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Plenipotentiary of the Slovak Republic
for Construction and Operation of Gabčíkovo – Nagymaros Project

Slovak Governmental Delegation
entrusted with negotiation with the Hungarian Delegation
about implementation of the Judgment of the International Court of Justice
in the case Gabčíkovo – Nagymaros Project

METHODICAL GUIDANCE ON THE ASSESSMENT OF GABČÍKOVO – NAGYMAROS PROJECT CONCERNING THE CONSTRUCTION AND OPERATION OF THE GABČÍKOVO – NAGYMAROS PROJECT SYSTEM OF LOCKS SIGNIFICANTLY AFFECTING NATURE 2000 SITES, SURROUNDING HABITATS AND AREAS, AND PRIMARY IMPORTANT FOR THE EUROPEAN POLICY

PROPOSAL

Based on minutes from Negotiation of the Slovak and Hungarian Governmental Delegation on Implementation of the International Court of Justice Judgment in Bratislava, on 7 March 2007

Bratislava, April 2007

Methodical guidance on the Assessment of Gabčíkovo–Nagymaros Project concerning the construction and operation of the Gabčíkovo–Nagymaros System of Locks significantly affecting Nature 2000 sites, surrounding habitats and areas, and primary important for the European Policy

PROPOSAL

Principal Directives:

Directive 2001/42/EC on the assessment of the effects of certain plans and programs on the environment
Directive 85/377/EEC on assessment of the effects of certain public and private projects on the environment
Habitats Directive 92/43/EEC
Birds Directive 79/409/EEC
Water Framework Directive 2000/60/EC
Directive on the Protection of Groundwater against pollution and deterioration 2006/118/EC
Directive on Assessment and Management of Floods – Proposal COM (2006) 15 final
Treaty Establishing the European Community
Dams and development, a new framework for decision-making, November 2000

Knowledge included to this proposal:

SLOVAK-HUNGARIAN ENVIRONMENTAL MONITORING ON THE DANUBE Results of the Environmental Monitoring base on the "Agreement between the Government of the Slovak Republic and the Government of the Republic of Hungary concerning certain temporary technical measures and discharges in the Danube and Mosoni branch of the Danube 1995-2005 [27]

This proposal is based on Minutes from Negotiation of the Slovak and Hungarian Governmental Delegation on Implementation of the International Court of Justice Judgment, which took place in Bratislava, 7 March 2007, Article 4, point c).

Bratislava, April 2007

Nature of the Proposal

This proposal has been prepared to provide basis for the **Strategic Environmental Assessment** (SEA assessment) which is required in the area where a project may give rise to significant effect upon NATURA 2000 sites (defined by Habitats Directive **[2]** and Birds Directive **[3]**), upon water quality (Water Framework Directive **[5, 67]**), upon groundwater (Directive on Protection of Groundwater – Proposal **[8]**), upon flood protection (Assessment and Management of Floods – Proposal **[9]**) and others EU relevant Directives.

This proposal has been prepared with the **compliance to the treaty establishing the European Community [1]**, and in particular the Article 174, supporting European Community policy (mainly in: protection of environment, public safety, energy, transport, climatic changes, international cooperation, sustainable development and others).

This proposal has been prepared using **integration principle** of maintaining and/or restoring natural biotops, while taking into account economic, social, cultural and regional requirements, European Community problems, European Community policy, and sustainable development. It means, conservation (protection and restoration if necessary) should be integrated into other development and water management plans.

This proposal is dealing with the most important **imperative reasons of overriding public interest**, especially:

- **Beneficial consequences for the natural environment** – maintain and mainly restore typical and nature close inundation habitats, river branches and ground water levels.
- **Public safety** – ensure **flood protection** of large areas behind inundation and reduce peek flood discharge downstream.
- **Human health** – improve communal hygiene (water quality, water supply and sewerage; roads; water born diseases and originally malaria endemic area), protect ground water resources and recharge.

This proposal at the same time supports **important European policy actions and reasons**:

- Renewable and waste less domestic **energy.**
- European **transport.**
- **Climatic** measures including reduction of CO_2 and methane gas emissions.
- Improvement of **water** self purification processes (in this case oxidation-reduction processes).
- **Infrastructure** development.

Background of this proposal is **The 1977 Treaty [31]** and **The Judgment of the International Court of Justice**, 25 September 1997 **[30]**.

The 1977 Treaty in Article 15 specified that the Contracting Parties, Hungary and Slovakia, "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". It was stipulated in Article 19 "The Contracting Parties shall, through the means specified in the Joint Contractual Plan, ensure compliance with the construction and operation of the System of Locks".

The Judgment of the International Court of Justice in Article 141 specified: "It is for the parties themselves to find an agreed solution that takes account of the objectives of the Treaty, which must be pursued in a joint and integral way, as well as the norms of international environmental law and the principles of the law of international watercourses. In the present

case it is required (Article 142) that the Parties find an "agreed solution within the co-operative context of the Treaty". In Article 143 is expressed that "both Parties can profit from the assistance and expertise of a third party". Both Parties agreed on elaboration of Strategic Environmental Assessment **[15].**

In Slovak republic are NATURA 2000 sites obligatory. In Hungary there is no obligation to adopt a management plan for a NATURA 2000 sites, except of those already protected by national legislation [66].

In this SEA proposal the environmental objectives and the consideration of socio-economic and cost-effective aspects are integrated into water management with the aim to enable the right choices for society.

1. Expectations

To integrate the Community policy on the environment with the policy and sustainable development of the Community and prudent and rational utilization of natural resources, using available scientific and technical data, environmental monitoring, regions environmental conditions and European Community Directives.

2. Basic methods

This proposal is based on: **careful monitoring of environmental conditions and processes, scientific research and interpretation of processes and, scientific quantitative and qualitative prognoses based on previous long-term development of monitored items and comprehensive modelling**. This is methodical categorical imperative in natural sciences. A categorical imperative would denote an absolute, unconditional requirement that exerts its authority in all circumstances, both required and justified as an end in itself. (Kant defined an imperative as any proposition that declares a certain action (or inaction) to be necessary).

Environmental monitoring is based on **Slovak and Hungarian long term National Monitoring**, on **Joint Slovak-Hungarian Monitoring** and cooperation among various institutions. This is comprehensive documented by reports and publications (see References **[20 – 27]** and also in small booklet **[28]**).

Complex integrated technical solution and water management plan in previously heavily modified natural area (flood protection, navigation, river training, closing of river branches, land drainage and use).

Comparison the potential benefits and costs of action and lack of action, taking into account sustainable development and global European Community policy.

Envisaged **cooperation with the Commission** on scientific research, economical and political appraisal, and examination of the sustainability of the project with regard to the invoked imperative reason and fulfilment of the ecological and other objectives.

General goals of proposal:

- **Flood** protection.
- Restoration and conservation of **functional nature close inundation** with nature close eupotamal and functional river branches.
- Improvement of **navigation** conditions, removal of bottlenecks.
- Production of renewable and waste-less **energy.**

- Improvement and development of **infrastructure, water for agriculture and silviculture, and others.**

The goal of the Strategic Environmental Assessment is, in compliance with the Judgment **[30],** to find **an agreed and the best solution** that takes account of the Objectives of the Treaty, which must be pursued in a compliance with the strategic policy of the European Union and with the EU Directives.

3. Identification of potential impacts

The effect of each project on the environment was, is, and will be unique due its goals (e.g. navigation, flood protection) and due the previous late quaternary river sedimentation and erosion processes, including historical man made changes.

This project is dealing mainly with **water regime impact**, but additional impacts as transport, forest management or tourism are taken into consideration. **Specific impact of water regime** is concentrated mainly on **floodplain area** (between flood protective dikes) where the NATURA 2000 sites are situated. Real impact of water regime is progressing further behind the flood protective dikes, on the agricultural land, river branches and canals behind the dikes.

4. Physical effects

The principal impact of the Project and pre-project long–term development is upon water regime. **Management of the water regime** is therefore the **main instrument of restoration measures**, and in addition, immediate measures against **climatic events**, measures to prepare conditions of **nature close eupotamal** and system of **river branches**, measures for **water self purification** processes, and others, including **flood protection**, **energy, transport,** etc. The main impact of the water management and river training technical structures (dams, embankments, dikes) is demonstrated by changes in surface water or hydrologic regime, followed by ground water levels and flow, further through the changes of soil moisture in the zone of aeration, which include the soil horizon with plant roots, and further on through the changes in flora and fauna. If there is a rise in the surface and ground water level, than there is also an increase of moisture in the zone of aeration, or occasionally the moisture may remain unchanged at some depths, but there is in no case a decrease in the moisture by the caused by increase of water level. This is valid reciprocally too. **Therefore, neither an increase of the moisture in the zone of aeration or soil moisture due to a lowering of ground water level, nor a decrease of moisture due to a rise of ground water level, can happen**.

The **monitoring of surface and ground water levels is keystone for interpreting** soil moisture and biota monitoring data. Lowering of ground water level means changes into more hygrophobe (dry) biocoenoses, a rise of the groundwater level means changes into the more hygrophilous (wet) biocoenoses. The monitoring is in the same time the keystone for further decision-making and water management.

5. Barriers

Barriers may affect the movements of many species. Barriers in the water management projects are especially: historical closures of river branches concentrating water in the main river canal (to ensure the navigation dip), flood protective dikes (they are delimitating floodplain area and protecting their integration), straightening the river canal and leaving meanders, water weirs and underwater weirs, dams etc. Special types of more or less natural

barriers are fords and shallow parts of water bodies creating by water level fluctuation occasionally littoral and dry areas, and in the river branches paraplesiopotamal or even plesiopotamal types of branches.

6. Chemical hydro-chemical and hydro-geochemical effects

Changes in chemical composition of surface and ground water are commonly encountered. They are usually response to pollution**. Water management and hydropower structures are not producing pollutants**. Water management is influencing flow and thus sedimentation-erosion processes and oxidation-reduction processes. **Oxidation-reduction processes** are common and very sensitive especially in alluvial areas and river branches. The main factors are changes in organic carbon in water and sediments, in nutrients, changes of water temperatures, dissolved oxygen, impacts of disposal of sewage sludge, surface pollution, etc. Oxidation-reduction processes are the **main processes in so-called self-purification processes in surface water and groundwater bodies**. These processes are at present well known in the area. Water management can support the self-purification processes and thus to improve the water quality. Water flow in river branches is improving oxidation-reduction conditions and hinders eutrophication.

7. Biological effects – flora

A frequent large-scale problem is the introduction of non-native plants and trees and introduction of clones in forestry. Commercial forestry and introduction of clones in previous centuries is a typical example in inundated areas. In the Project region more than 80% is covered by commercial forest.

8. Biological effects – fauna

Inundation area is in general inaccessible or not suitable for non-native animals when under typical nature close inundation water regime. Changes in water regime are changing species composition, its distribution in the area and habitats conditions.

9. Components of monitoring

The **keystone for interpretation of monitoring of impact of water regime** and construction of water management structures in the project area, in general, is monitoring of:

- Climatic parameters,
- Hydrologic data,
- Surface water level,
- Surface water quality,
- Morphological changes of surface water bodies,
- Ground water levels,
- Ground water quality,
- Soil moisture,
- Soil properties and composition,
- Keystone species of terrestrial and aquatic flora,
- Keystone species of terrestrial and aquatic fauna,
- Grow and health parameters of commercial forests,
- Hygiene parameters (mosquitoes, ticks, water quality, exhalations and others).

I. Characteristics of the Project area

The 1977 Treaty between Slovakia and Hungary **[31]** defines the **Project area** from Bratislava to Budapest. The Danube **(Fig.1)** enters Slovakia at the Devin Gate, the point where the Morava River flows into the Danube from the north. For a distance of 7.5 km, upstream and at Bratislava, the Danube forms the boundary between Austria and Slovakia. It then traverses southern Slovakia (where it is known as the "Dunaj") for a distance of 22.5 km, to the point where the Hungarian boundary with Slovakia intersects the Danube southeast of Bratislava. For the next 142 km the Danube forms the boundary between Slovakia and Hungary until its junction with the Ipeľ River, where the boundary then abandons the river and turns north. The Danube (now known by its Hungarian name, the "Duna" continues east into Hungarian territory for a short distance and then makes a sudden bend to the south towards Budapest.

Just downstream of Bratislava, the Danube forms two main branches on either side of the main channel: on the north the Malý Danube in Slovakia; on the south, the Mosoni Danube in Hungary **(Fig.1)**. This creates two large islands to the north and south of the main riverbed: Žitný ostrov in Slovakia and Szigetköz in Hungary.

Downstream from Žitný ostrov and in Szigetköz in the direction of Visegrád and Nagymaros, the topography is hilly. The Danube Bend, where the Nagymaros Step of Gabčíkovo-Nagymaros system is projected, is a narrow valley surrounded by the Visegrád and Börzsöny hills. Downstream Visegrád, down to Budapest, the Danube forms large island Szentendre, supplying Budapest with water from river bank-filtered wells.

Geologically the area is situated in the central part of an intermountain depression, the Danube basin, called in Slovakia "Podunajská nížina" (Danubian Lowland). The basin consists of Late Tertiary (marine and lacustrine sand, fine sand, clay, sandstone and shale) and Quaternary sediments. Since the glacial Mindel epoch, these Quaternary sediments are gravel and sand, deposited in the Danube alluvial fluvial and lacustrine conditions. The total depth of the Tertiary and Quaternary sediments reaches 8000 m. The Danube River sediments (since the Mindel epoch) form **the main aquifer consisting of highly permeable gravels** and sands with a hydraulic conductivity coefficient usually from 0.0001 up to 0.02 $m.s^{-1}$. Its **thickness** ranges from a few meters at Bratislava to more than 450 m at Gabčíkovo. Further downstream, after the village Sap, their thickness decreases to several meters. Under this aquifer there is a complex of low permeable or almost nearly impermeable older Quaternary and mainly Tertiary sediments.

The important **factors in the creation of the aquifer** were the existence of the **granite threshold** between the Alps and the Carpathians in the area of Bratislava, and the predominantly **andesite hard rocks** between Štúrovo/Estergom and Nagymaros/Visegrád **(Fig. 1).** These are the upstream and downstream geological boundaries and hydrological barriers, or literally natural dams, on the Danube River. Upstream of the "natural dams" the Vienna basin and Danube Lowland basin come into existence, respectively. The hard rock barriers and tectonic subsidence of the basin determine the surface slope **(Fig. 2),** the Danube River waters flow velocities, and subsequently, the development of the so-called Danube Inland Delta (geologically called alluvial fan). However, **The Danube Inland Delta is an alluvial fan** below the granite threshold at Bratislava, with its typical original morphology, i.e. branching of the Danube's, changing river meanders, coarse sediment accumulations, changing river gradient, etc. This large alluvial fan consists of a highly permeable and extensive aquifer capable of carrying high volumes of ground water. **The Danube flows on**

the top of this alluvial fan, which means, especially during the higher discharges, over the surrounding terrain (**Fig. 2**). Water from the Danube therefore infiltrates into the fan alluvial sediments during all water stages on the river, and flows downward as ground water through the Danubian Lowland, nearly parallel with the Danube River (**Fig. 3**), and towards the Little Danube and Mosoni Danube. **In the downstream part the river has a small slope**, deposits are more fine-grained and generally less permeable. Here the ground water flows back into the Danube River via its own riverbed, the Little Danube, Mosoni Danube, the other Danube river arms, tributaries and drainage canals.

Granite threshold, andesite threshold, and the place where the alluvial fan ends are all important points of significant changes in the natural conditions (on the alluvial fan end the river speed suddenly drops as its slope lessens from 40 to 10 cm per kilometre, **Fig. 2**). These are the places where it has been proposed to situate the hydropower dams known as Wolfsthal, Nagymaros and Gabčíkovo, respectively.

II. Previous development

II.1. Nature

Before the multiple impoundments in the upper Danube catchment's areas, and the embankment and endikement in Austria, Slovakia, and Hungary, **the Danube was a free flowing braided river with a wide flood plain that extended far beyond the present flood protecting dikes.** Flow velocities may also have been much lower, as in the Danube in the pre Gabčíkovo dam conditions. With the history of endikements, especially during the 19 and 20 centuries, **the Danube banks were fortified and flood protection dikes were built up** on both sides. The **straightened Danube channel** flows between these dikes and across earlier meanders **(Fig. 4).** Flood peaks became steeper and higher. The original zoning in vegetation toward higher ground and associated forests was largely 'diked' out of the system. Most of the higher lying ground, behind the dikes, was converted into **agricultural lands** and no longer flooded. The area in between the dikes was consequently flooded more often and the river arms flushed and scoured more intensively. Free meandering was limited by the construction of fortified riverbanks. Interconnections between the river and its branches were limited. The main **flow was concentrated into the previously straightened single river channel**, later known as the main Danube. The **reduced interaction with the side arms** so created meant less flow. According to the experts of the Commission of the European Communities, (November 23, 1992) **[32]** flow in almost all river arms existed 17 days per year. See also **[27]**.

Then, as at present, high discharges in the Danube meant water overflows riverbanks and flooded the area between the protective dikes, the present inundation. This **inundation – floodplain is highly valuable** from an ecological viewpoint, and its original functions are worthy of preservation. **Its irreplaceable functions include transferring of flood discharges, and acting as a natural polder moderating the maximal discharges during any flood.** Both these functions are significantly manifested in reduced maximal discharges in the downstream stretches of the Danube. The area has favourable conditions for the growth of natural floodplain forests as well as for timber production. It is aesthetically attractive for tourists, and it also fulfils the self-purification function of the Danube water, because the arms have flowing water.

