISTOV, GABČÍKOVO,
KLIŽSKÁ NEMÁ
KÓTA VZDUTIA 131,50 mn.m. (JADRAN)
meritko
STUPEŇ WOLFSTHAL-BRATISLAVA
STUPEŇ ČILISTOV r.km 1842,7
STUPEŇ KLIŽSKÁ NEMÁ r.km 1792,3
HAŤ KLIŽSKÁ NEMÁ r.km 1792,7
STUPEŇ NAGYMAROS
S L O V E N S K O
R A K Ú S K O
M A Ď A R S K O
Dunaj
Váh
Hron
Ipeľ
Modra
Senec
Devínska N. Ves
Devín
BRATISLAVA
Petržalka
Kalinkovo
Čuňovo
Dobrohošť
Vojka n. Dun.
Dunakiliti
Dunajská Streda
Gabčíkovo
Čalovo
Kolárovo
Nové Zámky
Šurany
Dvory n. Žit.
Nesvady
Komárno
Komárom
Gönyü
Štúrovo
Esztergom
Szob
Nagymaros

(21) SITUÁCIA DERIVAČNEJ SCHÉMY WOLFSTHAL - GABČÍKOVO - NAGYMAROS

KÓTA VZDUTIA 131,10 mn.m. (JADRAN)