Pre-dam activities have resulted in the following previous long-term changes:

- Greater water depth in the Danube navigation channel, much higher flow velocities, increased riverbed erosion.
- Decrease in the bed load transport via granite threshold, decrease of river bed-load sedimentation and further increase of riverbed erosion.
- General decrease of water levels in the Danube.
- Disconnection of river branches and side arms with the main riverbed and their drying out.
- General decrease of ground water levels and changes in the ground water flow.

The considerable **long-term decrease of ground water level [24, 26, 27]**, which occurred in the last 30 years (before putting the Gabčíkovo part of the Project into operation), is evident mainly in the upper part of the Danubian Lowland, close to Bratislava (**Fig. 5**). This pre-project decrease of ground water level over a long time had already negatively influenced natural conditions, mainly in the flood-plain area, and had negatively influenced agriculture, forestry and ground water resources.

Comparison with the "original" historical state and present state can be seen from Mikovini map (1733) **[34]** and superposition of present water bodies **(Fig. 4)**. Imre Dosztányi **[28]** originally made a similar comparison. This is the **primary impulse to recover, at least partially, the "original" and historical spirit of the Danube**, in the stretch between Dobrohošť and Sap**.** This idea is described and carefully justified from an ecological view point in the well known publication by Lisický, Mucha (eds.) **[25**, see also www.gabcikovo.gov.sk**].** The main aim is to **reconstruct the main eupotamal from the existing river branches** (**Fig.4**). This is also the reason why the Slovak Party is **not supporting the rehabilitation of the fortified and straightened Old Danube River navigation canal [16]**. The old Danube in the pre-Gabčíkovo project conditions was neither natural, nor a nature close stretch of the river. The main function of the Old Danube should be flood protection (carrying the part of the flood discharges), creation of water bodies for water sport and recreation activities.

II.2. Water quality

The Directive 2000/60/EC [5] contributed great deal to the characterization of the water quality, and ecological and chemical status of the water bodies. On the Danube the Joint Danube Survey, carried out with this goal, was realized by the International Commission for the Protection of the Danube River (ICPDR) in 2001 **[19]**. ICPDR, in addition, will provide a basin wide platform for the co-ordination necessary to develop a River Basin Management Plan for the Danube River Basin. The ICPDR monograph **[19]** is an objective Danube water quality and ecological status study along the whole Danube stretch. The 1977 Treaty area is situated in the upper part of the Middle Danube section. The main problems affecting the Danube River Ecosystems are described in **[19]** and in Communication from the Commission **[42]** Detailed and long term characterisations of the 1977 Treaty area is described in reports and monographs **[23, 26, 24, 25, 26** and others**]**. The main problems are previous long term man made changes in river flow patterns including transport of sediments, contamination with hazardous substances, oil, organic carbon substances, microbiological pollution, loss and degradation of floodplain and river branches. Downwards increases content of nutrients, pollution with organic and inorganic pollutants and hazardous substances.

Key environmental objectives are reduction of hazardous substances, cleaning and watering some river branches, recovery of its water regime and support for self-purification processes, including support for nature close and functional inundation.

III. Potentials of the future Danube ecosystems

The first preliminary results of the pressure and impacts analysis [67] indicate that a high number of water bodies are "at risk or possibly at risk of failing the environmental objectives set out by the WFD". In particular, the hydro-morphological alterations mainly due to navigation, hydropower, flood defences and other uses and pressures from agriculture and urbanisation are a common concern across Europe. The following text should indicate **proposal how to deal with a typical present situation on the Danube**.

III.1. Danube stretch of Gabčíkovo step

The **ecosozological status of the Danube ecosystem and the adjacent floodplains** declined proportionally to its anthropogenous changes, which occurred especially in the last 150 years (see Lisický, Mucha in **[27]**). According to the international criteria, its state in the mid 19th century would correspond to the category of World heritage. In the mid 20th century it still had values corresponding to a national park. At the time just before the start of construction of the Gabčíkovo project it had the values only of a large-size protected area in the category of protected landscape. The Gabčíkovo project represents a bifurcation of the potential development trajectory. On one hand it emphasises anthropogenous limits in the broad area and a reduction of its functions for agricultural, navigation, energy, and silvicultural (commercial forestry) exploitations. On the other hand, it has opened a possibility of agreement on conditions of fewer conflicts over the spatial delimitation of its functions, and better possibilities for its **integral water management**, including flood protection. Although most development during the last 15 years indicates rather more realization of the first alternative, there still exists a possibility **to rehabilitate the ecosystem in the limited within-dike area** with limited flow rates. These flow rates (into the Old Danube) are defined by the Slovak-Hungarian Agreement as follows: the annual average flow rate 400 $m^3.s^{-1}$; the flow rate in vegetation season up to 600 $m^3.s^{-1}$; the flow rate out of vegetation season at least 250 $m^3.s^{-1}$. In addition, there were agreed flow rates into the Mosoni Danube arm, about 40 $m^3.s^{-1}$ and other flow rates supplying the inundation area and agricultural area behind the protective dikes. Such flow rates and the corresponding water volume in the annual balance can be used ecologically more effectively when they are related to the natural seasonal dynamics of flow rate fluctuation in the Danube. It could be a preset flow (for example 3500 $m^3.s^{-1}$ at the gauging station Devín), at whose exceeding the water management structures ensure that water in the arm systems would start to overflow the area between the Old Danube and flood protective dikes. Thus, "natural" flooding would progressively start. This is the basic idea, which has been elaborated and published in the form of scenarios and the final recommendation of an expert group **[25]**. We note that in the pre-dam conditions such a flow rate of 3500 $m^3.s^{-1}$ was already not enough to overflow the area, neither from the Danube main channel nor from its side arms. The discharge of 3500 $m^3.s^{-1}$ occurs on average about 52 days a year, while that of 4500 $m^3.s^{-1}$ occurs about 17 days a year **[32]**.

Number of environmentalists, and surprisingly even some ecologically educated specialists, **are unable to interpret changes of the natural environment** from the view of secular (centenarian) spatial and temporary changes, and consider environmental perception (opinion) from a time span of one or two ancestor generations as the reference state. As we have already mentioned in the chapters about changes of biota in the Danube inundation area **[25, 27],** the **extent of the Danube floodplain between the present-day Bratislava and Komárno was reduced in the past centuries in orders, while the flow rate through this area remained on a comparable level.** In this way a gradually increasing disequilibria has arisen, which has

unavoidably led to the concentration of flows into a narrow within-dike corridor. This has increased their destructive power and, on the principle of a chain reaction, called for further measures, first of all in flood-control and navigation. The structure of the wooded plant stand, which was gradually pushed by the forest management, especially after World War II, worsened the situation from the hydraulic viewpoint, notably at large flow rates. The natural forests in the floodplain along the Danube, as a large river in the Central European area, would not have such a large stem density, neither near the eupotamal (one main channel) nor along more parallel flowing channels. The Danube would not create favourable conditions for permanent transitional floodplain forests. On the contrary, such a large river would have created a permanent retention capacity in the form of wetlands and flooded meadows. **The system mistake, which happened in the landscape care** during the last two centuries, is a result of inadequate intergeneration memory about the dynamics of the Danube hydrological regime.

Although any of the following comparisons may be not fully acceptable, we consider it to be purposeful to try to find out a **parallel between anthropogenous and natural changes** in the alluvial landscape. If we simultaneously draw attention to their common and different features, we can reach inspiring conclusions. In the case of the hydraulic structures built on a bypass canal, we can speak about an anthropogenous avulsion (abrupt change) and the subsequent aggradations. A sudden change of the riverbed is natural; unnatural, however, is the transformation of its character into an isolated canal, outside of inundation, which does not communicate with the adjacent water bodies. The elevation of the water level in the bypass canal can be compared with aggradations, which is here represented by lateral dams, without a corresponding elevation of the bottom altitude. Aggradations were a natural phenomenon in the Danube development, but it was accompanied by subsequent lateral erosion. The unnaturalness of the bypass canal lays in the minimal permeability of its riverbed and its permanent straightening. The character of its banks is degraded from the biological viewpoint. It does not offer conditions for organisms usually living in riverbanks; the canal bank does not enable infiltration and re-filtration, and does not represent a habitat for interstitial fauna. The river energy is under natural conditions used diffusively, but from the ecosystem viewpoint "*in situ*" for landscape forming processes. The river energy concentrated by the power station and led out of the space, is used "*ex situ*", for economic purposes, which are strange to the ecosystem. If we enlarge such an energetic balance to the whole area, which was directly influenced by the river in the past, we see that a part of the misappropriated energy after transformation (for example on agro-technical measures, supply of nutrients) returns into the landscape. This energy is used in favour of xenocoenous species (field crops and animals bound to them). Such a floodplain is not expected to fill its original roles. It became alienated also functionally misappropriated. However the river, which formed this floodplain in the past, is expected to provide a favourable regime of ground water levels. Up to this point it is logical and no essential problems rise from the viewpoint of equilibrium. On the contrary, such problems rise in the within-dike area, especially when it should be used integrated and economically.

Unlike ecosystems, human technologies have, up to the present, a limited ability to use diffused energy (see the existing problems in getting solar or wind energy). Therefore they are based on concentration of their resources, point transformation, and redistribution. It is, of course, connected with many problems of a logistic character, which are usually solved at the expense of natural environment quality. Similarly, the existing adaptability of agriculture is not so perfect to be able to use without conflicts areas of wetlands with shallow water (a specific exception is the cultivation of rice). Therefore anywhere agriculture comes with its interests, it tends to redistribute the natural continuum into entities serving partial interests and to give them discretely economically exploitable functions. Even delimitation of the

landscape into the economically used areas and protected areas (nature reserves), supported by the classical nature conservation, was based on this same principle. At the beginning, such delimitation more or less worked, because the protection referred only to small economically uninteresting areas. From the time that the institutionalised nature conservation began to push the principle of large-size protected areas, while recreation and sport have become a perspective economic exploitation of another kind (*sui generic* - unique), the conflict comes back.

The principal precondition of success of all systemic measures is taking into account that **it is not possible to optimise all parameters** of the system. **The optimum of a working system is not a sum of optimum states of all its components, but their optimal interplay**. It has its time-space dynamics. In the case of an ecosystem it means that ideal conditions for some ecological groups are provided in one time span, while the ideal conditions for other groups in another period. Therefore, it is necessary to exclude an a priori attempt at harmonization of all demands for optimality as defined by specialists from the viewpoint of one group. As **an example** we can present the attempt to set a norm for optimal simulation of floods.

From the viewpoint of optimising conditions for fish, it is necessary to provide each year one flood with cold water and one flood with warm water. Both floods should have sufficient duration, and it would be best if the whole within-dike zone would be flooded. **The first spring flood** should start in February, culminate in March and decay in April. **The second summer flood** should start in May, culminate in July and decay in September (Černý in **[27]**).

From the viewpoint of development of plankton, which is important for many fish species and food, it is optimal if the flow in an arm system is limited and slow and floods are not too frequent and not too dynamic. **From the viewpoint of poplar plantations** it is optimal if the surface flood does not occur at all and the river functions similarly to in agricultural ones in the out-of-dike area, are restricted to arrange for an optimal ground water level. This should be higher in the first part of vegetation season and lower at its end. On the contrary, from the **viewpoint of inhibition of allochtonous species**, especially of invasion herbs, it is optimal if a flood lasting several weeks occurs at least once a year. From the **viewpoint of organisms that naturally live in the floodplain**, but are not able to survive a several weeks long flood (for example edafon), it is optimal if the flood is followed by a longer period without floods, during which the connectivity on the river enables passive migration of living individuals for rehabilitation of populations. Such and similarly optimal floods could occur in this area as late as after building up of the dikes, they could not be typical of the original natural alluvium. Hence we are speaking about criteria of adaptive optimality. The problem is that in a **much smaller area** it is necessary to provide not only the original **flow capacity**, but also the **original diversity of habitats and species composition**. If we have to define, in spite of this, **the optimal ecological state, it will be that, which most converges to the natural state** (not to the adaptively natural one).

Hydraulic structures with the bypass canal, placed out of the within-dike zone, paradoxically offers the possibility not to norm all criteria, which must be filled from an ecological viewpoint by the within-dike area, but to provide them by a natural flow rate matching to its size (extent of the inundation area was manifold reduced during the past centuries) and to restore, in this way, autoregulation of the naturalness and its selection in the within-dike zone. But it cannot be concealed that this means an essential change in forest management, and the limitation of recreation to a degree that does not conflict with the environment naturalness. Paradoxically, at the same time the Gabčíkovo structures are offering new possibilities for water sport and recreation at the area of the reservoir and at the Old riverbed reserved for leading away flood discharges. **The landscape and flow of the**

river, which forms it, can again return to equilibrium after a well considered intervention.

These considerations have led the broad collective of various specialists **[25]** to set questions of **priorities in the inundation area,** and to comment on different scenarios of the possible future development of a natural environment in the within-dike area between Rajka and Sap from this viewpoint. In this regard we refer to the published monograph **[25]**. Here we discuss just a brief characteristic of the scenario, which appeared, under conditions of respecting the existing limitations (size of within-dike zone, disposable flow rates for its rehabilitation, and preservation of its flood control function towards the out-of-dike area), as the ecologically and ecosozologically most suitable. Simultaneously it sufficiently respects the flood control function and existing limitations.

We consider the so-called **Old riverbed of the Danube** to be ecologically dysfunctional and, from the viewpoint of heavy navigation, needless. Therefore, it can be abandoned so far as concerns the discharging of water. However, it cannot be filled or successively overgrown by floodplain forests because of its **flood control role.** Instead, it must be maintained without cost consuming technologies (removal of growths, dredging, etc.) as a corridor **able to lead discharges exceeding the total aggregative capacity** of the bypass canal, the rehabilitated river arm systems and floodplain forests on both riversides. It is necessary to restore the integrity of the ecosystem, which split after finishing the Gabčíkovo hydraulic structures into three relatively autonomous systems (the abandoned riverbed and two arm systems artificially supplied with water). The simplest method, how to solve it, would be damming of the whole stretch of arms by several weirs. However, we do not consider such a mode as ecologically favourable, because it inserts lentic stretches (slowly flowing lakes) into a markedly flowing water (lotic) ecosystem. Under conditions of reduced discharge, **the arm systems of inundation have to take over the functions of a bearing system of an anastomosing eupotamal** (branching and rejoining irregularly to produce a net-like pattern). This pattern existed in the Danube in the remote past on a much larger scale. It can be presumed that in the changed condition, in the within dike inundation, it could represent its contracted model. Reconnecting of the two arm systems should be enabled. Models must verify concrete places and flowing conditions. It can be presumed that it will be the so called gates, where the former main stream recently revives communication with side arms via previously closed entrances during flood (for example in 2002). The water flowing from the present left side inundation area into the right side area and vice versa must have an expressively flowing character and potential for lateral erosion. In the places where it is not excluded because of the security of the existing flood protecting dikes, the natural erosion should be allowed to remodel the present terrain shape. In this way, after removal of the existing weirs, the bed load regime of the river will be restored in this area. The bearing discharging system must be adjusted to enable not only the riverbed-forming processes but also ensure the dynamics of water level fluctuations in those side water bodies, which will not be permanently connected with this system.

The principle of this proposal is to lead the flowing Danube water from one side arm system into the other. During its crossing of the old riverbed, the water shouldn't lose its expressively lotic character. Thus this solution cannot be based only on connection of the arm systems with backwater in the old riverbed. Such a solution would mean that the lotic fauna of the eupotamal would drift into a lenitic environment, while the lenitic fauna would drift into the streaming water of the arms. If an agreement about crossing of the old riverbed will not be reached, there could exist two parallel arm systems. But in this case it would be ecologically worthless or even undesirable to connect them with the backwater ecosystem in the Old Danube.

The most serious tasks of this project, whose solution must be based on modelling, will create a solution for crossing the old riverbed so that water flowing between the arms across the Old Danube is not lost in the old riverbed. It will be necessary to build up a continuation of new eupotamal riverbank lines across the Old riverbed with boulder-chute, and to propose the shape of these weirs so the floodwater can be lead through the old riverbed, or a critical flood is able to take them apart.

When comparing the similarity of the restored ecosystem with its natural pattern as it existed there in the remote past, several **through flowing "reservoirs"** appear in the old riverbed as added non-original elements. However, under the presumed hydrological regime, they will have a **semi natural character** and will not substantially influence the restoration of natural qualities of the ecosystem. On the contrary, they will even **increase its diversity**.

It is natural that the 15-year experience with the behaviour of the river and its natural environment after putting the Gabčíkovo hydraulic structures into operation leads the ecologically oriented specialists to **convergent concepts, prognoses, and proposals of repairing measures**. They can differ in the proposed intensity, but they will agree in the opinion that the existing trend is undesirable from the nature protection viewpoint as well as from the viewpoint of flood control. Two years ago we had the opportunity to get acquainted with similar idea of the Hungarian specialists **[35]** and we embrace the possibility of common policy in solving the common problem. It is necessary to find a common strategy as soon as possible and to begin to act.

III.2. Danube stretch of Nagymaros step

The **ecosozological status of the Danube ecosystem and the adjacent floodplains** declined proportionally to its anthropogenous changes. In comparison with the Gabčíkovo stretch of the Danube, the Danube slope is much smaller; water flow velocity is also smaller, riverbed erosion is progressing, river branches behind the river isles are closed, water is concentrated into main river canal. River water in river branches is flowing only during the high water stages. River branches and the water bodies behind the isles are successively overgrown and at some places are polluted. Riverbed in the Danube decreased **(Fig. 6)** at lest 1 meter in last few decades, thus water levels in the river and river branches decreased by similar rate. Some river branches are dry and overgrown. The Danube with its isles and river branches, according to the geological limitation, has narrower inundation in comparison with the Gabčíkovo stretch, which all is characterised by natural straight flow, fords and exposition of hard rocks in the river bottom. The Danube is the only and valuable bio-corridor in this stretch, it is the only riverbed carrying flood discharges, is fortified and tailored for navigation, and is used as sewer and some river arms as junkyards. Rehabilitation of ecosystem and fulfilment of the Water Framework Directive **[5, 67]** needs surely the water management and, because of flood protection, navigation and other measures, it needs also assessment of plans and projects – Strategic Environmental Assessment – based on real scientific background and careful monitoring of natural processes.

IV. Plan and Project definition

IV.1. Historical Background

On the initiative of the Hungarian Water Power Department **the study in the Danube Bend** (at Nagymaros) were **started in 1946**. The geologic, hydrologic and geodetics surveys

provided for first hydraulic model tests realized in 1952 at the Budapest University of Technology. Parallel studies were started in Czechoslovakia. In order to obtain a complete picture about the natural conditions fundamental to project formulation, the data of topography, geology, hydrogeology, hydrology, biology, seismology, etc., were taken into consideration. The technical and economic criteria were established by exploring possibilities and demands of regional and communal development as hydro-energetic potential of the Danube, power generation, navigation, environmental protection and nature conservation, water management including flood control, land drainage and irrigation, regional water supply, conservation of surface and ground water quality, hygiene, and others. Project was adjusted to the projected dams upstream (Wolfsthal in Austria and Adony and Fajsz in Hungary). The studies concerned with the technical, economic, environmental, ecological, social, legal, political, aesthetic aspects have been discussed by the competent political, public and scientific bodies and organizations **[28]**.

IV.2. Plans and Project

Treaty of 16 September 1977 [31] concerning the construction and operation of the Gabčíkovo – Nagymaros System of locks and related documents (hereinafter called the **"1977 Treaty"**).

Area of the Plans and the Project is according to the 1977 Treaty the Danube stretch from Bratislava to Budapest (see also Minutes from Negotiation of the Slovak and Hungarian Governmental Delegation on Implementation of the International Court of Justice Judgment in Bratislava, 7 March 2007 **[15]**). Spatial area of conservation is limited into the Danube present inundation, which means the area between the Danube and flood protective levees (dikes) and areas behind the protective levees, including all areas proposed for the NATURA 2000 network. In addition, the area is "water protected area" in Slovakia. Ground water is prevailingly recharged from the Danube River water.

IV.3. Water management

Since the era of Queen Mary, wife of Bela IV **[28]**, who ruled from 1235 to 1270, the water management consists from straight riverbed excavation, flood protection and measures improving the navigation conditions, including heavy riverbank fortification, closures of river branches excavation of fords and others. Since 1927 water management is integrated with construction and operation of Dams on more than 30 places on the Danube. All dams are multipurpose; integrating mostly flood protection, transport, energy, water supply and infrastructure development, including reduction of greenhouse gases and supporting agriculture and human activities.

In general, **environmental impact is envisaged mainly from changes in water regime including climate events and water management**.

The 1977 Treaty provides for the construction and operation of a System of Locks by Slovak republic and republic of Hungary (hereinafter called "the Parties") as a "joint investment". According to its Preamble, the barrage system was designed to attain "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".

The joint investment was thus essentially aimed at the:
- production of **hydroelectricity,**
- **improvement of navigation and**
- **protection of the areas along the protective dikes against flooding.**

At the same time, by the terms of the 1977 Treaty, the Contracting Parties undertook to ensure **that the quality of water in the Danube was not impaired** as a result of the Project, and that compliance with obligations for the **protection of nature** arising in connection with the construction and operation of the System of Locks would be observed.

The 1977 Treaty provided for building of two series of locks, one at Gabčíkovo (in Slovak territory) and the other at Nagymaros (in Hungarian territory) to constitute "a single and indivisible operation system of works".

IV.4. Present stay

Based on Judgment of International Court of Justice (25 September 1997) **[30] the 1977 Treaty is remaining in force until terminated by mutual consent**. The 1977 Treaty is still in force and consequently governs the relationship between the Parties.

The **Gabčíkovo part** of the System with power plant has been in operation for fifteen years. Some measures have been and some others have not been realized yet.

The **Nagymaros part** of the system has not been built and navigation conditions have not been improved. The same is valid for environment; no measures were realized to improve state defined in governmental material **[36]** submitted to the Slovak-Hungarian Governmental delegation.

It is clear that the **Project is multipurpose project**; it is typical **water management project**, where the water management and water constructions are **integrating various objectives** including remediation of previous negative impacts upon natural biotops with energy production, navigation improvement act.

Based on Project single and indivisible nature in order to evaluate the environmental risks, to fulfil current European Standards and Directives, and to support the Policy of the EÚ the Slovak and Hungarian governmental delegations mandated Slovak party to prepare proposal of the **Strategic Environmental Assessment** on the whole area of the Gabčíkovo-Nagymars Project. This task is complicated and very complex by the fact that some technical works are completed and are already in operation, some are projected but not completed jet, and some are proposed or still under discussion. To solve this discrepancies this SEA proposal is based on the:
- **Conditions without the project.**
- **Existing state with partially completed and operated project.**
- **Projected state (**state, which should be reached by the project**).**
- **Any other feasible proposal.**

This proposal is using scientific reports, mainly **JOINT ANNUAL REPORTS** (Slovak-Hungarian annual reports) of the environment monitoring, according to the "Agreement between the Government of the Slovak Republic and the Government of Hungary about Certain Temporary Measures and

Discharges to the Danube and Mosoni Danube", Signed April 19, 1995 **[20, 21, 22, 23]**. The Proposal is using experience, reports and monographs related to the Project area **[24, 25, 26, 27, 28].**

This proposal, **to realize Strategic Environmental Assessment**, should help the Parties to find and agreed solutions that takes account of the objectives of the 1977 Treaty, which must be pursued in a joint and integrated way, as well as the Directives, norms, laws and policy of EU, and the law of international watercourses.

IV.5. Plans over the centuries

The Danube has always played a vital part in the commercial and economic development of its riparian States. The Romans excavated a canal to bypass the dangerous rapids in the Iron Gate section on the Lower Danube. Emperor Tiberius ordered the building of regulated banks and a towpath to facilitate the upstream passage of barges. Queen Mary, wife of Béla IV, had a new straight bed excavated for the Danube between Bratislava and Gönyü. However, the lowlands were permanently flooded. Conditions raising the level of agricultural production, development of industries, transport and urbanization were created by the various projects of river regulation, flood control and land drainage, improvements of the conditions of navigation over the Danube, were completed largely in the second half of the twenty century. Most of the landscapes, invoking the illusion of Nature undisturbed over the centuries have been shaped by human interference **[27, 28]**. Evidently, we are aware of the consequences, which such projects entailed. Thus large parts of the flood plain forest have been lost, inundation areas have been decimated **[27, 25]**, and millions of hectares of inundation have been added to arable lands.

V. Prudent and rational utilization of natural resources

Directive 2000/60/EC **[5, 67]** is establishing a framework for Community actions in the field of water policy. As set out in Article 174 of the Treaty **[1]**, the Community policy on the environment is **to pursue the objectives of preserving, protecting and improving the quality of the environment, in prudent and rational utilisation of natural resources [5, 67]** based on available scientific and technical data, environmental conditions and the economic and social development. This includes **integration of protection and sustainable management of water into other Community policy areas [5] and benefits [67]**. In this case it means at least:

- flood protection,
- renewable energy,
- navigation and transport,
- agriculture,
- mitigation of climate events and changes, reduction of emissions and glass house gasses,
- improvement of the water related quality of the environment, health and biodiversity of aquatic and terrestrial ecosystems,
- quality of life, tourism, water sport,
- human health through water related exposure, and other specific policy areas as for example water supply, decrease of anthropogenic greenhouse gas emissions, and others,
- lower costs for water uses, e.g. water supply, better water quality, reduced treatment and remediation costs, water for agriculture, and others,
- cost-effectiveness of water management and measures implementation and application,
- easier, cheaper and technically better river basin management of the Danube stretch,
- promotion of sustainable uses, and others.

The same objectives are the objectives of the Treaty 1977 **[31]** and the objectives of the Judgment of the International Court of Justice **[30].**

Directive 2004/101/EC **[12]** (amending Directive 2003/87/EC **[13]**) provides **guidance for the environmental evaluation of hydroelectric power generation** as a potential source of renewable and waste-less electric energy. According to Directive 2004/101/EC **[12], criteria and guidelines** that are relevant **to considering whether hydroelectric power production projects have negative environmental or social impacts** have been identified by the World Commission on Dams in its November 2000 Report **"Dams and Development – A New Framework for Decision-Making" [11]**, by the OECD and by the World Bank. In chapter 8, Strategic Priority 3, Addressing Existing Dams, there are ideas about comprehensive monitoring and the evaluation process, optimisation of benefits, and the effectiveness of environmental mitigation measures. A range of monitoring based measures to enhance and restore the Danube River inundation ecosystems is published **[25, 27]** and further described in the following chapters**.**

According to Decision 884/2004/EC **[14],** taking into account the objectives for the development of a **Trans-European transport network**, the priorities (related to the Danube section Bratislava – Budapest, covered also by the international Treaty 1977 **[31]** and confirmed by the Judgement of the International Court of Justice **[30]**) shall be:

- elimination of bottlenecks, especially in their cross-border sections and cross natural barriers (e.g. river fords),
- promotion of long-distance, short sea and inland shipping,
- integration of safety and environmental concerns in the design and implementation of the Trans-European transport network

When transport projects are planed and carried out **[13]** environmental protection must be taken into account by the Member States by carrying out, pursuant to Council Directive 85/337/EEC **[4]**, environmental impact assessment of projects of common interest which are to be implemented and by applying Council Directive 79/409/EEC **[3]** on the conservation of wild birds (amended by Regulation (EC) No 807/2003) and 92/43/EEC **[2].**

V.1. Water resources and water regime

Water resources are sources of water that are useful or potentially useful to humans. It is important because it is needed for life to exist. Many uses of water include municipal water supply, agricultural water supply, industrial use including energy production, water for recreation and sport, navigation, and as the life for the whole nature. In this case water resources are surface and ground waters in the area of the Danube River from Bratislava to Budapest.

Although the only natural input to any surface water system is precipitation the total quantity of water in the area at any given time is dependent on many other factors. These factors include storage capacity in ground water, lakes, wetlands and artificial reservoirs, the permeability of the soil and aquifer, recharge, the runoff characteristics of the land in the watershed, the timing of the precipitation and local evaporation rates. All of these factors also affect the proportions of water lost through discharge to the oceans, evaporation and sub-surface seepage. This all together, as a function of time, is called water regime. Water regime is monitored and described in many publications mentioned in References.

V.2. Water energy – hydroelectricity

The first dam, the Kachlet dam, inaugurated in 1927, was followed by more than 30 similar projects. Professionals have located approximately 47 potential sites on the Danube for harnessing renewable and waste-less hydro-energy. In the 1977 Treaty Projected production of electric energy in an average year and continuous production based on hydro energetic potential is at least 4020 GWh (see following Table).

Tab I. Projected production of hydroelectricity on the Danube stretch Bratislava - Budapest

Danube stretch	Power station	Average projected production GWh annually
Bratislava-Sap	Gabčíkovo	2980
Sap -Budapest	Nagymaros	1040
Sum total	**Gabčíkovo + Nagymaros**	**4020***

* continuous production in an average year

V.3. Navigation and transport

Following the inauguration of the Danube-Main-Rhine Canal, the Danube is the Eastern backbone of the 3500 kilometres long transcontinental waterway linking the Black and North Seas.

The first basic stage of river regulation and flood control development was realised between 1759 and 1914. The main straightened navigation channel, which has been in use ever since, was created by regulation, started in 1831 and completed in the last years of the 19th century. In spite of this about forty fords and gravel bars over the Bratislava-Gönyü stretch presented obstacles to navigation, as soon as the water level in the river drops below the mean stage. The Gabčíkovo part of the Project already solved the problems on this Danube stretch. Downstream towards Budapest, and especially at Dömös, a nightmare to the navigators of the Danube persisted.

The plans and the Project objectives are to create an international waterway with parameters that comply with the recommendations of the Danube Commission. The obstacles of navigation should be eliminated, carrying capacity increased, fuel demand cut down, combustion products decreased, the road partially transport shifted towards water transport, and navigation should be much more safe.

A large **improvement in navigation conditions on the Danube** between Bratislava and Budapest, planned in connection with the construction of Gabčíkovo-Nagymaros system of locks, creates the possibility to shift the transport balance by promoting the less polluting and energy saving Danube waterway from the Baltic to the Black sea. This means adding a transport decrease in CO_2 gas to the decrease caused by replacing fossil fuels with hydroelectric energy, into the bargain. However, this needs a better understanding and knowledge of the benefits and costs and investment needs in both hydroelectric energy and improving navigation conditions. (This means to produce hydroelectric energy and to save energy by using shipping transportation instead of road). However, this also needs EU policy support, to assess effects and effectiveness of different measures and policies, to increase the contribution of renewable and clean energy sources, and to help to fulfil the EU energy and climate change policy to meet the respective objectives **[40]**. Such an initiative is clearly stated as well in the Resolution of the European Industrial and Commerce Chamber **[41].**

What is not mentioned is, that one bottleneck on the Danube can considerable worsens the whole river transport effects and efficiency.

V.4. Agriculture and forestry

In Central and Northern Europe, in agriculture, there are expected higher temperatures, extending growing seasons. **Bad harvests could become more common** due to an increase in the frequency of extreme weather events (droughts as in 2003, floods as in 2002, storms, hail), and pests and diseases. The same is valid for forestry (storms, fire, pests, e.g. 2004, 2005). In the southern parts of Europe, drops in yield of up to 30 % are expected. Lack of irrigation water could significantly increase this drop of yield (e.g. year 2004, 2005) in some regions. Experience from Spain, France, Italy and Portugal shows that the first measure is reducing water consumption for watering, washing and agriculture.

In comparison with pre-dam conditions, installations and structures of the Gabčíkovo-Nagymaros hydropower stations project, completed at the Gabčíkovo step, make it possible to manage surface and groundwater, ground water recharge, the water supply of the Old Danube, Little Danube, Mosoni Danube river branch, the left and right Danube side inundation area, irrigation canals, and draining the surface and ground water, if necessary. For European agriculture this means some insurance to prevent large drops in yield because of extreme weather events and drought periods. **Management possibilities with the surface and ground water regime are the only immediate measure available against sudden climatic events,** mainly drought, floods, extreme temperatures, etc., in the municipal water supply, agriculture and forestry.

Similar management activities are possible downstream Gabčíkovo, for example at Komárno, Štúrovo, on the lower part of Ipeľ River, and more downstream.

V.5. Other sectors of the national economy

According to the 1977 Treaty and the Joint Contractual Plan piped water supply was to be provided to a number of villages, the sewer networks expanded, roads upgraded, and created for recreation and water sports. Consequently, the river dam project was regarded as the most important infrastructure development project in the region.

V.6. Protection of the areas along the protective dikes against flooding

River training brought number of benefits but did not eliminate floods in the past. Floods through breaches in protected and reinforced levees have devastated large parts of the Hungarian Szigetköz area in 1954 and of the Slovak Žitný ostrov area in 1965. **(Fig.7)** To save these areas Gabčíkovo structures have been build to split high flood discharges between the existing Danube riverbed (Old Danube) and the new constructed diversion canal (power canal), situated outside of the inundation area.

After the 2002 **damaging floods** along the Danube and Elbe rivers, protection against floods received greater awareness and involvement of the Commission of the European Communities **[37, 38]**. In communication **[38]** there is written, „Many Member States are already taking flood protection measures, but concerted and coordinated action at the level of the European Union would bring a considerable added value and improve the overall level of flood protection". This means the European Commission is giving flood protection higher priority. The need of higher priority was further confirmed in the spring 2006. Doing nothing is not a sensible option.

An example of coordinated action could be the area of the Danube between Bratislava and Budapest, where there are specific flood protection conditions. The Danube is flowing on the top of an alluvial fan consisting of very thick, coarse and high permeable gravel (**Fig.2**). Flood discharge in the Danube generally increases downstream until Bratislava **[39].** Crucial impulses to construct Gabčíkovo – Nagymaros System of Hydropower Plants and Locks were the catastrophic floods on the Danube in 1954 and 1965, when large areas on both the Hungarian and Slovak sides of the Danube were flooded. The main **integrated floodwater management** measures to be taken into consideration by the planning of the Gabčíkovo-Nagymaros structures were:

- To **lower floodwater levels** in the Danube (not to elevate protective dikes, they are already rising a great deal over the surrounding terrain).
- To **lower groundwater seepage and flooding of the area behind the protective dikes**, but to save a hydraulic interconnection between ground water and the Danube water.
- To **manage and divide flood peak progress velocity** with the goal of **reducing maximal flood discharge and water levels downstream**.
- To use the natural inundation between the flood-protective dikes on both sides of the Danube (floodplain) as a **temporary storage of floodwater** (as natural polder and as a control structure).
- To allow the **storage of floodwater in the alluvial aquifer** (via permeable reservoir bottom and flooding floodplain area).
- To cooperate with the reservoirs and hydropower stations on the **tributary river** Váh during flood events.
- To **maintain discharge capacity** of the Danube riverbed, including the inundation.
- Construction of the **second part of the project**, Nagymaros hydro energetic step, would further lower the flood peak downstream toward Budapest.

Some interesting results of the 2002 summer flood peak discharge along the Danube River are in the following table.