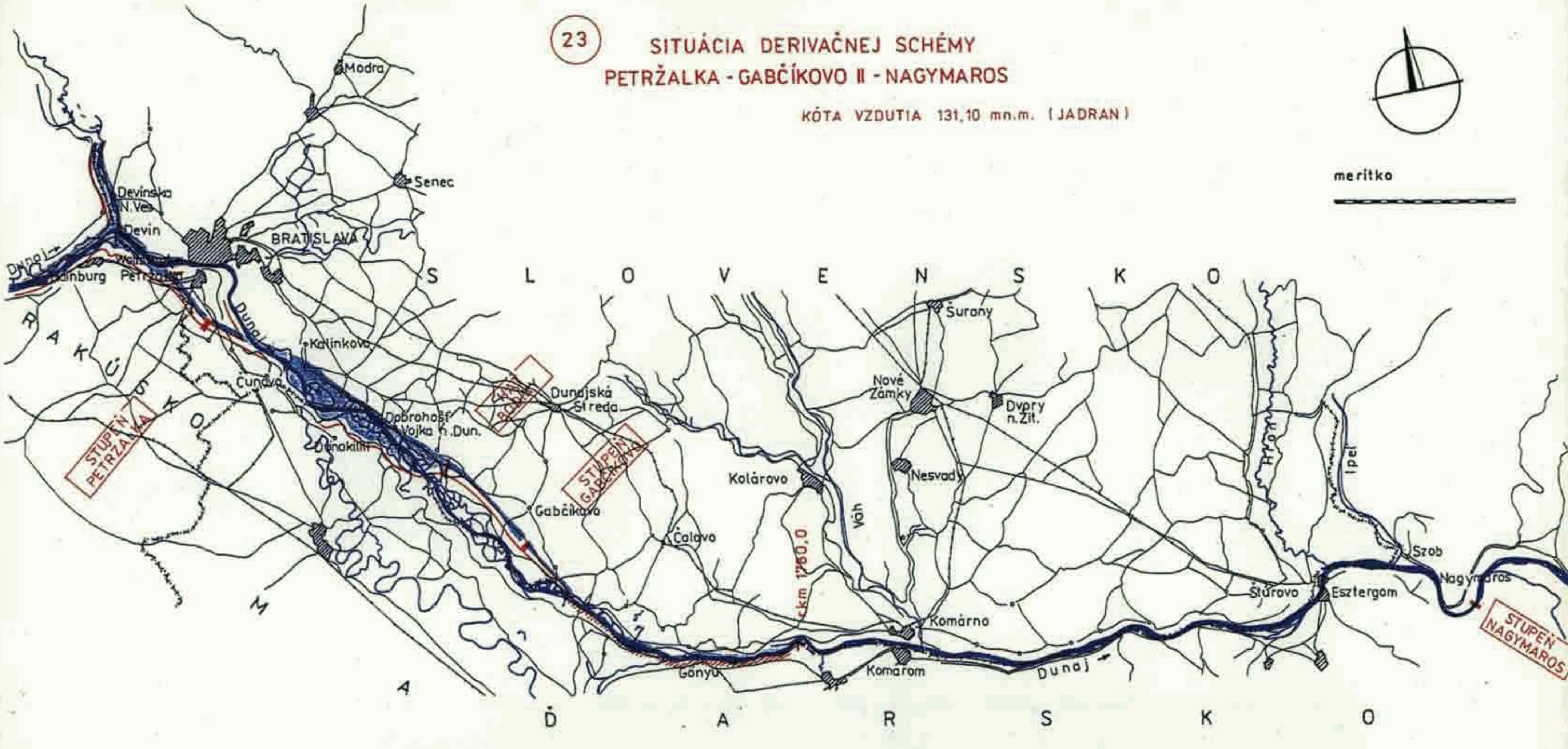


22 SITUÁCIA RIEČNEJ SCHÉMY
WOLFSTHAL - VOJKA - DUNASZEG - NAGYMAROS

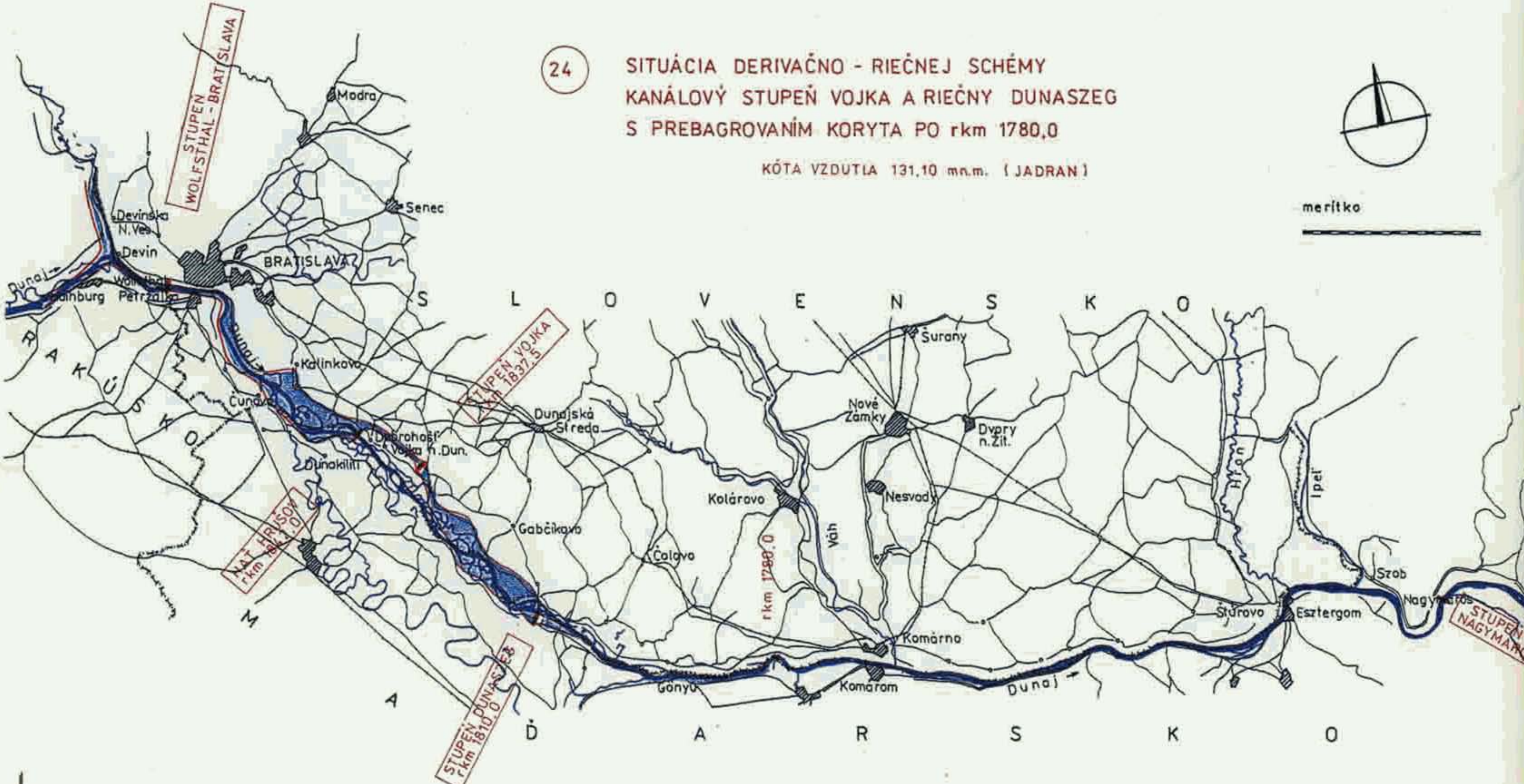
KÓTA VZDUTIA 131,10 mn.m. (JADRAN)

23 SITUÁCIA DERIVAČNEJ SCHÉMY PETRŽALKA - GABČÍKOVO II - NAGYMAROS

KÓTA VZDUTIA 131,10 mn.m. (JADRAN)



427

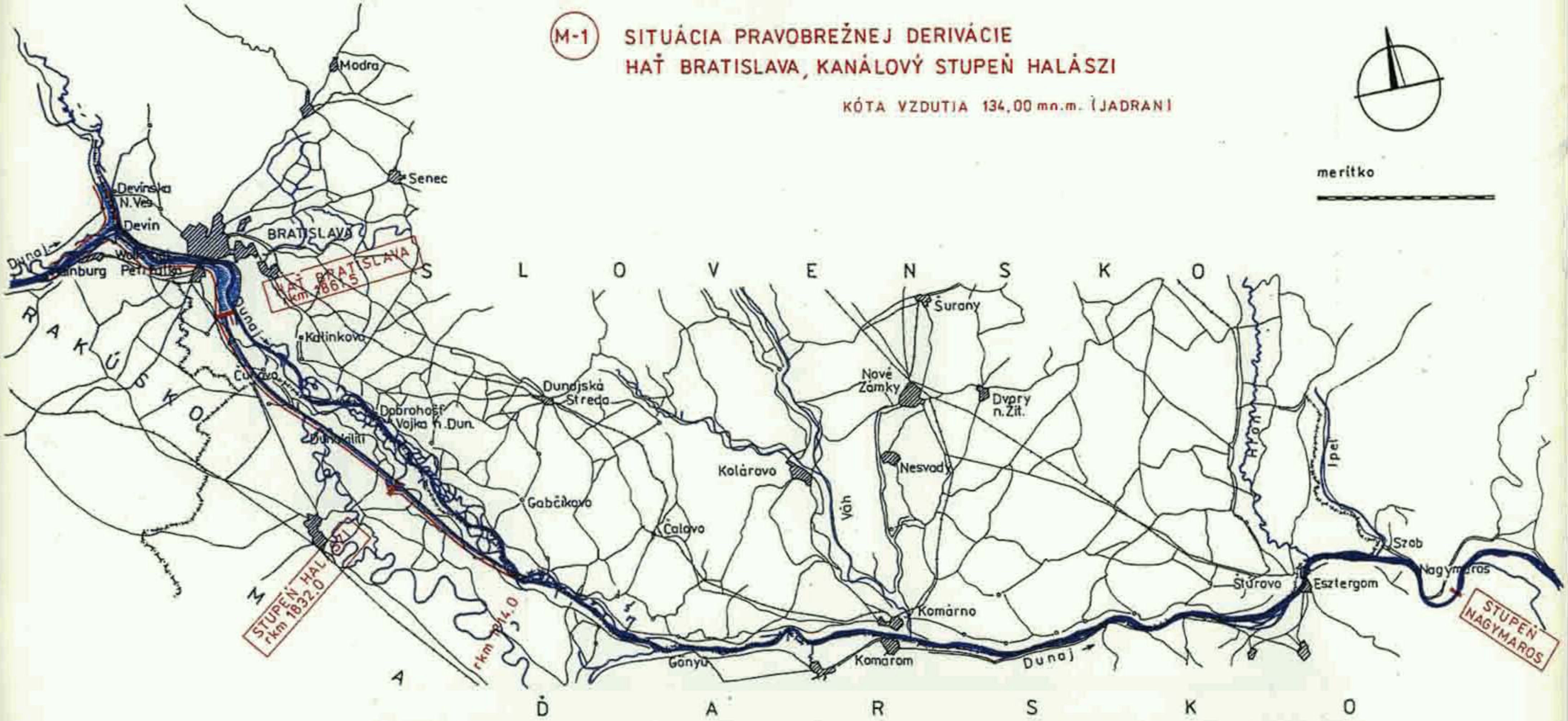


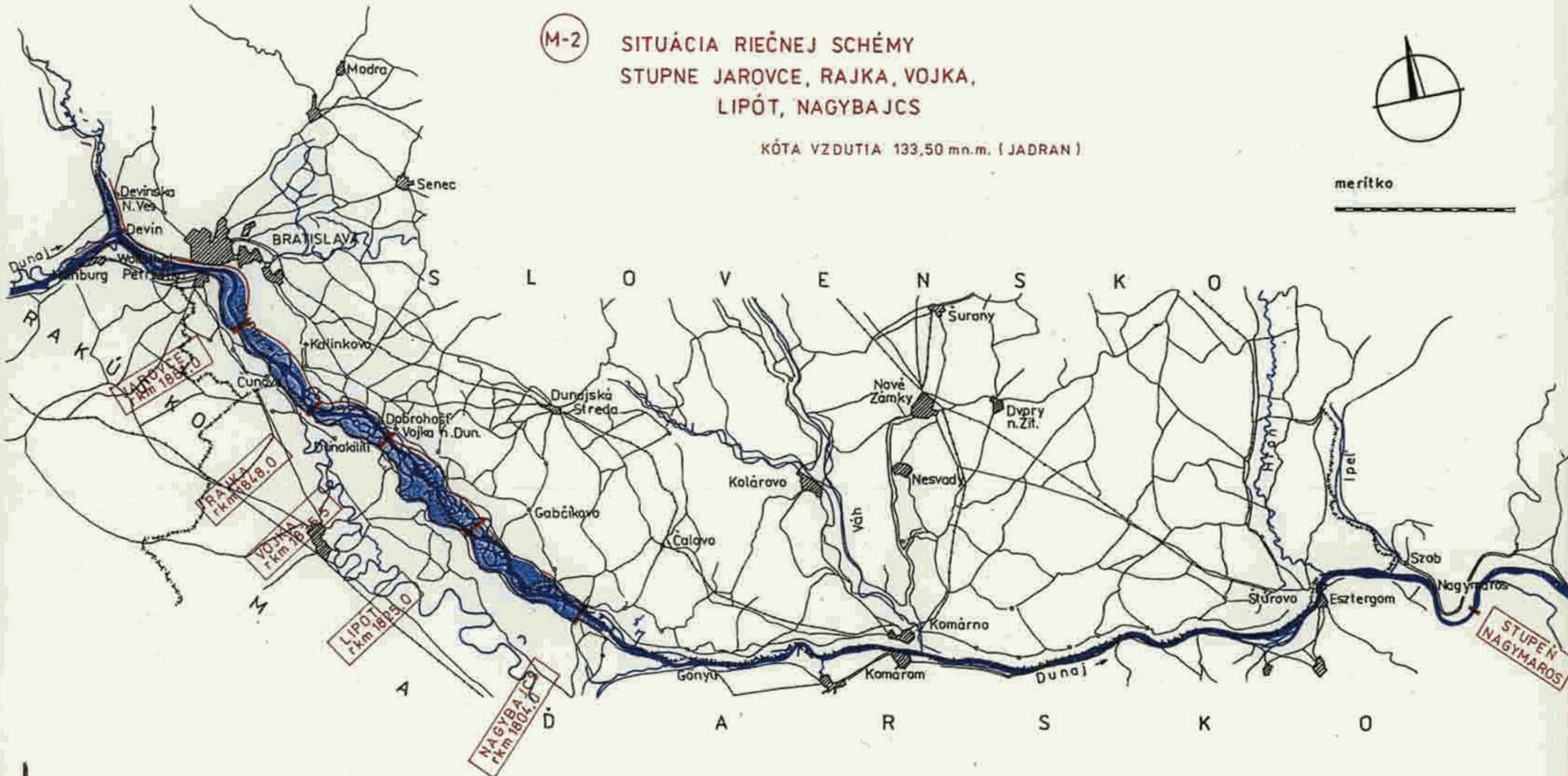
(24) SITUÁCIA DERIVAČNO - RIEČNEJ SCHÉMY
KANÁLOVÝ STUPEŇ VOJKA A RIEČNY DUNASZEG
S PREBAGROVANÍM KORYTA PO rkm 1780,0

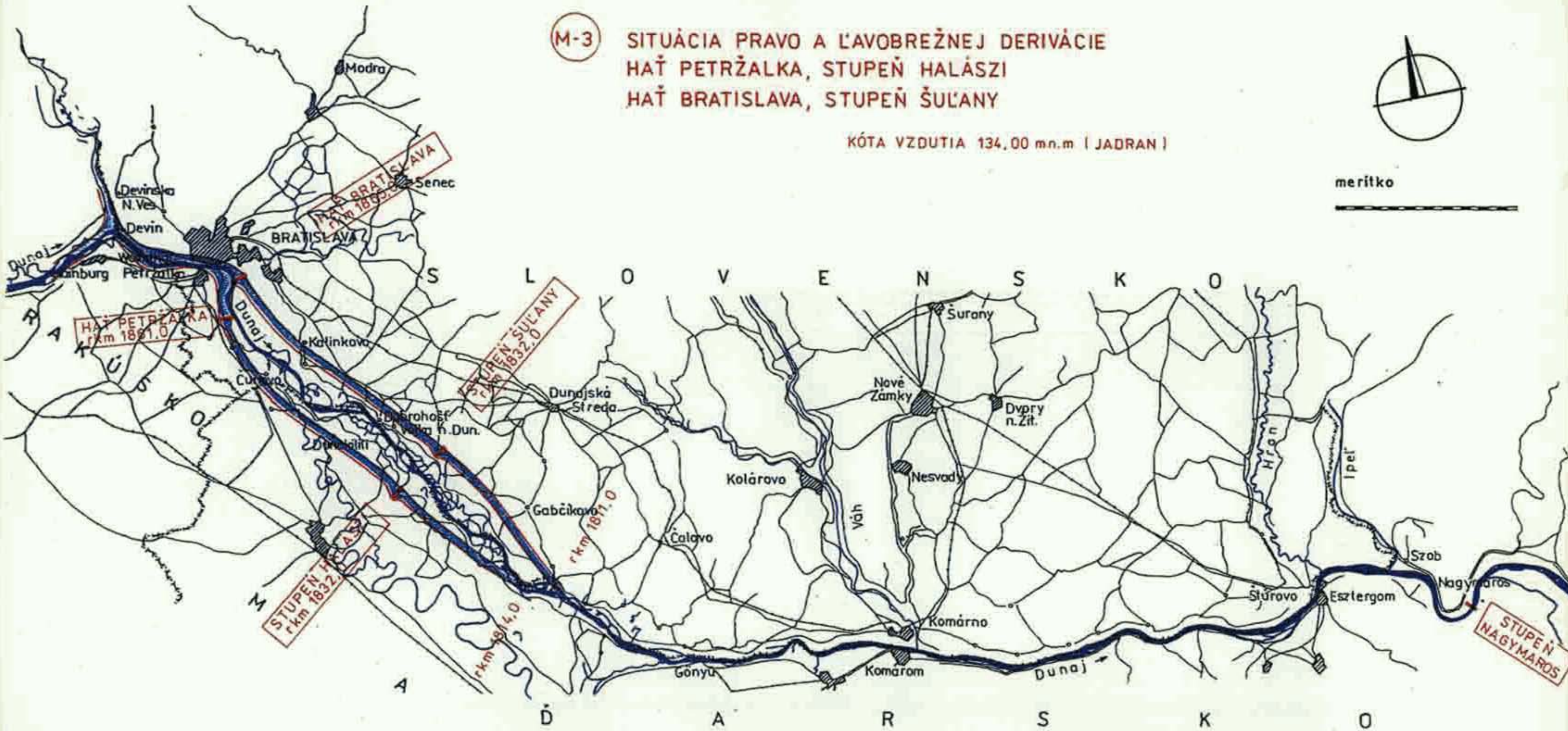
KÓTA VZDUTIA 131,10 m n.m. (JADRAN)