Tab II. Culmination of water levels and flow rates during the flood event in August 2002

Station River km	**Time of Culmination (day, hour.)**	**Maximal water level (cm)**	**Maximal Flow (m^3/s)**	**Difference from previous station (m^3/s)**
Bratislava-Devín 1879,78	16.8.2005 1 – 2	948	**10390**	
Bratislava 1868,75	18.8.2002 2 – 4	991	10310	-80
Medveďov 1806,30	17.8.2002 3 – 6	852	9240	Gabčíkovo -1070
Komárno 1767,80	17.-18.8.2002 22 – 1	842	8940	-300
Budapest	20.8.2002		**8250**	-690 + X
Difference Devín-Budapest				**-2140 + X**

X – flow rate of the Danube confluents between Bratislava-Devin and Budapest was approximately 300 – 400 m^3/s. Peak flow in Budapest was lower in comparison with Bratislava-Devín peak flow, taking into account confluents, by app. 2500 m^3/s.

New experience was the spring flood in 2006. Melting of extreme large snow masses caused high discharges of the Danube tributaries (Váh river 1500 m^3/s, Hron, Ipeľ 500 m^3/s each). Maximal flood discharge was therefore in Budapest higher as in Bratislava. High snow masses were laying in mountainous areas. It is lesson to revaluate Nagymaros project from its all water management functions (flood protection, navigation, energy production, revitalization of the river branches and nature protection, water supply, development of infrastructure and others).

However, flood protection is never absolute; only a certain level of protection can be reached **[4]**. The concept of residual risk should therefore be taken into consideration. That means **clearly define the design level of protection** to which the flood control structures might be reliable defended, or local conditions that might weaken it, and determine flood risks in the protected floodplain basin **[4]**. Build, maintain and rehabilitate, where necessary, dams, flood ways, bypassing channels, dykes and other flood-control works, hydraulic structures and other water construction works in order to ensure that they are safe and provide a sufficient level of flood protection **[4]**. Dam safety, the operation of dams during flood events and the legal framework concerning the operation of dams during flood events should be taken into consideration.

V.7. Protection of nature

"… protection and improvement of the environment, conservation of nature and the rational use of her resources are essential to the welfare of people and economic development of all nations …", Helsinki, August 1, 1975

The **objectives of the natural environment protection, in the Gabčíkovo-Nagymaros project case,** resulting from the objectives of the 1977 Treaty **[31]**, Judgment of the International Court of Justice **[30],** Agreement between the Government of the Slovak Republic and the Government of Hungary **[20],** Treaty establishing the European Community **[1]**, mainly Article 2 and 174, and other relevant Directives and documents are clearly stated.

Receptors of the protection are considered: air, surface and ground water, soil moisture, soil, fauna and flora, specific habitats and biodiversity, microclimate, agriculture, forestry, landscape, cultural heritage, population, human health, and others. Interrelationship between these factors, which are sensitive to the various changes among them, is very specific.

Monitoring, in general, is an activity of development observation of the **"receptors" and "factors"** described by "measurable parameters" of concern in magnitude, time and space. The monitoring and interpretation methods chosen should be those, which are available and best fitted in each case to seeing whether the assumptions made in the environmental assessment correspond with the environmental effects **[**see, for example, **23, 26, 27]**.

Monitoring has to cover the significant environmental effects, including negative, positive, foreseen and unforeseen effects. **Purpose of monitoring is** to enable the authority to **undertake appropriate water management and remedial actions**, and to help clarify and understand possibility of the future development.

V.8. Determination of the scope of monitoring

The basic step to design a monitoring system is to define what environmental effects the monitoring system needs to cover. In our case it is appropriate to focus on those environmental effects, which are relevant with respect to the implementation of objectives, for

example of revitalization or restoration of inundation area its river and river branch system. However, there are usually scientific difficulties in establishing a clear link between the project implementation and changes in the environment and there may be an obstacle to monitor all environmental effects. It is necessary to identify information needed for finding out the environmental impacts of project and for distinguishing which changes are not interconnected with the project, to establishing of the cause-effect link, i.e. to attribute a changes in environment, which may be influenced by various factors unambiguously to the project. In addition, environment can be monitored directly or indirectly. **The crucial point is to identify those data, which are relevant and representative for the project and data distinguishing between the project impact and impact of others events.** Usually it means, in addition, to monitor comparable areas not influenced by the project. In our case it means to monitor impact of already constructed part of the Gabčíkovo project structures; various protective measures, for example according to Agreements **[20];** and downstream area downwards to Budapest for following Strategic Environmental Assessment. The hierarchy of monitoring is as follows **[27]**:

Changes or redistribution in the flow rates and water distribution

- among the Old Danube, derivation canal, left side and right side inundation area and their river branches including Mosoni and Little Danube
- creation of artificial reservoir – through flowing lake – in the place of previous river and a part of inundation area.

Changes in surface water regime

- changes in flow velocities in surface water bodies,
- changes in water levels in water bodies
- changes in water level fluctuation in water bodies
- changes (general enlargement) of water bodies areas and water bodies banks
- changes in surface water quality and river bed composition

Changes in ground water regime

- changes in ground water levels and its fluctuation
- changes in ground water level depth
- changes in soil moisture
- impact on microclimate
- changes in ground water quality

Changes in biota

- changes and redistribution of aquatic flora and fauna
- changes and redistribution of terrestrial flora and fauna
- changes in soil properties

Changes in land use

- improvement of flood protection
- production of renewable and waste less energy
- improvement of navigation conditions
- improvement of water management possibilities
- impact on agriculture
- impact on forestry
- impact on tourism and recreation
- impact on water supply

Other aspects, which should be taken into consideration

- climate changes
- long term pre project natural and manmade changes (e.g. meandering, flood protection, navigation)
- present man made changes (e.g. roads, sport activities, irrigation, drainage, etc.)
- agricultural and forestry practices and activities, fishery
- comparison with areas not influenced by the project
- fulfilment of the project objectives (transport, energy, flood protection and others)

VI. Description of the project and plan

Project according to the valid 1977 Treaty is of multipurpose nature.

Flood control

- protection of areas behind flood protective dikes,
- protection of flood protective dikes by division of flood discharges,
- lowering of maximal discharges further downstream using natural inundation as a polder,
- integrated flood management (integration with river Váh basin).

Improvement of navigation:

- in the Danube between Bratislava and Budapest,
- between the Danube and the river Váh,
- entrance into the Bratislava harbour during low water stages.

Energy (more than 4000 GWh per annum) renewable and waste-less,

- continuous production,
- peak production,
- emergency production,
- management of frequency.

Water supply purpose

Water supply purpose of the Project and proposal is to:

- increase the ground water level on the large agricultural areas, areas of commercial forestry and the ground water levels in the inundation during the low water stages in the Danube,
- supply the Maly Danube and the Mosoni Danube with water,
- supply the water for the irrigation canals on the adjoined areas,
- supply the water into river branches and behind existing isles
- ground water recharge (support for municipal water supply, river bank wells)

Water management purpose

Water management purpose is mainly:

- preparation and construction of management tools
- preparation, testing and publishing of manipulation handling rules
- execution of water management using manipulation constructions and rules (discharges and water levels, flood protection, simulation of floods, etc.)

VII. SEA – NATURA 2000 – WFD integration

The **Gabčíkovo–Nagymaros System of Locks** is directly connected and necessary to the sites management for nature conservation and restoration of nature close inundation. Authorisation may be granted for integrated water and sites management. Considering the long time it will take to approve river basin plans NATURA 2000 sites and river basin management plans (WFD) are included into this SEA assessment. Consultation with Commission in this SEA process should be continuous.

NATURA 2000 network means not only conservation but also care of habitats and biotops. Management of the sites is a complex method with the spirit of integration of various tasks

involved. This involves **positive and proactive intervention** to promote biodiversity by maintaining or restoring certain habitats and species within the context of NATURA 2000 sites, **while taking into account**: economic, social, cultural and regional requirements, as a means to achieve sustainable development.

This part of document has been produced to provide **basic proposal for review the assessment** required by the **habitats directive** on the already realised project structures and to **carry out the assessment** on plans and not jet realised structures. In the same time, because water management is required and some changes in water regime are envisaged, the **Water Directive** is included with the aims at maintaining and improving the aquatic environment. **To integrate**: nature protection, water quality, sustainable water management into community policy (such as: energy, transport, agriculture, infrastructure, tourism, etc.); into overriding public interest (in this case: restoration of natural functional inundation with its typical biotops, protection of public health, flood safety) document "Dams and development, a new framework for decision-making" has been included.

Member states are obliged to designate eater basins and their management plans, taking into consideration the conservation of habitats and species on NATURA 2000 sites. It is not the best approach to managing NATURA 2000 sites, considering the long time it will take to approve river basin plans **[68].** Therefore all relevant Directives are integrated into this SEA proposal, regardless of the schedule of the WFD program.

The **Gabčíkovo–Nagymaros Project** area is directly connected to **the management of the site**. The management is prevailing of the water management type coordinated for the whole Danube stretch Bratislava – Budapest sector, which is geologically and morphologically the Danube basin called Danubian lowland in Slovakia and Little Hungarian Plain in Hungary. This is, in addition, **the Danube sector where the river basin management plan is required under the Article 13 of the Water Frame Directive.** Water management plan in this section should be supplemented by more detailed management plan dealing with particular aspects of water management in inundation area and areas protected by flood protection measures, including irrigation and drainage systems. This section is, an international river basin district. Hungary and Slovakia shall ensure coordination with the aim of **producing a single international river management plan** at this district of the 1977 Treaty (Water Directive Art. 13).

In this area there exist at least **imperative reasons** of overriding public interest relating to:

- beneficial consequences of primary importance for the environment of inundation,
- public safety related to flood protection and
- human health related to water quality and water born diseases.

VIII. SEA approach

VIII.1. Screening

a) Identification of previous processes and impacts.
b) Identification of present state.
c) Identification of impacts upon a Natura 2000 sites.
d) Identification of impacts upon sites related to Water Directive and to water protected areas (protected water economy area),
e) Determination of mitigation measures.

Screening assessment should be carried out in the absence of any consideration of mitigation measures that form part of a project or plan and are designed to avoid or reduce the impact of a project or plan on Natura 2000 site. (this is expressed in the point a)). Competent authority must first consider the project or plan in absence of envisageg mitigation measures (point b)) that are designed into a project. Effective mitigation of adverse effects can only take place once those effects have been fully recognised (point c)), assessed and reported. It will then be for the competent authority, on the basis of consultation, to determine what type and level of mitigation are appropriate (point e)).

VIII.2. Appropriate assessment

a) Assessment of impact on integrity of the NATURA 2000 sites.
b) Assessment of the impact on structures and function of the sites.
c) Assessment of the flood protection function of the inundation.
d) Assessment with respect to conservation objectives and restoration of typical inundation habitats and biotops, including specific nature close biodiversity.
e) Assessment of mitigation of some measures.

VIII.3. Assessment of alternative solutions

Assessment of alternative solutions (some technical works are completed and are already in operation, some are projected but not completed jet, and some are proposed or still under discussion):

a) Conditions without the project (continuation of pre-project condition.).
b) Project solution (realisation according to the Project, Project completion).
c) Nothing to do or zero solution (Present Project state and no continuation of works)
d) Other alternatives (alternative: Report of the Government of Hungary 1999 **[36];** Framework Agreement 1998 **[49]** or others).

VIII.4. Assessment of measures of imperative reasons

a) Assessment of beneficial consequences for the environment of inundation.
b) Assessment of public safety related to flood protection.
c) Assessment of public health related to water quality and water born diseases.

VIII.5. Assessment of measures to support the EU energy, transport, climate, development policy

a) Assessment of renewable and waste-less energy production.
b) Assessment of transport improvement.
c) Assessment of measures against sudden climatic events.
d) Assessment of sustainable development.

IX. Content of SEA

1. General identification of biotopes and possible changes (screening matrix)

1.1. Name of project or plane. Description of the project or plan

Description and maps of the area influenced by the Project. Definition of the area, present and previous long term development, geological, hydro-geological, geographical, hydrological conditions, river and river branches, ground water level, flow, quality, soil, soil moisture, natural and commercial forests, habitats, biotopes, fauna, flora. Realized measures, flood protection, natural resources, and use of the territory.

1.1.a. Gabčíkovo step

1.1.b. Nagymaros step

1.2. Description of the NATURA 2000 sites
Location of NATURA 2000 sites, maps, description of habitats, biotops, protected species, conditions to be protected or restored.
1.2.a. Gabčíkovo step
1.2.b. Nagymaros step

1.3. Description of protected water economy area
Maps and description of surface and ground water flow, quality and quantity. Localities of municipal waterworks, protection of surface and ground water.
1.3.a. Gabčíkovo step
1.3.b. Nagymaros step

1.4. Description of any direct, indirect or secondary impacts of the projects on the NATURA 2000 sites, protected water economy area, land-take, surface and ground water, soil and soil-moisture, agriculture, forestry, river and river branches, flood protection, navigation, climate and emissions, excavation requirements, transport requirement, duration of constructions, etc. Description of any other relevant facts.

1.5. Description of likely changes to the site arising as a result of reduction of habitat areas, disturbances to key species, habitat or specific fragmentation, reduction of species density, changes in key indicators of conservation value (as for example water quantity and quality, ground water levels, soil moisture. Description of climate changes measures.

1.6. Description of possible impacts on the NATURA 2000 sites, interference with the key relationship that defines the structure and the function of the site.

1.7. Provide indicators of significance in term of loss, fragmentation, disruption, disturbance, change to key elements of the site (e.g. water quality, level, moisture, etc.

2. Finding of no significant effects

2.1. Name of project or plan.

2.2. Name and location of NATURA 2000 site

2.2.a. Description of the project or plan with relation towards the NATURA 2000 site
2.2.b. Importance of the project or plan for the management of the NATURA 2000 site
2.2.b. Other projects affecting the NATURA site

2.3. Assessment of significance of effects
2.3.a. Description of how the project or plan is likely to affect the NATURA site.
2.3.b. Description why these project effects are not considered significant
2.3.c. List of agencies consulted, contact names and addresses, telephone, e-mail.
2.3.d. response to consultation

2.4. Data collected to carry out the assessment, Name or author, source of data, level of assessment completed, address where can the full results of assessments be accessed and viewed.

3. Mitigation measures

3.1. General overview of mitigation measures related between project or plan and NATURA 2000 sites.

3.2. List of NATURA 2000 sites and corresponding measures
3.2.a. NATURA 2000 site and corresponding measures
3.2.b. Explanation how the measures will avoid or reduce adverse effects on the integrity of the site
3.2.c. How and by whom the measures will be implemented.
3.2.d. NATURA 2000 site and corresponding mitigation measures
3.2.e. Evidence of the confidence in their likely success
3.2.f. Timescale of implementation
3.2.g. Proposal of monitoring items, interpretation, remedy measures and tailoring of the management measures

4. Assessment of the effects of the project or plan on the integrity of the site

4.1. Name and location of NATURA 2000 site
4.2. Elements of the project or plan that are likely to give rise to significant effects on the site
4.3. Conservation, protection, mitigation, restoration objectives of the site
4.4. Description of the affecting of key species and key habitats by the project, uncertainties and gaps in information
4.5. Description of site integrity affection 9los of habitats, disturbance, disruption, changes in water quality and quantity, etc. Estimate gaps and uncertainty in information
4.6. Description of mitigation measures which are to be introduce to avoid the adverse effect on integrity of the site. Estimate gaps and uncertainty in information
4.7. Results of consultation, Name of agency, description of results.

5. Assessment of alternative solutions ('do nothing' and others)

5.1. The ´do nothing´ alternative

5.1.a. Description of state, status and envisaged development of the 'do nothing' alternative
5.1.b. Predicted expected adverse effects of this alternative
5.1.c. Comparison with proposed (chosen) plan or project
5.1.d. Evidence of how the alternative 'do nothing' were assessed
5.1.e. Description of the relative effects on the conservation objectives of NATURA 2000

5.2. The other alternative solutions

5.2.a. Alternative name, description, locations
- I. Alternative one
- II. Alternative two
- III. Alternative three
- …

5.2.b. Alternative size, scale, dimensions, principle
- I. Alternative one
- II. Alternative two
- III. Alternative three
- …

5.2.c. Alternative means of meeting objectives (type of constructions, management, …)
- I. Alternative one
- II. Alternative two
- III. Alternative three
- …

5.2.d. Alternative methods of construction
- I. Alternative one
- II. Alternative two
- III. Alternative three
- …

5.2.e. Alternative operational methods
- I. Alternative one
- II. Alternative two
- III. Alternative three
- …

5.2.f. Alternative decommissioning methods and timescales
- I. Alternative one
- II. Alternative two
- III. Alternative three
- …

5.2.g. Conclusions on assessment of alternatives

6. Alternative solutions assessment statement

6.1. Description of alternative solutions minimizing significant negative impacts on the NATURA 2000 sites

6.2. Description why the proposed project or plan is favoured over the other alternatives

6.3. Overall statement on conservation and restoration, protection, general and special impact on the NATURA 2000 sites

7. Evidence of assessment of alternative solutions

7.1. Monitoring and data collections used for the assessment, monitoring organizations; assessment, publications and reports

7.2. NATURA 2000 sites and alternatives, consideration of adverse impacts

7.3. NATURA 2000 sites and alternatives, consideration of neutral and positive impacts

8. Compensatory measures

8.1. Identification of compensatory measures, alternatives, relation to the conservation objectives of sites
8.2. Estimation of compensatory measures from the points as: coherence of NATURA site, locality site, geological, hydro-geological, soil and other biotic conditions
8.2. Functions of compensatory measures and their relation to criteria of the original site
8.3. Demonstration and probability of compensation success

9. Consultation on compensatory measures

9.1. List of agencies and response to consultation
9.2. Compensatory measures considered acceptable, compensatory measures not considered acceptable, reasoning
9.3. Data used bay consultation of compensatory measures, source of data, reports, publications

IX.1. Conservation concept

For special areas of conservation, as the Danube inundation is, necessary conservation measures should be established. In this case, case of inundation, appropriate water management structures integrated into development plans, and water management plans, which correspond to the ecological requirements of natural habitat types and species on the sites, should be established. **Conservations concept in this case requires to restore natural habitats and corresponding populations of species, and to develop and include into operating rules such as water and soil moisture management regime, which would correspond to the original one, and thus support the long term process of nature close distribution, structure and survival of its typical species.**

For a natural habitat in the inundation (area between river and flood protective dikes) it means: the area of habitat is stable, ensured by protective dikes, the water and soil moisture is protected (managed) by corresponding technical structures and water management plan which is to continue to exist for the foreseeable future, in the contrary to the previous long term development.