M-1 SITUÁCIA PRAVOBREŽNEJ DERIVÁCIE
HAŤ BRATISLAVA, KANÁLOVÝ STUPEŇ HALÁSZI

KÓTA VZDUTIA 134,00 m n.m. (JADRAN)




M-2
SITUÁCIA RIEČNEJ SCHÉMY
STUPNE JAROVCE, RAJKA, VOJKA,
LIPÓT, NAGYBAJCS
KÓTA VZDUTIA 133,50 mn.m. (JADRAN)
meritko
SLOVENSKO
RAKÚSKO
MAĎARSKO
Modra
Senec
Devinska N. Ves
Devin
BRATISLAVA
Dunaj
Kalinkovo
Čuňovo
Dunajská Streda
Dobrohošť
Vojka n. Dun.
Dunakiliti
RAJKA rkm 1848.0
LIPÓT rkm 1825.0
NAGYBAJCS rkm 1804.0
Gabčíkovo
Čalovo
Kolárovo
Váh
Nové Zámky
Šurany
Dvory n. Žit.
Nesvady
Komárno
Komárom
Gönyü
Hron
Ipeľ
Štúrovo
Esztergom
Szob
Nagymaros
STUPEŇ NAGYMAROS



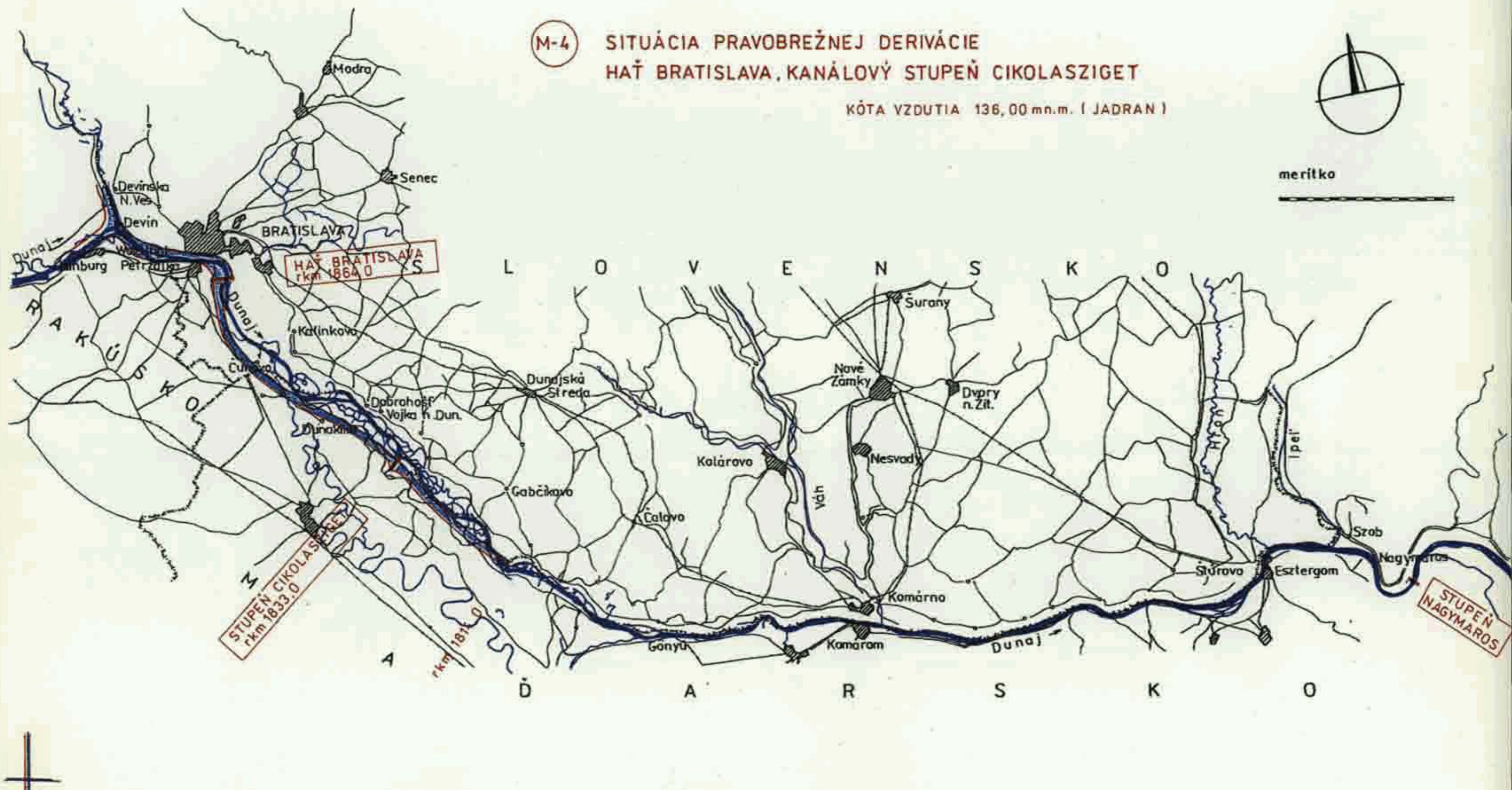
M-3 SITUÁCIA PRAVO A ĽAVOBREŽNEJ DERIVÁCIE
HAŤ PETRŽALKA, STUPEŇ HALÁSZI
HAŤ BRATISLAVA, STUPEŇ ŠUĽANY

KÓTA VZDUTIA 134,00 mn.m (JADRAN)