For the species it means: the population dynamics of the specie concerned should indicate that it is maintaining itself on a long-term basis, the natural range of the species is expected to be stable in the future and there is and will probably continue to be habitat maintaining its population on a long term basis.

Careful monitoring of habitat (mainly water and ground water fluctuation, soil moisture) and the species (biota) concerned is necessary **to regulate and to tailor the water management** using corresponding structures.

The ecological requirements of natural habitat types and the species are described in National list of Proposed Protected areas of European significance.

IX.2. Management plan

1. Need of management plan

Management plan is required in the river basin under Article 13 of the Directive 2000. This river management plan is combined in sub basins and river sectors to deal with particular water related aspects as:

- flood protection, use of natural polder as the inundation is, flood protection measures,
- water supply of inundation during low water river stages,
- water quality management (flow, level fluctuation, flushing of river branches as a measure against colmatation (clogging) and eutrophication),
- water supply for natural and commercial forestry,
- water regime management for alluvial protected areas,
- water regime for ground water recharge and ground water quality ,
- use and maintenance of water management devices and installations.

2. Initialization and responsibility for the management plan

The **responsible body for the implementation of water management plan** in the framework of the WFD at national level is the Directorate-General Water (Water section) of the Ministry of Environment.

For the water management on the Gabčíkovo – Nagymaros System of Locks is responsible:

- during the development and operation of installations – Plenipotentiaries of the Slovak Republic and the Republic of Hungary for construction and operation of the Gabčíkovo-Nagymaros system of locks, and
- operator of the System according to the 1977 Treaty and the Judgement of the International court of Justice 1997.

3. Importance about the sites of the 1977 Treaty Project

Importance about the sites is in following facts:

- Nature close functional inundation area (valuable and specific biotops, flood protection abilities, NATURA 2000 sites, river branches, water quality and water and ground water levels, natural or nature close processes in inundation),
- Agricultural areas behind the protective dikes - the most important agricultural areas in Slovakia and Hungary (water supply and water for irrigation canals)
- Ground water of high quality - protected area (recharge of ground water),
- Prudent and rational and sustainable utilisation of natural resources

4. What do we want to achieve

Using water management plan and program we would like to achieve the objectives of preserving, protecting and improving the quality of the environment, in prudent and rational utilisation of natural resources [5, 67] based on available scientific and technical

data, environmental conditions and the economic and social development. This includes **integration of protection and sustainable management of water into**:

- flood protection,
- energy,
- transport,
- agriculture,
- improvement of the water related quality of the environment,
- tourism,
- public health,
- and other specific policy areas as for example water supply, decrease of anthropogenic greenhouse gas emissions, and others.

Management plan will be specially designed for the inundation area. The basic tool of the management plan is preparation of the nature close new meandering eupotamal from the main river branches and the recovery of **nature close water, ground water and soil moisture regime** using local hydraulic structures, regulating water levels and discharges in the inundation area.

Such complex management plan, including eupotamal and existing and new hydraulic structures would take into account the variable characteristics specific to each local site in the area of inundation and all foreseen activities.

5. How do we want to achieve it

The main tool should be the water management plan using water management structures.

6. Monitoring and evaluation

There exist Joint Slovak Hungarian Monitoring and experience with the data interpretation. This monitoring will be tailored to Community Directives and to the specific requirements of the Project area and Project activities.

7. How much will it costs

Costs - benefit relations will be estimated using benefits (energy production, improvement of navigation, flood protection, water for water supply, agriculture, tourism etc.) Part of the Project is ready and is operating. Some investments were already included into the 1977 Treaty.

X. Water Framework Directive 2000/60/EC

Water Framework Directive (WFD) **[5]** has integrated sustainable development of the Community and prudent and rational utilization of natural resources, using available scientific and technical data, environmental monitoring, taking into account regions environmental conditions, sustainable development, with the Community policy **[5, 67]** on the environment, using, where it is convenient, Basin water management.

The purpose, policy and objectives of the WFD **[5, 67]** is to establish a **framework for the protection of surface and ground water quality**, to prevent its deterioration, and where it is possible **to improve, and restore** the nature close (sometimes called background) water

quality. In the same time the goal is to mitigate the effect of floods and droughts (climatic events and changes) and ensure sufficient supply of water for all types of use.

The objective of the Slovak strategy in the 1977 Treaty Danube stretch is a complete and smooth **implementation of he WFD in the Slovak water management**. The following strategy should minimize the risk of an incorrect application of the WFD, which includes the mutual understanding of the technical and scientific issues that have to be tackled in the course of implementing of the WFD.

Main elements of the strategy in this stretch of the Danube are:

- Securing the **integrated implementation** of the WFD, other related EU Directives, the goals of the EU policy and rational utilization of natural resources in Slovak water management.
- **Integrating all important activities, including activities of the Construction and Operation of the Gabčíkovo-Nagymaros Project and System of related structures** to develop water management plans on the Slovak territory as required by WFD.
- Building of **human and technical capacities** for implementation and realization of WFD.
- **Sharing of information** (consultations with stakeholders) and informing the public in the implementation of the WFD and Plans and Programs and informing about the **results of the environmental Monitoring**.

For this reason working groups and teams of experts and monitoring staff have been established guiding and supporting implementation of WFD in Slovakia. Additionally to these working groups there exist the monitoring working group established according to the Agreement 1995 **[20]**. In this special case according to Minutes from negotiation of Governmental Delegations of the Slovak Republic and the Republic of Hungary on implementation of the Judgment of International Court of Justice in the case of the Gabčíkovo-Nagymaros System of Locks, held on 7 March 2007 in Bratislava [15] the Joint Slovak – Hungarian group for organization of SEA have been established.

X.1. Organization of WFD implementation in Slovakia

The responsible body for the implementation of the WFD at national level is the Directorate-General Water (Water section) of the Ministry of Environment. The Directorate is the national 'water director' in the sense of the WFD. The organization of the WFD implementation has been delegated to the Director of the Department of Water Policy and Planning under the Directorate-General Water. Technical Coordinator of WFD implementation is based at the Water Research Institute (VÚVH Bratislava).

Nine working groups in accordance with the Common Implementation Strategy of EU have been established. Their task is to collect, process and analyze relevant data and to report the results to the Technical Coordinator. Finally, the reports will be submitted to the EC in Brussels.

At present, for the work on implementation of the WFD, in the period 2006 / 2008 the following working groups have been established:

- Pressures and impacts on surface and protected areas.
- Heavily modified Water bodies.
- Typology, reference conditions and classification of water bodies.
- Managing the intercalibration network.
- Economic analyses.

- Monitoring.
- Ground Water.
- Geographical information system.
- Water quality – floods and droughts.
- Work with the public.
- Reporting.

X.2. Water Framework Directive 2000/60/EC – Common Implementation Strategy

In the framework of WFD set of helping and guiding technical documents has bee developed. Slovak experts are considering the documents as position documents on best practice agreed. We will use these documents in SEA process as methodical guidance documents and hope that we will find agreement by the Hungarian Party. Further, we are discussing some peculiarities of concrete environmental conditions related to Strategic Impact Assessment Water Framework Directive and the Water Management Plan.

The Common Implementation Strategy methodical and guidance WFD documents are **[51-64]**:

1. Economics and the Environment – *WATECO*
2. Identification of water bodies – *Water Bodies*
3. Analysis of Pressures and Impacts – *Impress*
4. Identification and Designation of Heavily Modified and Artificial Water Bodies – *HMWB*
5. Transitional and Costal Waters – Typology, Reference conditions and Classification Systems – *COAST*
6. Towards Guidance on Establishment of the Intercalibration Network and the Process on the Intercalibration Exercises – *Intercalibration*
7. Monitoring under the Water Framework Directive - *Monitoring*
8. Public participation in Relation to the Water Framework Directive – *Public Participation*
9. Implementing the Geographical Information System Elements – *GIS*
10. Rivers and lakes – Typology, Reference conditions and Classification Systems – *REFCOND*
11. Planning Process – *Planning Process*
12. The Role of Wetlands in the Water Framework Directive – *Wetlands*
13. Overall approach to the Classification of Ecological Status and Ecological Potential – *Classification*
14. Guidance on the Intercalibration Process 2004-2006 – *Intercalibration 2004-2006*

There are other guidance and publications relevant and useful to SEA preparation, for example about environmental objectives and exemptions [67].

1. Economics and the Environment – *WATECO*

The different economic elements should be well integrated in the policy decision and management. The economic elements are:

- Analyses of existing and potential water uses, impacts of water uses and pressures upon environment according to environmental objectives.
- Identification of potential measures and potential proposals.
- Justifying potential derogations.
- Identification of programs and possible measures.
- Implementation of programs and measures.

- Evaluation of impact of programs and measures proposed.

The first step is characterizing the river basin in term of economics of water use (energy, transport, water supply, other water services, uses and benefits). This means to prepare an economic analysis of current water use and their economic importance; to prepare an economic analysis of future trend and possibilities of water use and their economic importance and current cost-recovery levels of water use and services. Further details are in **[51]**.

The second step is identification of water bodies achievement or not achievement of environmental objectives. This means to identify the differences between the water status and the environmental objectives, to identify significant water management issues and to prepare the way for program of measures to address these issues.

The third step is support of the development of the **program of measures to be integrated in the river basin management plan** through cost-effectiveness analysis. This means to provide an economic input into the program of measures and help ranking possible measures based on cost effective criteria. In the same time it means economic support to the assessment of derogation and the assessment of potential impacts and financial implication of the program.

The primary objective of the economic analysis is to assess how important water is for the economy and socio-economic development of the river basin and to pave the way for the assessment of significant water uses and analysis of disproportional costs. In the case of SEA assessment all-important alternative solutions are at least:

- **Conditions without the project,**
- **Existing state with partially completed project,**
- **Projected state,**
- **Other proposal based on Water Management Plan.**

The socio-economic aspects and, in particular the **cost-effectiveness**, is a central part in the development for the program of measures.

In this sense the Guidance document [51] will be used by the Strategic Environmental Assessment.

2. Identification of water bodies – *Water Bodies*

Identification of water bodies has already been realized. Where necessary, water body identification should be **verified and refined** in the period before the publication of each river basin management plan. During SEA process it is foreseen monitoring, verification and refinement of the water body identification. Body of surface water means discrete and significant elements, defined by significant characteristics. States may identify surface water bodies using **additional criteria** designed to take account of local circumstances and therefore assist in the river basin management planning process. Discrete element of surface water should not contain significant elements of different status.

There exist “specific objectives” and “specific requirements” for the areas and water bodies covered by the WFD, described and dealt in various Directives. Typical example is Habitat directive **[2]** and Birds Directive **[3]**, NATURA 2000 protected areas, or flood protection measures, which all must be considered for an integrated river basin management plan.

In the Project area at least following **characteristic bodies** (not only water bodies), which could be significantly influenced by the water management, exist. These bodies should be taken into consideration in the SEA assessment process. The bodies are at least:

1. Nature close main river water body – eupotamal.
2. Meandering main river branches (Mosoni Danube, Maly Danube).
3. Through-flowing reservoir (at least deep and shallow part and isles for waterfowls).
4. River branches from paraplesiopotamal to plesiopotamal.
5. Dead successively overgrown river arms – wetlands.
6. Earlier meandering main river branches – originally natural eupotamal .
7. Artificial, straightened, fortified river water body.
8. Derivation canal.
9. Seepage canals.
10. System of irrigation and drainage canals.
11. Inundation area between the river and flood protective dikes.
12. Protected area behind the flood protective dikes .
13. Flood protecting dikes (inundation and biotop boundary and bio-barrier with specific species).
14. Protected areas (Nature 2000), other protected areas.
15. Isles in the Danube.
16. Closed (artificially) and partially closed water bodies behind the isles.
17. Ground water body inside of inundation.
18. Ground water body outside of inundation.
19. Gravel pits water body.

To each of these (not only water) bodies the (water management) environmental objectives could be described and applied. This is important not only from the Strategic Environmental Assessment but also from the goals of the WFD (all waters protection, modern water management, integration of environmental objectives) and with the compliance to the treaty establishing the European Community.

3. Analysis of Pressures and Impacts – *Impress*

This guidance addresses an impact of human activity on the status of surface waters and ground waters, which must be fully integrated with the economic analysis, for which Guidance has been prepared. The Guidance is dealing with the **Identification of pressures** and with the **Assessment of impacts**. The guidance is dealing with following pressures:

- Point sources of pollution.
- Diffuse sources of pollution.
- Effects of modifying the water flow regime.
- Morphological alterations.
- Any other pressures (must be defined and identified).

For ground water is described:

- Initial characterization.
- Further characterization.
- Review of the impact of human activities.
- Review of impact of changes in ground water levels.
- Review of the impact of pollution.

In general, in the SEA process, there is necessary to define for these bodies, additionally to the WFD specification:

- **drivers** (activity or process which may have an environmental effect),
- **pressures** (direct monitored effect of the driver),
- **states** (condition of the water bodies resulting from natural and anthropogenic factors),
- **impacts** (environmental effect of the pressure),
- **responses** (measure taken to improve the state of water body).

In WFD there is important identification of contemporary: Driving forces, Pressures, States, Impacts and Responses. In the SEA assessment it is important additionally to identify new or envisaged Driving forces arising directly or indirectly from the Plans or the Projects and their pressures, influence on states, impact on nature and possible or envisaged responses and protective measures. In the projects, for example water management projects, which should have in the same time beneficial consequences for the natural environment, (restoration and conservation of functional nature close protected area, e.g. inundation, with nature close eupotamal and functional river branches) it is necessary to forecast or to propose the remedy measures and management, and their responses. An example is in the following Table. This means that the WFD methods should be integrated into the SEA process and this without the real progress and timetable plan of WFD.

For protected areas, notably those designated as NATURA 2000 sites under the Habitats Directive, the requirement is to meet the water-related biological criteria of a particular habitat. This is the goal of the water management. The same is valid for wetlands, in this case for the inundation area.

Tab. III. Example of simplified identification of Drivers, Pressures, States, Impacts and Responses, which are necessary to analyze in the SEA assessment.

Water body	Driver	Pressure	State	Impact	Response
Nature close main river water body – eupotamal	Erosion, dredging in main riverbed	River bed decrease morphology changes	No qualitative or flow rate impact	Decrease of water level	Impoundment by some means
Meandering main river branches (Mosoni Danube, Maly Danube)	Erosion, dredging in main riverbed	Decrease of water level, discharge, connection to the main river	Decreased, partially interrupted discharge, rise of organic carbon and pollution concentration	Reduction of oxygen, increase eutrophication	Artificial water supply, or remediation of water levels in main riverbed
Through-flowing reservoir (at least deep and shallow part and isles for waterfowls)	impoundment	New water areas, shallow and deep, longer river-reservoir banks	Larger water body, smaller water level fluctuation	Increase of limnic organism, suitable breading and wintering conditions for water fowls	
River branches from paraplesiopotamal to plesiopotamal	Erosion, dredging in main riverbed	Decrease and interruption of water flow	Successive overgrowing process	Water stagnation, organic sediments, negative impact on ground water	Artificial water supply, or remediation of water levels in main riverbed. Dredging and deepening
Dead successively overgrown river arms - wetlands	Erosion, dredging in main riverbed	Drying up, desertification	Changes from vet to dry ecosystems	Grow of terrestrial vegetation, by floodplain forests	Artificial water supply, or remediation of water levels in main riverbed.

Water body	Driver	Pressure	State	Impact	Response
Earlier meandering main river branches – originally natural eupotamal	Closing of river arms, collection of water for navigation	Less water smaller flow rate	Loss of the natural eupotamal	Changes in all branches, sucsesive desetrification	Renewal of eupotamal by hydraulic measures
Artificial, straightened, fortified navigation river water body	Increased discharge and velocities, erosion				
Derivation canal	Artificial water body outside of inundation				
Seepage canals	Artificial water bodies outside of inundation	Clean water seeping from ground water	Nearly without nutrients. Close to the natural background waters		
System of irrigation and drainage canals	Artificial water bodies in agricultural land	Clean water seeping from ground water and water supplied from Danube			
Inundation area between the river and flood protective dikes	Long term water regime and water management changes	Drying process	Process of land drying. At some areas semi equilibrium using water management	Plant grow and algal grow. General long term changes	Water supply, flood simulation, impoundment in the main river, inundation complex water management
Flood protected area behind the flood protective dikes	Long term ground water level changes	Impact on agricultural production, and vice versa	Drying of soils	Change in production	Irrigation and drainage water management
Flood protecting dikes (inundation and biotop boundary and bio-barrier with specific species)	No significant changes of driving force				
Protected areas (Natura 2000), other protected areas	Water and ground water level changes, soil moisture changes	Drying of habitats	Decrease of water available for biota	Changes toward more hygrophobe species	Suitable water management
Isles in the Danube	Long term decrease of water level				
Closed (artificially) and partially closed water bodies behind the isles. River training	Long term decrees of water level, water pollution, sewage discharges	Not through flowing condition, water and sediment pollution	Increased sedimentation	Algal grow, Successive overgrowing process	Impoundment, dredging, cleaning from polluted sediments, opening of water bodies
Ground water body inside of inundation	Changes in ground water level				Impoundment of boundary conditions, water supply of river branches, cleaning of branches, flow regulation
Ground water body outside of inundation	Changes in ground water level, agricultural practices				Impoundment of boundary condition, general water management and ground water recharge
Gravel pit water body	Artificial water bodies, pollution	eutrophication		Water stagnation	Water in and outflow

4. Identification and Designation of Heavily Modified and Artificial Water Bodies – *HMWB*

Heavily Modified Water Body (HMWB) [54] is a body of surface water which as a result of physical alteration by human activity is substantially changed and designed as: navigation, water storage, power generation, water regulation and others important human development activities.