437

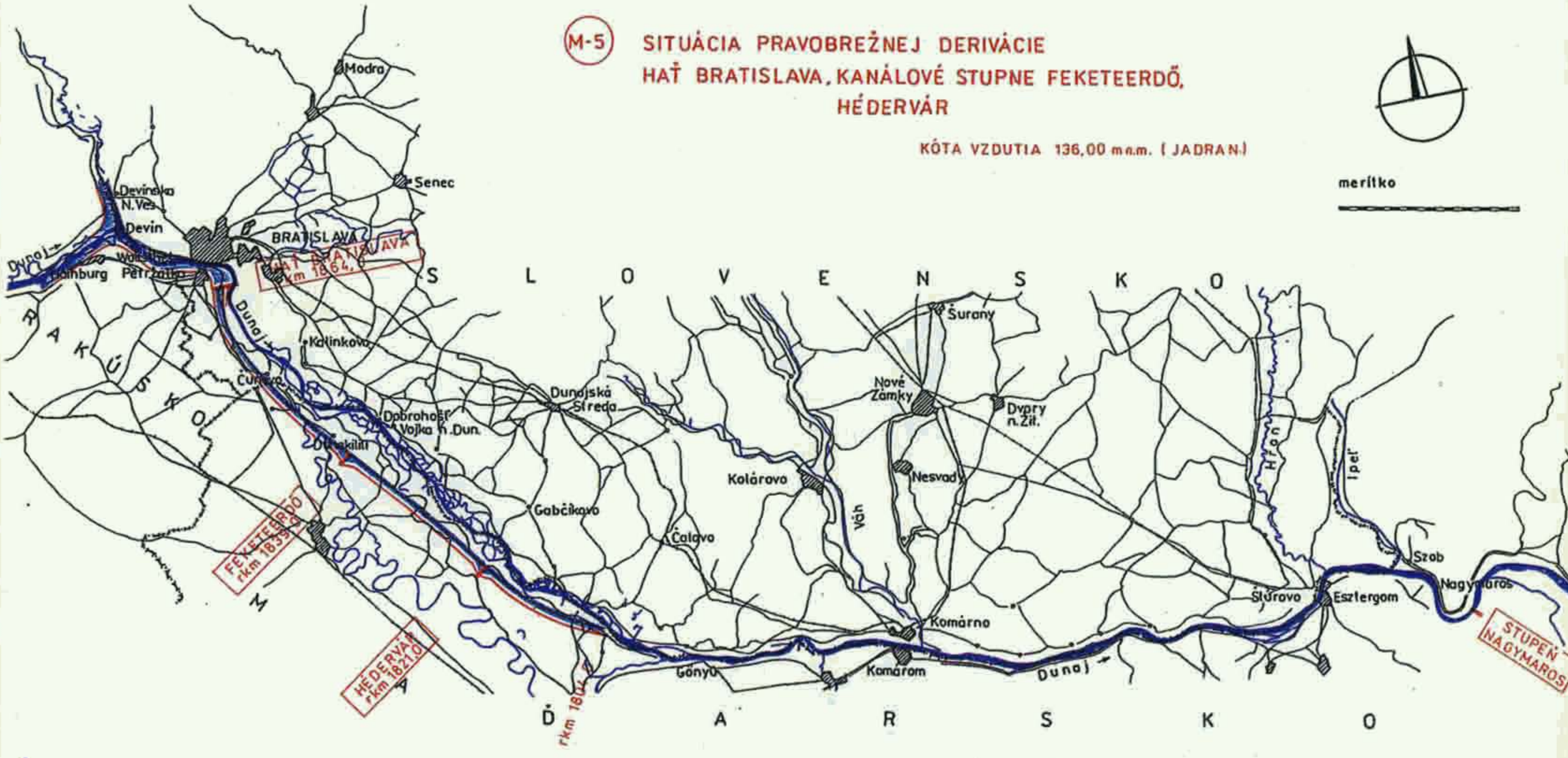
M-4 SITUÁCIA PRAVOBREŽNEJ DERIVÁCIE
HAŤ BRATISLAVA, KANÁLOVÝ STUPEŇ CIKOLASZIGET

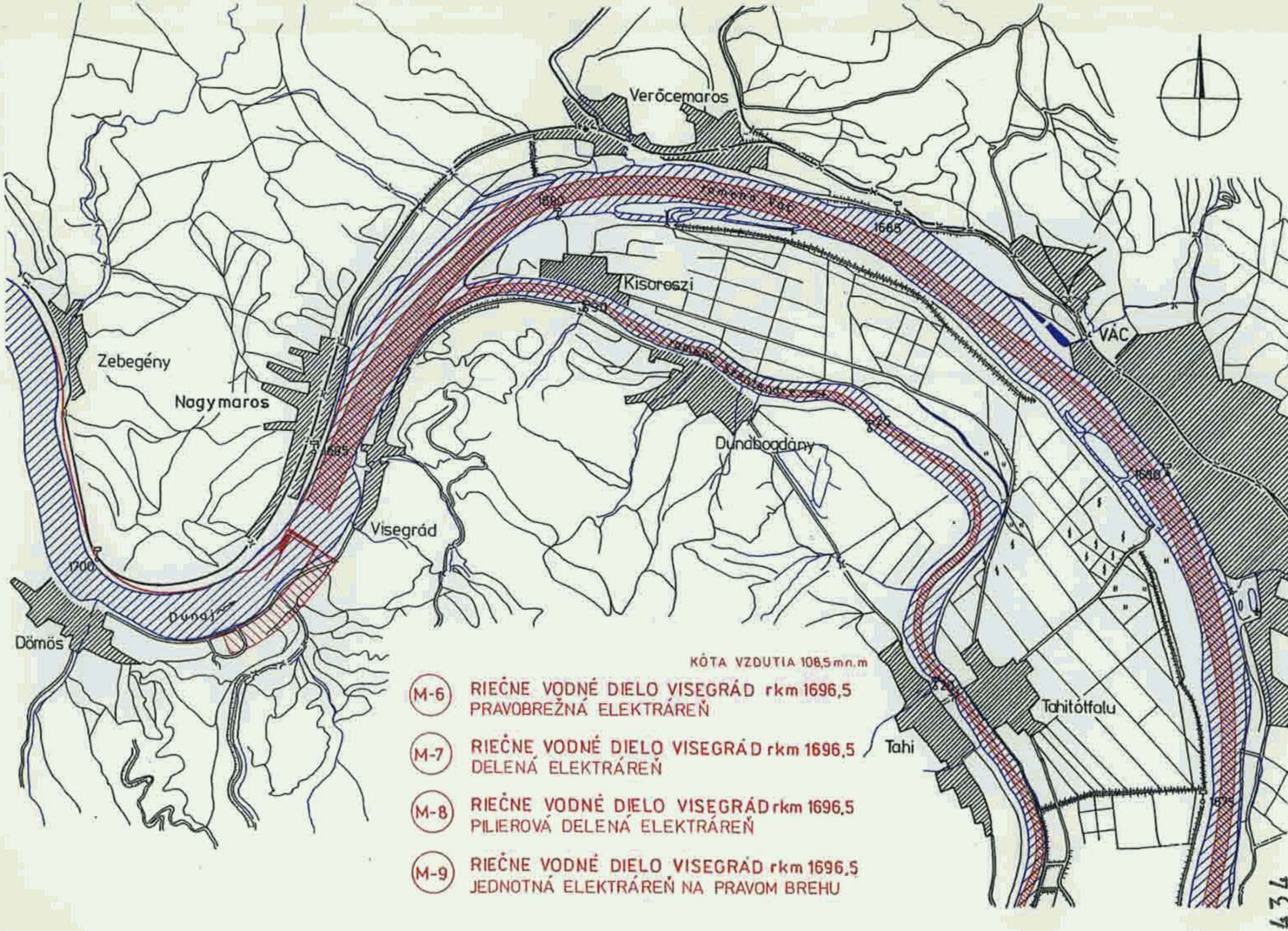
KÓTA VZDUTIA 136,00 mn.m. (JADRAN)



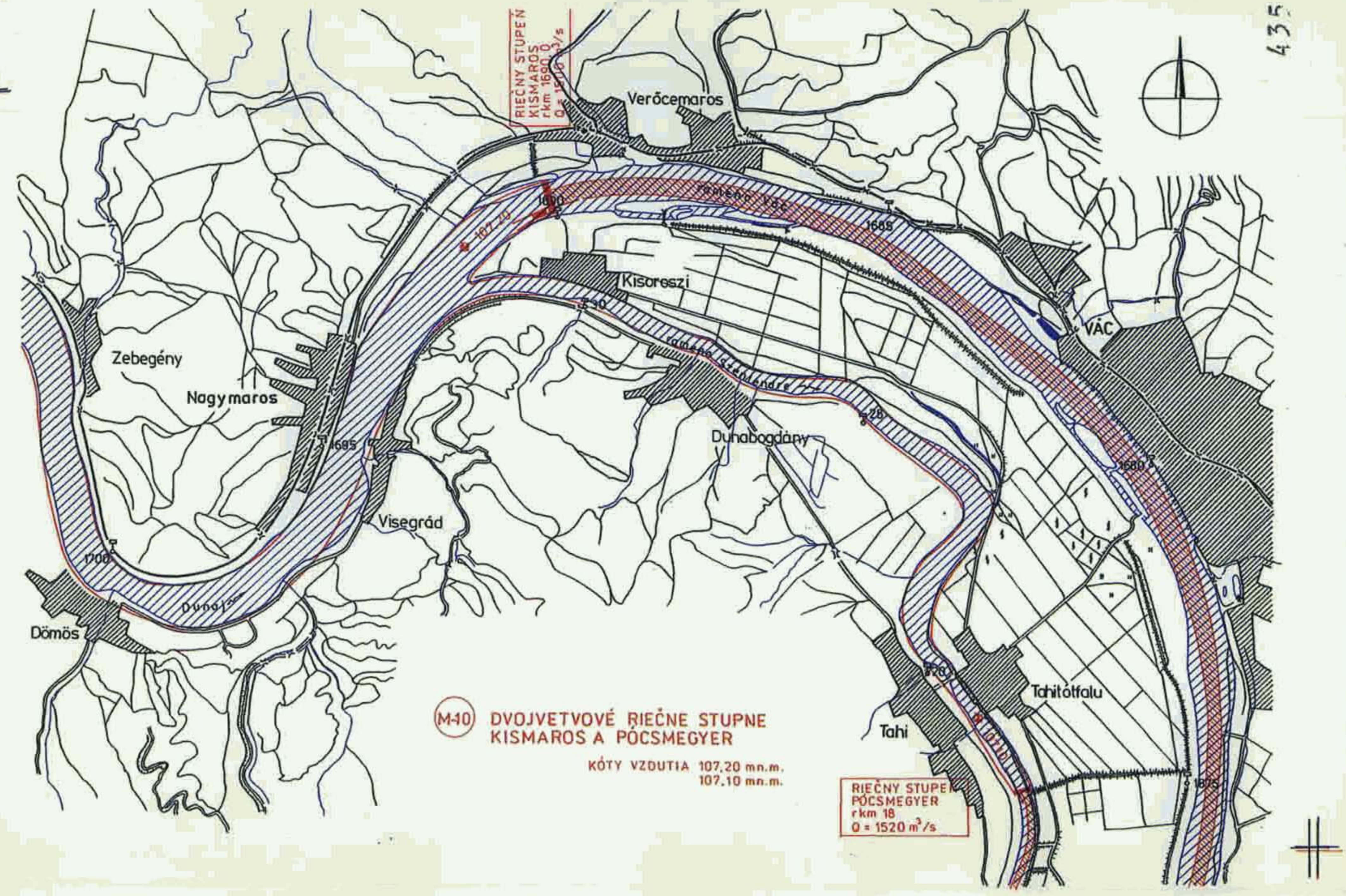
M-5 SITUÁCIA PRAVOBREŽNEJ DERIVÁCIE
HAŤ BRATISLAVA, KANÁLOVÉ STUPNE FEKETEERDŐ, HÉDERVÁR

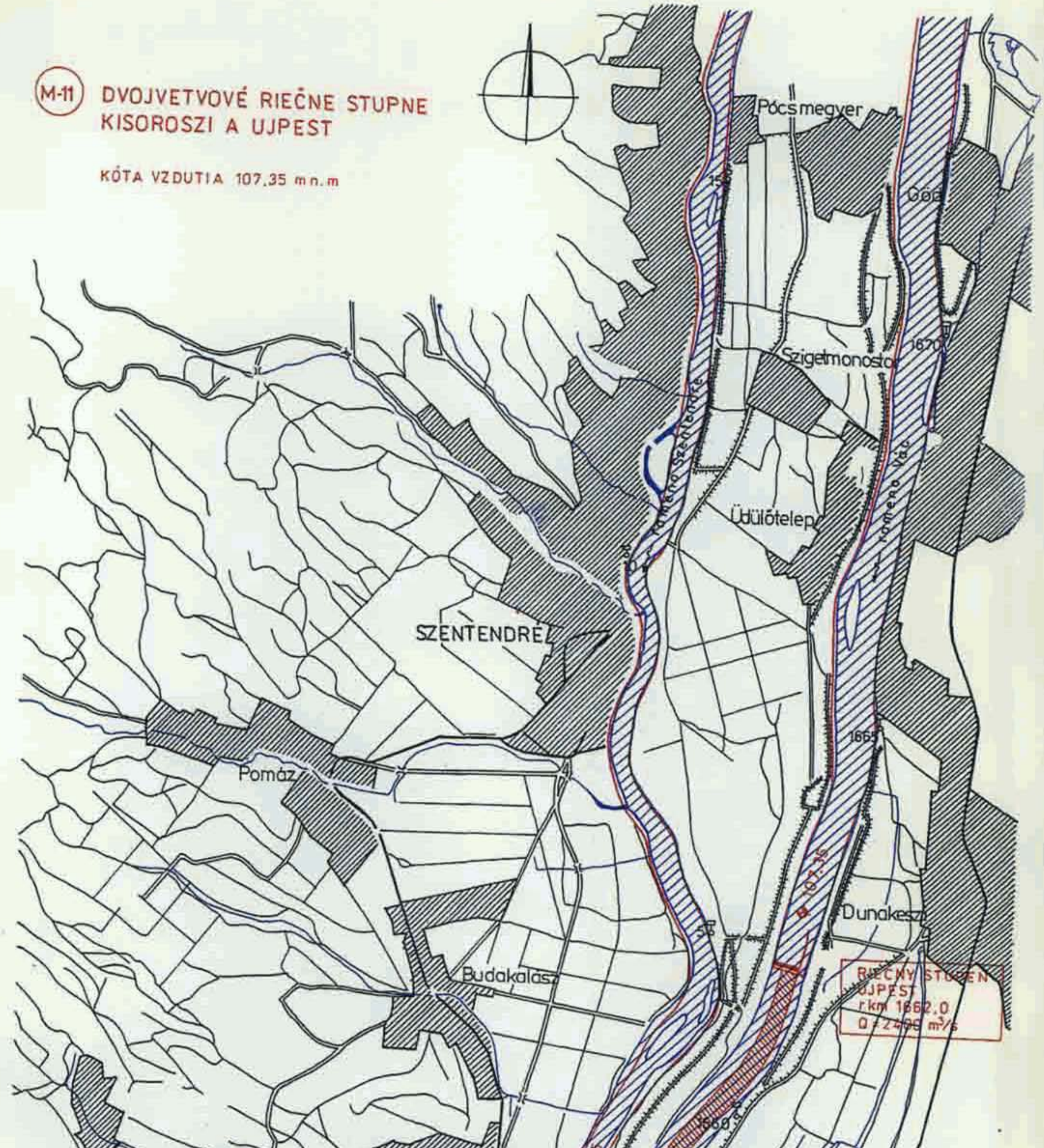
KÓTA VZDUTIA 136,00 m.n.m. (JADRAN)