Artificial Water Body (AWB) means water body of surface water created by human activity.

The designation of HMWB and AWB is optional. Member states do not have to designate modified water bodies as HMWB or AWB. Where modified or artificial waters are not designated, the objective will be good ecological status. The designation of HMWB or AWB will not be an opportunity to avoid achieving ecological and chemical objectives, since Good Ecological Potential (GEP) is an ecological objective [54].

In the case of the SEA assessment it seems to be more convenient to designate real HMWB and real AWB and add a **Natural** (or better not substantially changed or **Nature Close Water Body**) **NCWB**, which is by WFD not prohibited. NCWB are chosen while they are of natural origin and they need some support by water management.

In the SEA assessments there are important **specific areas** or physical boundaries, as for example flood protective dikes and terrestrial areas as a whole. Dikes are physical boundaries and to some degree barriers between floodplain and agricultural land, and to some degree are supporting integration of protecting areas. Terrestrial areas are protected by habitat Directives **[2]** and Birds Directive **[3].** Specific area is the aquifer area. In this SEA proposal it is suitable to distinguish aquifer by the way of ground water flow towards a waterworks wells. In inundation area the flow towards wells is prevailing vertical (leakage), water quality is therefore not suitable for municipal water supply. Outside of the inundation the water flow is prevailing horizontal, water quality is therefore usually suitable for municipal water supply [43,44].

All water bodies designated as HMWB or AWB should reach "Good ecological potential" (GEP) and Good Chemical Status. Other water bodies should reach a "Good Ecological Status" (GES). GEP make allowances for ecological impacts resulting from physical alterations that are necessary to support a specified use or must be maintained to avoid adverse effects on the wider environment. This means that appropriate objectives can be set for the management of other pressures, including physical pressures, not associated with the specific use, while ensuring that the **adverse ecological effects of the physical alteration can be appropriately mitigated without undermining the benefits they serve [54]**. The environmental objectives for NCWB are high ecological status, and for HMWB and AWB are maximum ecological potential (MEP). The MEP is the state where the **biological status** reflects, as far as possible that of the closest comparable surface water body, taking into account the modified characteristics of the water body, see **Tab. IV**.

The **term "Inundation area"** in this content stand for specific wetland that is dependent on ground water, on water in river branches, and on flooding of largest part of the area during flood events. Area has a **specific function of natural polder** (storing of part of floodwater and carrying of some river discharges). This area is in the same time **nature protected** area. WFD is giving obligation to protect and restore the status of water and the Guidance on

wetlands **[62]** to **restore the nature of the inundation**. This should be included into water management plans.

Tab. IV. Characteristics of water bodies and important structures in the area for SEA assessment

No.	Water body	Characteristics	Remarks (examples)
1	Nature close main river water body – eupotamal	HMWB	Navigation and heavily fortified (Danube from Sap to Nagymaros)
2	Meandering main river branches	NCWB	Natural rive arm (Mosoni Danube, Maly Danube)
3	Through-flowing reservoir (at least deep and shallow part and isles for waterfowls)	AWB	Reservoir for: navigation, water storage and water energy production
4	River branches from paraplesiopotamal to plesiopotamal	NCWB	Natural slightly changed river arms (inundation from Čunovo to Sap}
5	Dead successively overgrown river arms – wetlands	NCWB	Natural slightly changed (Inundation from Čunovo to Sap)
6	Earlier meandering main river branches – originally natural eupotamal	NCWB	Natural slightly changed (Bodícke arm, Halrekesztö Duna arms)
7	Semi artificial, straightened, fortified river water body (Old Danube)	HMWB	Old straightened navigation canal known as Danube (Danube from Čunovo to Sap)
8	Derivation canal	AWB	Derivation canal for energy production, navigation canal. Outside of inundation
9	Seepage canals	AWB	Seepage canals along the derivation canal
10	System of irrigation and drainage canals	AWB	Canals outside of inundation
11	Inundation area between the river and flood protective dikes	Natural areas	Natural floodplain area mostly protected by NATURA 2000 (floodplain forest)
12	Protected areas behind the flood protective dikes	Natural areas	Natural areas protected by NATURA 2000 (e.g. Ostrov Kopác, Kraľovská lúka, Ostrovné lúčky, etc.)
13	Flood protecting dikes (inundation and biotop boundary and bio-barrier with specific species)	Artificial bodies and barriers	Physical boundary between inundation (natural polder) and flood protected mostly agricultural areas
14	Water management protected areas	Aquifer	Drinking water protected area of Žitný ostrov and of waterworks (e.g. Rusovce, Šamorin, etc.)
15	Isles in the Danube	Semi-natural	Táti-sziget, Nyaros-sziget, Radványi sz.
16	Closed (artificially) and partially closed water bodies behind the isles	NCWB or HMWB	Kis-Duna,
17	Ground water body inside of inundation	Natural aquifer	Prevailing vertical flow towards wells, leakage, not suitable for water supply
18	Ground water body outside of inundation	Natural aquifer	Prevailing horizontal flow towards wells
19	Gravel pit water body	AWB	Lake in inundation area, sometimes flooded

5. Transitional and Costal Waters – Typology, Reference conditions and Classification Systems – *COAST*

Transitional waters are bodies of surface water in the vicinity of river mouths which are partly saline in character as a result of their proximity to costal waters but which are substantially influenced by freshwater flows. Such waters are not present in the Project area.

6. Towards Guidance on Establishment of the Intercalibration Network and the Process on the Intercalibration Exercises – *Intercalibration*

Inter-calibration is process aimed at consistency and comparability of the monitoring system interpretation and classification results. Intercalibration in the WFD should established values

for the boundary between high and good status and between good and moderate status. Intercalibration is described in [**56** and **64**]. Artificial and heavily modified water bodies could be considered to be included in the intercalibration network, if they fit in one of the natural bodies selected for the intercalibration network. In the SEA assessment area all water bodies are of natural body types, from their composition and quality. Responsibility for the Danube (in this SEA stretch) belongs to the Eastern Continental (ICPDR) coordinator group. Results of intercalibration will be used for comparison of water quality of water bodies with and within the area of the Strategic Environmental assessment.

7. Monitoring under the Water Framework Directive - *Monitoring*

Methodology from this Guidance is an overall methodological approach and must be adapted to regional and national circumstances and need to be tailored to specific diversity circumstances in the river basin.

Criteria of Assessment System to ensure that ecological quality is reported to the Commission in a unit-less scale based on ratios of reference values are:

- An assessment on the **deviation** of observed conditions to those that would be normally found under **reference conditions.**
- Description of natural and artificial **habitat variations.**
- Description of the natural **variability** and variability arising from anthropogenic activities of quality elements in water-body types.
- Description of **interactions** between surface and ground waters.
- Detection of the **potential impacts** to enable a robust classification of ecological status.

Key principle is the comparison of **real observed conditions** with the **expected water management conditions** to **the reference conditions** (estimated or expected natural conditions).

Real observed conditions are present conditions estimated by monitoring under present water regime and habitat stay.

Expected water management conditions are conditions predicted under water regime and habitat by realization of modern water management and specific enhancing, protection and improvement measures.

Reference conditions are conditions expected to be under natural or nature close **habitat** conditions. (Habitat – usual natural place and conditions of growth, home)

Reference conditions in the river district or river stretch area are in addition the water qualitative and quantitative conditions (state) at the inflow and outflow of the river stretch, in this case the area of the 1977 Treaty and their segments (the Danube profiles: Bratislava, Sap, Szop Budapest).

Relative unit-less comparison of these conditions creates the assessment system. This is the check verifier of the WFD purpose which:

- Prevents further deterioration of water bodies, protect and enhances the status of water resources.
- Promotes sustainable water use.
- Aims at enhancing protection and improvement of the aquatic environment through specific measures.

- Ensures improvement of ground water quality.
- Contributes to mitigating the effects of flood and droughts.
- And others in accordance with other EU Directives.

Relative unit-less or percentage comparison is based on real measured monitoring data. In the SEA process the original data will be graphically presented and interpreted.

For the key actions that the Member States need to take is responsible, in Slovakia, **the Directorate-General Water (Water section) of the Ministry of Environment.**

In the framework of Strategic Environmental Assessment of the Gabčíkovo–Nagymaros Project all work done should be used and enhanced by specific National and Joined monitoring **[20],** data analysis and reporting. This could save the time and improve the River Basin Management Plan.

The central concept to the WFD **[57** chapter 1.8**]** is the **concept of integration** that is seen as key to the management of water protection within the river basin district.

Integration of environmental objectives in this SEA proposal in addition to the mentioned aquatic ecosystems and water bodies should be expanded to the whole inundation habitat and its terrestrial ecosystems in the area inside of inundation and areas outside of flood protective dikes. There is clearly stated importance for all water uses, functions and values into a common policy framework including water for economic sectors (in this case energy), transport (in this case navigation) flood protection etc. There is clearly described integration of all disciplines, analyses and expertise for achieving the environmental objectives of the WFD, except the political sciences and political disputes. Legislation shall be integrated into a common and coherent framework. Other Directives as for example Habitats Directive, Birds Directive, Nitrates Directive and others must be coordinated in the river basin management plans. There should be integrated all significant management and ecological aspects relevant to sustainable river basin management including those which are beyond the scope of the WFD such as flood protection, in this case water supply of inundation, energy production support of forestry and agriculture and others. Integration of wide range of measures, integration of different decision-making levels that influences water resources and water status for an effective management of all waters, in this case waters on the area of Žitný ostrov and Szigetköz. This all is integrated by Slovakia and Hungary by the 1977 Treaty and its Joint Treaty Project **[30, 31, 50]**.

Monitoring requirements

Monitoring requirements are described in Chapter 2 of Guidance Document 7 **[57]**. The methodology of monitoring must be adapted to regional and national circumstances. The objective of the monitoring is to establish an overview of water status and must permit classification of surface water bodies into one of five classes and ground water into one of two classes. The biological quality elements are supported by the assessment of physical (hydrology, hydraulics), chemical (geochemistry and hydro-geochemistry). Non-biological indicators should complement the use of biological indicators. **In the SEA area surface water level, ground water levels, hydro-morphological and hydraulic data are considered as drivers of the impacts on water and groundwater bodies**.

According to the WFD the water bodies are units to which the environmental objectives of the Directive must be applied. Because the SEA area is the inundation area and area behind the inundation, which is influenced by water regime, monitoring should include monitoring of

protected areas (NATURA 2000), water management protected areas and also generally areas, which are supposed to be under impact of the surface and ground water regime. Water regime is a dynamic process. Monitoring should be therefore enhanced by monitoring of processes. In this case: water regime, water oxygenation-reduction processes and succession processes of biota. Integrating monitoring for WFD and for SEA and EIA assessments should be tailored also for expected or envisaged measures of water management.

Delineation of ground water bodies should be realized on relation between surface and ground water. The main difference on ground water quality impact is by aquifer recharge. Therefore it is proposed, from practical reasons of eventual ground water use, to identify two ground water bodies: the first in the inundation area, the second in the area outside of inundation. **The first ground water body** is usually not suitable for municipal water supply in the area of SEA. Inundation area – flood plain – is in this case special wetland area with specific function of natural polder, specific and characteristic biodiversity and specific management. Most part of it is NATURA 2000 protected area. Inundation includes terrestrial parts. **The second ground water body** is usually suitable for municipal water supply. Monitoring of protected areas outside of inundation **[57]** include the water bodies used (or protected for) abstraction of drinking water and protected areas under the Habitats **[2]** and Bird **[3]** Directives**.** Additional Directives are quoted and described their use in **[57].**

In the Guidance Document No. 7 **[57]** there is complete description of water bodies monitoring methodology and related subjects. Proposal is to follow this Guidance.

Monitoring and data collection of the SEA area are based on Joint monitoring **[20]**, monitoring in the framework of the Danube "Boundary Waters" and national monitoring in Slovakia and Hungary. Monitoring description and results are described in publication **[27].** Publication is attached to this document and can be find, together with other documents, on the web side www.gabcikovo.gov.sk**.**

Intercalibration (task of the European Commission) means comparability of biological (including physical and chemical) monitoring results. Sites should be selected by expert judgment. In the area Bratislava – Budapest, in the SEA process, SEA specific "intercalibration" should be realized at typical places with the purpose to define the boundary between different qualitative statuses, in the case of SEA at least at Bratislava, Sap, Szop and Budapest. Surveillance monitoring is specified for bodies at risk or which cross a boundary between Member Stares. In this case it is at Čunovo-Dunakiliti and Szop. For ground water it is at Čunovo – Rajka.

Quality elements to be monitored are described in the separate proposal.

8. Public participation in Relation to the Water Framework Directive – *Public Participation*

Methodology of public participation in relation to the WFD is described in **[58]**. Three basic forms are mentioned: Information supply, consultations and active involvement of public. River basin management plan and Strategic Environmental Assessment of Plans and Projects are close related and mutually integrated. Therefore the Document "Public Participation in Relation to the Water Framework Directive" **[58]** will be used for the SEA realization.

9. Implementing the Geographical Information System Elements – *GIS*

The Guidance document **[59]** focuses on the thematic content and technical specifications for the GIS layers. This guidance makes suggestions for the best practices, especially for the reporting needs and formulates strategies. GIS methodologies are still under development; therefore in the SEA application it will be very convenient to discuss the GIS and reporting strategy with this Guidance.

10. Rivers and lakes – Typology, Reference conditions and Classification Systems – *REFCOND*

River and lakes typology, reference conditions and classification are the ecological basis for the SEA assessment. This Guidance document **[60]** will be used on the whole SEA stretch of the Danube.

11. Planning Process – *Planning Process*

The Guidance document "Planning process" **[61]** defines objectives and deadlines, which are compulsory for the Ministry of environment as a competent authority in order to achieve the requirements from the WFD.

This SEA assessment proposal will include the development of plan and project to integrate the Community policy on the environment with the policy and sustainable development of the Community and prudent and rational utilization of natural resources, using available scientific and technical data, environmental monitoring, regions environmental conditions and European Community Directives in the 1977 Treaty **[31]** area.

In general, this SEA assessment is dealing with the partially realized Project **[31]**. By dealing with and comparison of alternative solutions the water planning process, in this case the water management project, should develop a number of reasonable alternatives to consider economic, environmental, political and social impacts. Planning of water management and utilization of natural resources can help to approach complex problems, to organize thinking and to form the understanding necessary to strike that appropriate balance. In this process the Guidance Document "Planning process" will be a good helping tool by the SEA process assessment.

12. The Role of Wetlands in the Water Framework Directive – *Wetlands*

Wetlands are diverse, hydrological complex ecosystems, which tend to develop within a hydraulic and soil moisture gradient from terrestrial to mainly aquatic habitats. This is true especially **for inundation areas**, as in this SEA case. Wetlands are heterogeneous and mosaic like distinctive ecosystems, which develop naturally, or are the product of human activities.

The Danube, formerly dynamic river have become highly managed, single thread channel, isolated from the floodplain **[27 -** attached to this report**]**. The Danube is strongly regulated for navigation, regulated by weirs, dredging, flood protection dikes and embankments, straightened, and disconnected from its rive arms.

According to [62] "if the current specified uses of the water body (navigation, hydropower, water supply or flood defence) or the wider environment are significantly adversely affected by restoration measures required to achieve Good Ecological Status (GES), and if no other technically feasible and cost effective environmental option exist, then these water bodies may be designated as HMWB. The environmental objectives for such water bodies imply reaching Good Ecological Potential, which may represent a less stringent requirement than

achieving GES. In this special case of the Danube there is possibility of integrated approach to restoration methods by exploiting of possibilities given by existing present situation. These possibilities are described in [27]. Similar possibilities of nature restoration and positive effects on navigation, flood protection, and other profits and benefits exist on the lower stretch of the Danube. To study these possibilities should be the goal of the Strategic Environmental Assessment integration principle of the WFD water management. It is surely possible within the context of "restoration or creation of wetlands" to help to realize other beneficial objectives, described in **[30, 31]**.

In the area of SEA there exist long term monitoring and various studies. Examples could be find in the following complex publications [**21 – 28** and others].

Scope of the Guidance document "The role of wetlands in the Water Framework Directive" is fully conform with the goals of the SEA assessment. This Document will be fully integrated into the assessment.

13. Overall approach to the Classification of Ecological Status and Ecological Potential – *Classification*

This Guidance **[63]** provides general guidance on the assessment of **ecological status** and **ecological potential**. Member States should achieve adequate confidence and precision in classification, and to give estimates of the level of confidence and precision achieved in the River Basin Management Plans. The River management plan is included in this SEA assessment. It means to estimate and forecast the ecological status and potential according to planed and projected activities and measures for all alternative solutions. Using existing monitoring data when evaluating impact of existing technical structures and present water management can help this estimation. This guidance is useful and practical tool.

14. Guidance on the Intercalibration Process 2004-2006 – *Intercalibration 2004-2006*

The intercalibration process is aimed at consistency and comparability of the classification results of monitoring systems. Methodology of intercalibration can be also used by comparison of monitoring data from various localities.