Verőcemaros
Zebegény
Nagymaros
Kisoroszi
VÁC
Dunabogdány
Visegrád
Dömös
Dunaj
Tahi
Tahitótfalu
1700
1695
1690
1685
1680
1675
KÓTA VZDUTIA 108,5 m n. m
M-6 RIEČNE VODNÉ DIELO VISEGRÁD rkm 1696,5
PRAVOBREŽNÁ ELEKTRÁREŇ
M-7 RIEČNE VODNÉ DIELO VISEGRÁD rkm 1696,5
DELENÁ ELEKTRÁREŇ
M-8 RIEČNE VODNÉ DIELO VISEGRÁD rkm 1696,5
PILIEROVÁ DELENÁ ELEKTRÁREŇ
M-9 RIEČNE VODNÉ DIELO VISEGRÁD rkm 1696,5
JEDNOTNÁ ELEKTRÁREŇ NA PRAVOM BREHU


M-40 DVOJVETVOVÉ RIEČNE STUPNE
KISMAROS A PÓCSMEGYER
KÓTY VZDUTIA 107,20 mn.m.
107,10 mn.m.
RIEČNY STUPEŇ
KISMAROS
rkm 1690,0
Q = 1500 m3/s
RIEČNY STUPEŇ
PÓCSMEGYER
rkm 18
Q = 1520 m3/s
Verőcemaros
Zebegény
Nagymaros
Kisoroszi
VÁC
Dunabogdány
Visegrád
Dömös
Tahi
Tahitótfalu
Dunaj
rameno Vác
rameno Szentendre
1700
1695
1690
1685
1680
1675
30
28
20
107,20
107,10


M-11
DVOJVETVOVÉ RIEČNE STUPNE
KISOROSZI A UJPEST
KÓTA VZDUTIA 107,35 m n.m
Pócsmegyer
Göd
1670
Szigetmonostor
rameno Szentendre
rameno Vác
Üdülőtelep
SZENTENDRE
1665
Pomáz
107,35
Dunakeszi
Budakalász
RIEČNY STUPEŇ
UJPEST
r.km 1662,0
1660
Békásmegyer
107,35
Üröm
BUDAPEST
1655

Annex 22

(Translation)

Interview with Emil Mosonyi in Magyar Tudomány, No. 1/94

Q: - Which is the real history of the Nagymaros Project?
Interview with Emil Mosonyi, the Hungarian Academician[1].

(Magyar Tudomány, Nr. 1/94)

A: I am going to describe it briefly. I have already mentionned before that in 1942, as a young engineer, I was appointed head of the State Water Management Office. In the meantime, we entered into the run of the WW.II. In the last years of war, still before its end, Budapest was hit by bomb-attacks and me, as I wanted to save my family, I rented a room in a peasant's house in Visegrad where I placed my first wife and two children. During the week I stayed and worked in Budapest, and I sailed with a ship to Visegrad for the weekend.

At that time, I have been often walking on the Danube banks. I knew well the hydrology of the Danube and the geology round Visegrad, as I graduated and got the doctor's degree also from the geology as a second subject. I determined in 1942 that it would be necessary to construct a hydroelectric power plant at that section of the Danube. I came to this conclusion from American literature of that time. I mentioned it to Hugo Lampl, who was an excellent nestor of the Hungarian water management, that I proposed a hydroelectric power plant on the Danube in the section where nobody has ever considered it for possible. (Although the professor Verebely was preoccupied with the idea of the utilization of water energy of the Mosoni branch system). I intended to construct such a river step near Nagymaros which were already constructed on many places, especially in U.S.A. and Switzerland.

Now the most interesting part of the history follows:
A part of Transylvania and Sub-carpathian Ukraine belonged temporary to our country at that time and Miklós Kállay (who was first the president of the State Office for Irrigations and the Prime-Minister since March 1942) wanted me not to concentrate on the Danube but to be concerned with the problems of mountainous sections. Therefore I studied the possibilities of the utilization of water energy and water accumulation of Talabor, Nagyág and the valley of Visó, as well as the questions of water energy of the North Transylvania. As the war culminated, it was no more possible to refer to American examples. Unfortunately, it was impossible

1 Since mid-sixties he has been a professor in Germany.

to mention Western examples at the end of the World War II due to Gestapo, later due to Stalinist era. Thus it is a primitive accusation that the Nagymaros Project is a Stalinist idea. It is very ridiculous and everybody who comes with this idea is either absolutely stupid or absolutely malicious.

What had happened later? In 1948, the Communist Party had taken over the power. It means that between 1946 - 1948, the Agrarian Party had still a relatively strong influence. I took part at that time and with the permission of the Minister of Agriculture, in two study visits: in 1947 I was in Switzerland and in 1948 in Sweden with aim to study exclusively the waterworks with low fall. I could get acquainted, during these two stays, with detail information about all what the Swiss constructed and were constructing already at that time on the upper river flow of the Rhine. They were constructing numerous river steps similar to the Nagymaros step, and the hydroelectric power plant Rheinfelden is already 100 years old! At the same time, I have got a lot of materials on the activities of the French and the Americans. The Americans began quite a new canalization of the river Tennessee in those years. After coming back to Hungary, I prepared my own concept of the Nagymaros step and designed a simple schematic proposal. Later, we elaborated from this scheme the first Variant of the Nagymaros Project with my co-workers. After 1948, when the Communist Party took over the power, it was no more possible to refer to Switzerland, Sweden, America, we could refer only to Soviet examples.

Q: - Have we learnt anything?