XI. NATURA 2000 and its integration into the SEA process

For protected areas, notably those designated as NATURA 2000 sites under the Birds and Habitats Directive, the requirement is to meet the water-related biological criteria of a particular habitat. This is the goal of the water management. The same is valid for wetlands, in this case for the inundation area.

List of NATURA sites with: protection objects, area use and management, and negative impacts are in following Table (source: Štátna ochrana prírody Slovnskej republiky; WWW.sopr.sk). Protected areas are shown on **Fig. 8.**

Tab. V. List of NATURA sites

ID code **Name** **Remark**	**Reasoning of proposal**	**Site management, site use** (written in Slovak Language)	**Activities recognized having negative impact** (written in Slovak Language)
SKCHVU007 Dunajské luhy Birds Area of inundation between flood protective dikes	Selected species: *Haliaetus albicilla, Egretta garzeta, Milvus migrans, Ixobrychus minutus, Larus melanocephalus, Sterna hirundo, Alcedo atthis, Anas querquedula, Tringa totanus, Netta rufina, Anas strepera, Mergus albellus, Aythya fuligula, Aythya ferina, Bucephala clangula*. Other species: Ostatné druhy: *Anthus campestris, Ciconia nigra, Circus aeruginosus, Riparia riparia*	Simulácia inundačných procesov. Ponechávanie mokradí, rašelinísk a statických vodných plôch bez výsadby drevín. Revitalizácia tokov, obnova prívodných kanálov, mŕtvych ramien za účelom zavodnenia mokraďových biotopov. Uplatňovanie pôvodných druhov drevín pri obnove brehových porastov. Regulovanie hladiny podzemných vôd, opatrenia na udržanie primeraného vodného režimu (vysokej hladiny podzemnej vody) Špeciálny manažment lúk – kosienok a plôch popri starom koryte Dunaja prispôsobený protipovodňovej ochrane. Postupne eliminovať zastúpenie nepôvodných druhov drevín. Zachovať alebo cielene obnoviť pôvodné druhové zloženie lesných porastov. Zvyšovanie podielu prirodzenej obnovy. Ponechávanie stromov a drevnej hmoty v porastoch. Jemnejšie spôsoby hospodárenia lesa a ich formy. Zvyšovanie rubnej doby. Odstraňovanie sukcesných drevín, prípadne bylín a vyhrabávanie stariny.	Výkon rybárskeho práva . Jazda na vodných skútroch, člnoch. Neprirodzená manipulácia s vodnou hladinou. Umiestnenie zariadenia na vodnom toku alebo inej vodnej ploche neslúžiacej plavbe alebo správe. vodného toku alebo vodného diela. Budovanie a vyznačenie turistických chodníkov, náučných chodníkov, cyklotrás. Rozširovanie všetkých nepôvodných druhov živočíchov. Údržba brehových porastov (oprávnenie správcu toku), nad 1000 m dĺžky. Výrub krov, nad 500 m2 Rozširovanie inváznych a nepôvodných druhov rastlín. Stožiare, transformačné stanice,parkoviská a odstavné plochy. Účelové komunikácie. Výrub stromov, nad 80 stromov. Likvidácia brehových porastov holorubným spôsobom (oprávnenie správcu toku), nad 100 m dĺžky.

HUFH10004 Mosonská planina Birds	Selected species: *Otis tarda*	Lesné hospodárstvo, poľnohosp., ochrana prírody, vedecké účely, poľovníctvo	Výrub lesa, zvýšenie intenzity poľnohosp. výroby, odbery podzemnej vody.
HUFH30004 Szigetköz Birds **HUFH30004** Szigetköz Habitats	Selected species: *Nycticorax nycticorax, Milvus migrans, Circus pygargus* Other species: statné druhy:*Ardea purpurea, Ciconia nigra, Aythya nyroca, Porzana parva, Alcedo atthis, Asio flammeus, Dryocopus martius* - Alluvial forests: Mixes ash-alder forests (Lužné vŕbovo-topoľové a jelšové lesy) (91E0), Riparian mixed forests of *Quercus robur, Ulmus laevis* and *Ulmus minor, Fraxinus excelsior or Fraxinus angustifolia*, along the great rivers (Lužné dubovo-brestovo-jaseňové lesy okolo nížinných riek) (91F0), Alluvial meadows of river valleys of the *Cnidion dubii* alliance (Aluviálne lúky zväzu Cnidion venosi) (6440), Lowland hay meadows (Nížinné a podhorské kosné lúky) (6510), *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Bezkolencové lúky) (6410), Alkaline fens (Slatiny s vysokým obsahom báz) (7230) - *Cobitis taenia, Cottus gobio, Gobio albipinnatus, Gymnocephalus schraetzer, G. Baloni, Hucho hucho, Zingel zingel, Bombina bombina, Triturus dobrogicus, Emys orbicularis, Castor fiber, Microtus oeconomus* - *Apium repens*	Lesné hospodárstvo, rybárstvo, poľnohosp., ochrana prírody, vedecké účely, poľovníctvo, vodné hospodárstvo.	Vyrušovanie vtáctva, zvýšenie intenzity poľnohosp. výroby, cudzie druhy, problémy vodného hospod.
HUDI10002 Börzsönyské a Višehradské pohorie Birds	Selected species: *Aquilla heliaca, Dendrocopos leucotos* Other species: *Pernis apivorus, Falco cherugg, Bubo bubo, Picus canus, Dendrocopus medius, Dryocopus martius, Lullula arborea, Muscicapa collaris, Ficedula parva*	Lesné hospodárstvo, rybárstvo, poľnohospodárstvo.	Intenzivne lesné hospod., rozvoj infraštruktúry, vyrušovanie vtáctva, zanechanie alebo zvýšenie intenzity poľnohosp. výroby, rekreácia

SKUEV0017 Pri Orechovom rade Habitats	- Inland salt meadows (vnútrozemské slaniská a slané lúky) (1340); Panonic salt steppes and salt marshes (panónske slané stepi a slaniská) (1530)	Odstraňovanie sukcesných drevín, prípadne bylín a vyhrabávanie stariny. Pestovanie chránených druhov ex situ a posilňovanie populácií druhu v území (dosievanie), resp. transfer druhov. Oplotenie chráneného územia. Odstraňovanie inváznych druhov rastlín.	Rozširovanie inváznych a nepôvodných druhov rastlín. Skládky odpadu. Oplotenie pozemku, vypaľovanie stariny. Železničné, lanové a iné dráhy. Telekomunikačné, elektrické stožiare a transformačné stanice, siete. Športové areály. Výrub krov, nad 500 m2
SKUEV0067 Čenkov Habitats	- Panonic inland sand dune thicket with Junipero-Populetum albae }Panónske topoľové lesy s borievkou) (91N0), Xeric sand calcareous grasslands (Suchomilné travinnobylinné porasty na vápnitých pieskoch) (6120) - *Iris humilissubsp. arenaria, Colchicum arenarium, Pulsatilla subslavica, Proterorhinus marmoratus*	Zvyšovanie rubnej doby. Jemnejšie spôsoby hospodárenia a ich formy. Šetrné spôsoby sústreďovania drevnej hmoty. Zvyšovanie podielu prirodzenej obnovy. Zachovať alebo cielene obnoviť pôvodné druhové zloženie lesných porastov. Eliminovať zastúpenie nepôvodných druhov drevín Odstraňovanie sukcesných drevín, prípadne bylín a vyhrabávanie stariny. Odstraňovanie inváznych druhov rastlín	Rozširovanie nepôvodných druhov rastlín a živočíchov Výkon poľovného práva - lov zveri Pohyb mimo vyznačených chodníkov Výrub stromov, nad 80 stromov Výrub drevín pri cestných komunikáciách, nad 300 m dĺžky
SKUEV0069 Búčske slanisko Habitats	- Lowland hay meadows (Nížinné a podhorské kosné lúky) (6510), Vnútrozemské slaniská a slané lúky (1340) - *Apium repens, Proterorhinus marmoratus, Lutra lutra*	Kosenie a následné odstránenie biomasy. Opatrenia na udržanie primeraného vodného režimu (vysokej hladiny podzemnej vody). Odstraňovanie inváznych druhov rastlín. Odstraňovanie sukcesných drevín, prípadne bylín a vyhrabávanie stariny. Extenzívne prepásanie ovcami . Optimalizovať ekologické podmienky v bylinnej etáži.	Rozširovanie inváznych druhov rastlín uvedených v prílohe č. 2 vyhlášky. Rozširovanie nepôvodných druhov rastlín (s výnimkou druhov uvedených v prílohe č. 2 a 3 vyhlášky). Vypaľovanie stariny. Výrub stromov, nad 80 stromov.
SKUEV0076 Bokrošské slanisko Habitats	- Lowland hay meadows (Nížinné a podhorské kosné lúky) (6510), Inland salt meadows (Vnútrozemské slaniská a slané lúky) (1340) - *Lutra lutra*	Kosenie a následné odstránenie biomasy. Zasypávanie odvodňovacích kanálov. Odstraňovanie inváznych druhov rastlín. Opatrenia na udržanie primeraného vodného režimu (vysokej hladiny podzemnej vody). Odstraňovanie sukcesných drevín, prípadne bylín a vyhrabávanie stariny. Odstraňovanie zámerne vysadených drevín. Extenzívne prepásanie ovcami. Oplotenie chráneného územia.	Rozširovanie inváznych druhov rastlín. Rozširovanie nepôvodných druhov. Vypaľovanie stariny. Oplotenie pozemku. Skládky odpadu. Výrub stromov, nad 80 stromov. Výrub krov, nad 500 m^2.
SKUEV0077 Dunajské trstiny Habitats	- Natural eutrophic lakes with *Magnopotamion or Hydrocharition* type vegetation (Prirodzené eutrofné a mezotrofné stojaté vody s vegetáciou plávajúcich a/alebo ponorených cievnatých rastlín typu *Magnopotamion* alebo *Hydrocharition)* (3150), Riparian mixed forests of *Quercus robur*,	Ponechávanie stromov a drevnej hmoty v porastoch . Zachovať alebo cielene obnoviť pôvodné druhové zloženie lesných porastov. Eliminovať zastúpenie nepôvodných druhov drevín. Kosenie a následné odstránenie biomasy. Závlahové opatrenia za účelom regenerácie, revitalizácie	Rozširovanie inváznych a nepôvodných druhov rastlín. Vypaľovanie stariny. Neprimeraná manipulácia s vodnou hladinou. Vykonávanie činnosti meniacej stav mokrade alebo korýto vodného toku, najmä ich úpravu.

	Ulmus laevis and *Ulmus minor, Fraxinus excelsior or Fraxinus angustifolia*, along the great rivers (Lužné dubovo-brestovo-jaseňové lesy okolo nížinných riek) (91F0), Lowland hay meadows (Nížinné a podhorské kosné lúky) (6510) - *Bombina bombina, Microtus oeconomus mehelyi, Lutra lutra*	územia po zásahoch do vodného režimu. Opatrenia na udržanie primeraného vodného režimu (vysokej hladiny podzemnej vody). Revitalizácia tokov, obnova prívodných kanálov, mŕtvych ramien za účelom zavodnenia mokraďových biotopov. Odstraňovanie inváznych druhov rastlín.	zasypávanie, odvodňovanie, ťažba trstia, rašeliny, bahna a riečneho materiálu okrem vykonávania týchto činnosti v koryte vodného toku jeho správcom.
SKUEV0090 Dunajské luhy Habitats Area of inundation between flood protective dikes	- Natural eutrophic lakes with *Magnopotamion or Hydrocharition* type vegetation (Prirodzené eutrofné a mezotrofné stojaté vody s vegetáciou plávajúcich a/alebo ponorených cievnatých rastlín typu *Magnopotamion* alebo *Hydrocharition)* (3150), Riparian mixed forests of *Quercus robur, Ulmus laevis* and *Ulmus minor, Fraxinus excelsior or Fraxinus angustifolia*, along the great rivers (Lužné dubovo-brestovo-jaseňové lesy okolo nížinných riek) (91F0), Alluvial forests. Mixed ash-alder alluvial forests (Lužné vŕbovo-topoľové a jelšové lesy) (91E0) - *Cottus gobio*, *Aspius aspius*, *Gobio albipinnatus*, *Gobio kessleri*, *Gymnocephalus baloni*, *Hucho hucho, Gymnocephalus schraetser*, *Pelecus cultratus*, *Cobitis taenia*, *Proterorhinus marmoratus*, *Rhodeus sericeus amarus*, *Rutilus pigus*, *Sabanejewia aurata*, *Zingel streber*, M*isgurnus fossilis*, *Triturus dobrogicus*, *Bombina bombina*, *Microtus oeconomus mehelyi*, *Lutra lutra* a *Castor fiber*	Predĺženie obdobia na zalesnenie a zabezpečenie nového porastu. Jemnejšie spôsoby hospodárenia a ich formy. Šetrné spôsoby sústreďovania drevnej hmoty. Ponechávanie stromov a drevnej hmoty v porastoch. Zvyšovanie podielu prirodzenej obnovy. Zachovať alebo cielene obnoviť pôvodné druhové zloženie lesných porastov. Eliminovať zastúpenie nepôvodných druhov drevín. Optimalizovať ekologické podmienky v bylinnej etáži . Stráženie (napríklad. hniezd dravcov). Obnova zdroja potravy (zarybňovanie). Extenzívne prepásanie koňmi . Kombinovaná pastva. Kosenie a následné odstránenie biomasy. Závlahové opatrenia za účelom regenerácie, revitalizácie územia po zásahoch do vodného režimu. Opatrenia na udržanie primeraného vodného režimu (vysokej hladiny podzemnej vody). Simulácia inundačných procesov. Revitalizácia tokov, obnova prívodných kanálov, mŕtvych ramien za účelom zavodnenia mokraďových biotopov. Zasypávanie odvodňovacích kanálov. Prehrádzky na vodnom toku (z dôvodu zadržania vody v území, spevnenia nivelety dna a pod.). Odstraňovanie sukcesných drevín, prípadne bylín a vyhrabávanie stariny. Spaľovanie biomasy (napr. Trstiny počas zimy). Odstraňovanie inváznych druhov rastlín. Odstraňovanie zámerne vysadených drevín. Ponechávanie mokradí, rašelinísk a statických vodných plôch bez výsadby drevín.	Rozširovanie inváznych rastlín a nepôvodných druhov rastlín a živočíchov. Výkon poľovného a rybárskeho práva. Oplotenie pozemku. Let klzákom, Vypaľovanie stariny. Jazda na vodných skútroch, mot. Člnoch. Neprimeraná manipulácia s vodnou hladinou. Hospodársky odber vody. Umiestnenie reklamného zariadenia. Farmy zvierat. Prístavy, plavebné kanály a komory. Úpravy tokov, priehrad, rybníkov a ochranných hrádzí. Umiestnenie zariadenia na vodnom toku alebo inej vodnej ploche nesúžiacej plavbe alebo správe vodného toku alebo vodného diela. Umiestnenie vodného diela. Úpravne vody, čistiarne. Banské stavby a ťažobné zariadenia. Malé vodné elektrárne. Skládky odpadu. Zmena v užívaní stavby. Cesty, komunikácie, mosty, nadjazdy. Závlahové a melioračné sústavy. ropovody a plynovody, rozvody vody. Telekomunikačné a elektrické siete a vedenia, stožiare a transformačné stanice. Športové areály. Automobilové, motocyklové a cyklistické dráhy. Výrub stromov, nad 80 stromov. Výrub krov, nad 500 m**2**. Rekonštrukcie všetkých typov parkov.