A: We learnt from the Soviets that they had build also such river steps. I visited some of them. I was sent to a study visit there, but our conditions were much more similar to the physical and regional conditions on the Rhine river and French Rhône river. In reality, we copied the works of that area but we had to refer to the Soviet Union.

Let's stay at Nagymaros. I would like to summarize what the Nagymaros step is. Basically, it is a hydroelectric power plant with especially low fall, which would consist of an engine room with turbines, generators and other equipment, one navigation lock and a weir with regulating steel equipment. such a water step causes no damage to environment as it was described in connection with this work, nor any catastrophic damage. These remarks are ridiculous. Such river steps have been built and are being built all over the world. The Hungarian opinion was completely misled. I cannot take it amiss because the Hungarian nation was tens of years secluded. If someone walks along the Rhine, or the Rhône in the South France, or along the Danube in Austria, he finds out that the inhabitants of those regions got friendly with such constructions. They know that these constructions changed in some way the original nature but they know also that the advantages exceed highly the negative sides. It is necessary to consider the ratio of pros and cons at every new water work.

The Hungarian public opinion does not know obviously that the planned Austrian Danube Project (which is very similar to the Nagymaros Project) is being built in the area of Vienna even if the campaign against it was big (the Hungarian press used also these attacks against the Nagymaros Project, but the same press is now silent about the construction) because the Austrians have voted with 73% for the construction of this work. Everybody, who is interested, can come and see the construction works at the Freudenau step, the structure for the production of hydroelectric energy, in such a construction pit which is being just filled in our country with billion costs and to debit of not at all wealthy tax-payers.

I explained once my standpoint on the Nagymaros Project: I would not have been the supporter of the Nagymaros if some technical measures would not have been realized. It means: as far as I am informed, a great part of wastewaters from Györ and villages north of Nagymaros flow into the Danube without treatment. I don't know how far are treated the wastewaters from Bratislava and the Váh river. I said then: if they don't know to prevent further pollution of the Danube, then, I would not be the supporter of the Nagymaros Project. We have got such experience abroad: if some river is extraordinary polluted, then the damage effects of a backwater structures are indisputable from different chemical and biological reasons which I don't want to mention now. But if water is treated upstream of the water work (as it is realized in Austria, Germany, France and Switzerland), i.e. if water reaches a certain step of purity, then the backwater has no negative chemical and biological effects!

I must still point out that it is necessary in any case to treat wastewater from justified reasons of environment protection, it is necessary to realize the wastewater treatment in sufficiently (so-called three-step) wastewater treatment regardless of if a water work will be or will not be realized. Thus, if we suppose the modern wastewater treatment, we can say that the Nagymaros Project would urge the solution of wastewater treatment in such an extent which will be necessary at any rate.

I wanted to divide it into 2 parts. Now I have been talking only about Nagymaros, but I want to say still something else in advance. When the Nagymaros Project was prepared in such a way that it was possible to think seriously about its realization, then, in 1953, we were informed (from the head of Planning Office) that Czechoslovakia considered the utilization of the Danube downstream Bratislava. They learnt that we, the Hungarians, designed the Nagymaros step and proposed a meeting to discuss the possibility of one joint system of water works. I was appointed head of the Hungarian section of the Czechoslovak-Hungarian experts commission. I directed the experts negotiations in this function. When I submitted, in 1957, to my director all already mentioned reasons which had, in my opinion, to be included into an interstate treaty and which he rejected, he informed me only that I was no more the head of the commission. He proposed me to become the secretary of the commission. This was one of reasons of my emigration from Hungary.

Now I come back to 1953. We met the Czechoslovak colleagues and we studied jointly how to utilize the whole section of the Danube between Bratislava and Nagymaros in the best way. We elaborated several variants. We discussed the possibility to construct all steps in the river bed in the same way as it was done on the Rhine in Switzerland. But it would have meant an extraordinary complex technical problem due to geological and hydrological conditions of the Danube. The costs would have arisen to such an extent that we rejected this way. I want to point out that the Czechoslovak delegation consisted of real experts, scientists and engineers. We decided that the solution with the bypass canal would be necessary. The solution with the bypass canal was initiated by the Czechoslovak side. I dare to say that as I am a spiritual father of the Nagymaros step, the Czechoslovak experts and engineers are in the same manner the fathers of the solution of the bypass canal. We evaluated and determined that the solution with the left bypass canal is technically better to be realized and more economic than the right bypass canal. But I spoke already about the political conditions of this solution and I mentioned that I disagreed the way how the Czechoslovak-Hungarian interstate Treaty was signed. When I came back to Hungary after several years of emigration (after my emigration I was sentenced to several years of prison and all my property was confiscated), I read the Czechoslovak-Hungarian Interstate Treaty and I stated that all my remarks, I mentioned then, were not included in the Treaty. At that time, many friends and colleagues addressed me and I answered them as follows: I did not want such a horse, but I wanted a horse. But if a horse does not suit my imagination, there is no need to kill it, but let's try to saddle it with our neighbours and make the best use of it. On the occasion of my first visit, I studied in detail the projects of VIZITERV.

Q: - When it was?

A: Some years ago.

Q: - I think that it was at that time when you got back your academic title.

A: No. It was a year earlier. I discussed then with the minister of environment Marórthy, the last minister for water management of the former regime who invited me to come back to Hungary. I studied the water management projects in VIZITERV which were elaborated for that section of the Danube which was affected by the construction of the Project. These projects were founded on those ideas which we proposed with my colleagues and Czechoslovak experts 30 years ago. A detailed elaboration was done during my absence. I have not been in Hungary for 25 years. I had to state that VIZITERV had done a good job and the demands of the protection of environment were largely respected. We took into account the impact of the Project on environment already in the first stage of preparation work. At that time, a notion of the protection of environment did not yet exist. We considered the effects of the Project on groundwaters, on adjacent territory, on flora and fauna and people. We considered also the anti-flood protection and I must repeat my very well known saying that not only fauna and flora, but also man and his children belong to environment. They must be protected, too! I expressed my opinion at that time that the Project could be realized only if all other structures would be constructed and if we apply all rules at the operation which would prevent all negative impacts, respectively they lower them, because every our activity has its impact on nature. Even, if a person protecting a nature buys a land and builds a house or he buys a car or if a road is being constructed, every of these activities have impact on environment. It is necessary to explore if the effects are acceptable.

I could say briefly: the Nagymaros Project as a typical low step has no negative effects on environment if respective wastewater treatment would be guaranteed in the section of the Danube upstream of Nagymaros and if a complementary protection structures would be constructed, but it is not possible to talk about damaging effects even in such a case. Everything else are only political phrases! The question of the bypass canal at Gabcikovo is not so easy as the question of Nagymaros. It has greater impact on adjacent territory. These effects can be in balance with respective complementary structures and responsible operation.
It is possible to reach even positive effects on environment. I stress that it is possible to influence positively the environment but the actual opponents fear that in case if the Project would be realized, it will be clear that their declarations were unjustified and Hungarian people could get angry.