		Zabezpečenie vhodných podmienok bioty. Úprava a budovanie nových hniezd, hnniezdnych biotopov. Ochrana, údržba a úprava priaznivého stavu súčasných a budovanie nových liahnísk pre obojživelníky. Pestovanie chránených druhov ex situ a posilňovanie populácií druhu v území (dosievanie), resp. transfer druhov. Uplatňovanie pôvodných druhov drevín pri obnove brehových porastov. Odstraňovanie nepôvodných druhov drevín pri údržbe brehových porastov. Zakladanie nových brehových porastov s uplatnením pôvodných druhov drevín. Usmerňovanie návštevnosti územia. Revitalizácia starých záťaží. Umiestnenie a výstavba lavičiek, chodníkov. Oplotenie chráneného územia.	Likvidácia všetkých typov parkov. Výrub drevín brehových porastov. Údržba brehových porastov (oprávnenie správcu toku), nad 1000 m dĺžky. Likvidácia brehových porastov holorubným spôsobom (oprávnenie správcu toku), nad 100 m dĺžky. Výrub drevín pri cestných komunikáciách, nad 300 m dĺžky. Likvidácia stromoradí a remízok. Výrub stromov na pasienkoch. Likvidácia opustených ovocných sadov a záhrad, nad 0,5 ha. Umiestnenie, výsadba a zloženie nepôvodných druhov drevín mimo ovocného sadu, vinice, chmeľnice a záhrady, bez limitu.
SKUEV0092 Dolnovážske luhy Habitats	- Alluvial meadows of river valleys of the *Cnidion dubii* alliance (Aluviálne lúky zväzu Cnidion) (6440), Riparian mixwd forests of *Quercus robur, Ulmus laevis,* and *Ulmus minor, Fraxinus excelsior* or *Fraxinus angustifolia* along the great rivers (Lužné dubovo-brestovo-jaseňové lesy okolo nížinných riek) (91F0) *- Lutra lutra, Spermophilus citellus, Rhodeus sericeus amarus, Zingel streber, Gymnocephalus baloni, Gobio albipinnatus*	Eliminovať zastúpenie nepôvodných druhov drevín tak aby sa zabránilo ich šíreniu na ďalšie lokality Zachovať alebo cielene obnoviť pôv. druh. zlož. lesných porastov Predlžovanie obnovnej doby Jemnejšie spôsoby hospodárenia a ich formy Kosenie a následné odstránenie biomasy 1 x ročne Extenzívne prepásanie hovädzím dobytkom Odstraňovanie inváznych druhov rastlín Odstraňovanie sukcesných drevín, prípadne bylín a vyhrabávanie stariny Odstraňovanie nepôvodných druhov drevín pri údržbe brehových porastov Zvyšovanie rubnej doby Úprava a budovanie nových hniezd a hniezdnych biotopov vtáctva	Rozširovanie inváznych druhov rastlín uvedených v prílohe č. 2 vyhlášky. Rozširovanie nepôvodných druhov rastlín (s výnimkou druhov uvedených v prílohe č. 2 a 3 vyhlášky). Výkon poľovného práva - lov zveri. Organizovanie spoločných poľovačiek. Vypaľovanie stariny. Ťažba ostatných nerastov. Diaľkové rozvody elektriny
SKUEV0093 Bodícky kanál Habitats Artificial seepage canal	- Lowland hay meadows (Nížinné a podhorské kosné lúky) (6510) *- Apium repens, Cucujus cinnaberinus*, *Rutilus pigus*, *Proterorhinus marmoratus*, *Misgurnus fossilis*, *Gymnocephalus baloni*, *Gymnocephalus schraetser*, *Cottus gobio*, *Cobitis taenia*, *Aspius aspius*, *Zingel streber* a *Rhinolophus hipposideros*	Obnova zdroja potravy (zarybňovanie). Kosenie a následné odstránenie biomasy. Odstraňovanie sukcesných drevín, prípadne bylín a vyhrabávanie stariny. Odstraňovanie inváznych druhov rastlín. Liahniská pre obojživelníky. Uplatňovanie pôvodných druhov a odstraňovanie nepôvodných druhov drevín pri obnove brehových porastov.	Rozširovanie inváznych druhov rastlín, nepôvodných druhov rastlín a živočíchov. Výkon poľovného práva . Zriadiť rybochovné zariadenie. Let klzákom. Jazda na vodných skútroch, mot. Člnoch. Vypúšťanie odpadových vôd. Účelové komunikácie, parkoviská.

		Umiestnenie lavičiek, chodníkov a pod.	Ropovody a plynovody, rozvody vody alebo pary telekomunikačné a elektrické siete a vedenia, stožiare a transformačné stanice. Športové areály.
SKUEV0099 Pavelské slanisko Habitats	- Inland salt meadows (Vnútrozemské slaniská a slané lúky) (1340)	Intenzívne prepásanie ovcami. Kosenie a následné odstránenie biomasy. Závlahové opatrenia za účelom regenerácie, revitalizácie územia po zásahoch do vodného režimu. Odstraňovanie sukcesných drevín, prípadne bylín a vyhrabávanie stariny. Odstraňovanie inváznych druhov rastlín. Revitalizácia starých záťaží. Opatrenia na udržanie primeraného vodného režimu (vysokej hladiny podzemnej vody). Zasypávanie odvodňovacích kanálov. Oplotenie chráneného územia. Odstraňovanie zámerne vysadených drevín. Pestovanie, transfer chránených druhov ex situ.	Rozširovanie inváznych druhov rastlín, nepôvodných druhov rastlín a živočíchov. Organizovanie spoločných poľovačiek. Oplotenie pozemku. Vypaľovanie stariny. Vzletové dráhy, pristávacie dráhy. Oplocovanie pozemkov. Terénne úpravy, ktorými sa podstatne mení vzhľad prostredia alebo odtokové pomery. Likvidácia drevín z dôvodu revitalizácie pasienkov, nad 1 ha. Umiestnenie, výsadba nepôvodných druhov drevín.
SKUEV0182 Číčovské luhy Habitats	- Riparian mixwd forests of *Quercus robur, Ulmus laevis,* and *Ulmus minor, Fraxinus excelsior* or *Fraxinus angustifolia* along the great rivers (Lužné dubovo-brestovo-jaseňové lesy okolo nížinných riek) (91F0), Alluvial forests: Mixed ash-alder alluvial forests (Lužné vŕbovo-topoľové a jelšové lesy) (91E0), Natural eutrophic lakes with *Magnopotamion or Hydrocharition* vegetation (Prirodzené eutrofné a mezotrofné stojaté vody s vegetáciou plávajúcich a/alebo ponorených cievnatých rastlín typu *Magnopotamion* alebo *Hydrocharition)* (3150), Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea unifloare and/or soeto-nanojuncetea (Oligotrofné a mezotrofné stojaté vody s vegetáciou tried *Littorelletea uniflorae* a/alebo *Isoeto-Nanojuncetea)* (3130) - *Cirsium brachycephalum*, *Graphoderus bilineatus*, *Cobitis taenia*, *Proterorhinus marmoratus*, *Misgurnus fossilis*, *Rhodeus sericeus amarus*, *Gobio albipinnatus*, *Umbra krameri*.	Jemnejšie spôsoby hospodárenia a ich formy. Ponechávanie stromov a drevnej hmoty v porastoch. Zachovať alebo cielene obnoviť pôvodné druhové zloženie lesných porastov. Eliminovať zastúpenie nepôvodných druhov. Zvyšovanie podielu prirodzenej obnovy. Kosenie a následné odstránenie biomasy . Opatrenia na udržanie primeraného vodného režimu (vysokej hladiny podzemnej vody). Opatrenia na zlepšenie kvality vôd. Revitalizácia tokov, obnova prívodných kanálov, mŕtvych ramien .za účelom zavodnenia mokraďových biotopov. Odstraňovanie inváznych druhov rastlín. Usmerňovanie návštevnosti územia. Uplatňovanie pôvodných druhov a odstraňovanie nepôvodných. drevín pri obnove breh. Porastov. Nové hniezda a hniezdne biotopy vtáctva.	Rozširovanie inváznych a nepôvodných druhov rastlín Výkon poľovného a rybárskeho práva. Vypaľovanie stariny. Manipulácia s vodnou hladinou. Budovanie a vyznačenie turistických chodníkov, náučných chodníkov, bežeckých trás, lyžiarskych trás alebo cyklotrás. Zmeny obytných objektov na rekreačné.

	Pelecus cultratus, *Rutilus pigus*, *Sabanejewia aurata, Aspius aspius*, *Gymnocephalus baloni*, *Bombina bombina* a *Lutra lutra*		
SKUEV0183 Veľkolélsky ostrov Habitats	- Riparian mixwd forests of *Quercus robur, Ulmus laevis,* and *Ulmus minor, Fraxinus excelsior* or *Fraxinus angustifolia* along the great rivers (Lužné dubovo-brestovo-jaseňové lesy okolo nížinných riek) (91F0), Alluvial forests: Mixed ash-alder alluvial forests (Lužné vŕbovo-topoľové a jelšové lesy) (91E0), Lowland hay meadows (Nížinné a podhorské kosné lúky) (6510) - *Cottus gobio*, *Zingel streber*, *Gymnocephalus baloni*, *Proterorhinus marmoratus*, *Sabanejewia aurata*, *Rhodeus sericeus amarus*, *Gobio uranoscopus*, *Gobio kessleri*, *Gobio albipinnatus*, *Bombina bombina*, *Lutra lutra* a *Spermophilus citellus*	Kosenie a následné odstránenie biomasy . Kombinovaná pastva a kosenie . Opatrenia na udržanie primeraného vodného režimu (vysokej hladiny podzemnej vody). Opatrenia na zlepšenie kvality vôd. Odstraňovanie inváznych druhov rastlín. Uplatňovanie pôvodných druhov a odstraňovanie nepôvodných drevín pri obnove breh. Porastov. Usmerňovanie návštevnosti územia. Nové hniezda a hniezdne biotopy vtáctva.	Výkon poľovného a rybárskeho práva - Vypaľovanie stariny. Manipulácia s vodnou hladinou. Výrub stromov na pasienkoch . Rozširovanie nepôvodných a inváznych druhov rastlín.
SKUEV0184 Burda Habitats	- Semi-natural dry grasslands and scrubland facies on calcareous substrates – important orchid sites (Suchomilné travinnobylinné a krovinové porasty na vápnitom podloží - dôležité stanovištia vstavačovitých) (6210), Pannonian-Balkanic tyrkey oak – sessile oak forests (Panónsko-balkánske cerové lesy) (91M0), Panonian woods with Quercus pubescens (Teplomilné panónske dubové lesy) (91H0), Panonic woods with *Quercus petrea* and *Carpinus betulus* (Karpatské a panónske dubovo-hrabové lesy) (91G0), Lowland hay meadows (Nížinné a podhorské kosné lúky) (6510) - *Echium russicum*, *Callimorpha quadripunctaria*, *Dioszeghyana schmidtii, Bolbelasmus unicornis, Cottus gobio*, *Zingel streber*, *Gymnocephalus baloni*, *Proterorhinus marmoratus*, *Sabanejewia aurata*, *Rhodeus sericeus amarus*, *Gobio uranoscopus*, *Gobio albipinnatus*, *Bombina bombina*. *Lutra lutra*. *Mvotis mvotis*. *Mvotis*	Zvyšovanie rubnej doby. Predlžovanie obnovnej doby. Predĺženie obdobia na zalesnenie a zabezpečenie nového porastu. Jemnejšie spôsoby hospodárenia a ich formy. Ponechávanie stromov a drevnej hmoty v porastoch. Zvyšovanie podielu prirodzenej obnovy. Zachovať alebo cielene obnoviť pôvodné druhové zloženie lesných porastov. Eliminovať zastúpenie nepôvodných druhov drevín. Kombinovaná pastva a kosenie. Odstraňovanie sukcesných drevín, prípadne bylín a vyhrabávanie stariny. Odstraňovanie inváznych druhov rastlín. Elimináciu vplyvu nepôvodných druhov na pôvodnú faunu. Usmerňovanie návštevnosti územia.	Rozširovanie nepôvodných druhov živočíchov. Výkon poľovného práva. Pohyb mimo vyznačených chodníkov Cesty, komunikácie, rozvody elektriny Skládky odpadu. Turistické, náučné chodníky, cyklotrasy. Zvýšenie ubytovacích kapacít. Výrub stromov, nad 80 stromov. Výrub krov, nad 500 m^2. Výrub stromov na pasienkoch.

	emarginatus, *Myotis bechsteini*, *Barbastella barbastellus*, *Rhinolophus hipposideros* a *Rhinolophus ferrumequinum*		
SKUEV0269 Ostrovné lúčky Habitats Revitalized fladplain forest area due to increase of ground water	- Riparian mixwd forests of *Quercus robur, Ulmus laevis,* and *Ulmus minor, Fraxinus excelsior* or *Fraxinus angustifolia* along the great rivers (Lužné dubovo-brestovo-jaseňové lesy okolo nížinných riek) (91F0), Alluvial forests: Mixed ash-alder alluvial forests (Lužné vŕbovo-topoľové a jelšové lesy) (91E0), Dry grasslands and scrubland facies on calcareous substrates (Suchomilné travinnobylinné a krovinové porasty na vápnitom podloží) (6210), Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* vegetation (Prirodzené eutrofné a mezotrofné stojaté vody s vegetáciou plávajúcich a/alebo ponorených cievnatých rastlín typu *Magnopotamion* alebo *Hydrocharition)* (3150) - *Cerambyx cerdo*, *Cucujus cinnaberinus*, *Lucanus cervus*, *Leucorrhinia pectoralis*, *Cottus gobio*, *Zingel streber*, *Gymnocephalus baloni*, *Proterorhinus marmoratus*, *Rhodeus sericeus amarus*, *Gobio kessleri*, *Gobio albipinnatus*, *Bombina bombina*, *Triturus dobrogicus*, *Castor fiber* a *Myotis myotis*	Eliminovať zastúpenie nepôvodných druhov drevín. Zachovať alebo cielene obnoviť pôvodné druhové zloženie lesných porastov. Optimalizovať ekologické podmienky v bylinnej etáži (napr. presvetlenie znižovaním zápoja). Kosenie a následné odstránenie biomasy. Odstraňovanie sukcesných drevín, prípadne bylín a vyhrabávanie stariny. Odstraňovanie inváznych druhov rastlín. Odstraňovanie zámerne vysadených drevín. Usmerňovanie návštevnosti územia.	Rozširovanie nepôvodných a inváznych druhov rastlín a nepôvodných druhov živočíchov. Oplotenie pozemku. Let klzákom. Jazda na vodných skútroch, mot. Člnoch. Hospodársky odber vody. Cesty, komunikácie, ropovody a plynovody, rozvody vody alebo pary, rozvody elektriny, stožiare, transformačné stanice. Športové areály. Automobilové a cyklistické dráhy. Golfové ihriská. Turistické, náučné chodníky, cyklotrasy. Použitie zariadení spôsobujúcich svetelné a hlukové efekty. Prenosné stánky, prístrešky. Zábavné parky, parky, domy, hotely, chaty, kempingy, budovy. Oplocovanie pozemkov. Vykonávanie činnosti meniacej stav mokrade alebo koryto vodného toku, Terénne úpravy, ktorými sa podstatne mení vzhľad prostredia alebo odtokové pomery. Čerpacie stanice, telekomunikačné siete a vedenia. Umiestnenie, výsadba a zloženie nepôvodných druhov drevín. Likvidácia vetrolamov, protieróznych pásov, remízok, stromoradí. Výrub drevín pri cestných komunikáciách, nad 300 m dĺžky. Likvidácia brehových porastov holorubným spôsobom (oprávnenie správcu toku), nad 100 m dĺžky. Údržba brehových porastov (oprávnenie správcu toku), nad 1000 m dĺžky. Výrub drevín brehových porastov (žiadateľ nie je správcom vodného toku), nad 50 m dĺžky.
SKUEV0270 Hrušovská zdrž	- Through-flowing lake with deep and shallow habitats - *Lucanus cervus*, *Rutilus pigus*, *Cottus gobio*,	Stráženie (napríklad. hniezd dravcov). Obnova zdroja potravy (zarybňovanie). Opatrenia na zlepšenie kvality vôd.	Neprimeraná manipulácia s vodnou hladinou. Prístavy, plavebné kanály a komory. Úpravy tokov, priehrad, rybníkov a ochranných

Habitats Artificial water body	*Zingel streber*, *Gymnocephalus baloni*, *Proterorhinus marmoratus*, *Rhodeus sericeus amarus*, *Gobio kessleri*, *Gobio albipinnatus*, *Sabanejewia aurata*, *Gymnocephalus schraetser*, *Aspius aspius*, *Pelecus cultratus*, *Bombina bombina* a*Castor fiber*.	Zabezpečenie vhodných pobytových podmienok bioty. Usmerňovanie návštevnosti územia. Malé kolísanie hladiny vody počas hniezdenia vodného vtáctva.	hrádzí. Športové areály. Výkon rybárskeho práva - lov rýb. Jazda na vodných skútroch, mot. Člnoch.
SKUEV0293 Kľúčovské rameno Habitats	- Riparian mixwd forests of *Quercus robur, Ulmus laevis,* and *Ulmus minor, Fraxinus excelsior* or *Fraxinus angustifolia* along the great rivers (Lužné dubovo-brestovo-jaseňové lesy okolo nížinných riek) (91F0), Alluvial forests: Mixed ash-alder alluvial forests (Lužné vŕbovo-topoľové a jelšové lesy) (91E0), Natural eutrophic lakes with *Magnopotamion or Hydrocharition* type vegetation (Prirodzené eutrofné a mezotrofné stojaté vody s vegetáciou plávajúcich a/alebo ponorených cievnatých rastlín typu *Magnopotamion* alebo *Hydrocharition*) (3150) - *Rutilus pigus*, *Pelecus cultratus*, *Misgurnus fossilis*, *Gymnocephalus schraetser*, *Cottus gobio, Zingel streber*, *Gymnocephalus baloni*, *Proterorhinus marmoratus*, *Sabanejewia aurata*, *Rhodeus sericeus amarus*, *Gobio kessleri*, *Gobio albipinnatus*, *Bombina bombina*, *Lutra lutra* a *Castor fiber*	Revitalizácia tokov, obnova prívodných kanálov, mŕtvych ramien za účelom zavodnenia mokraďových biotopov. Závlahové opatrenia za účelom regenerácie, revitalizácie územia po zásahoch do vodného režimu. Zvyšovanie rubnej doby. Jemnejšie spôsoby hospodárenia a ich formy. Ponechávanie stromov a drevnej hmoty v porastoch (ojedinelo stojacich stromov, skupiny stromov a ležaniny). Zvyšovanie podielu prirodzenej obnovy. Zachovať alebo cielene obnoviť pôvodné druhové zloženie lesných porastov. Odstraňovanie inváznych druhov rastlín.	Manipulácia s vodnou hladinou. Výkon poľovného a rybárskeho práva. Let klzákom.
SKUEV0295 Biskupické luhy Habitats Revitalized floodplain forest area due to increase of ground water level and water supply	- Pannonian woods with *Quercus pubescens* (Teplomilné panónske dubové lesy) (91H0), Panonic woods woth *Quercus petraea* and *Carpinus betulus* (Karpatské a panónske dubovo-hrabové lesy) (91G0), Riparian mixwd forests of *Quercus robur, Ulmus laevis,* and *Ulmus minor, Fraxinus excelsior* or *Fraxinus angustifolia* along the great rivers (Lužné dubovo-brestovo-jaseňové lesy okolo nížinných riek) (91F0) - *Cerambyx cerdo*, *Lucanus cervus*, *Dioszeghyana schmidtii, Cottus gobio*, *Gymnocephalus baloni*, *Gobio kessleri*, *Bombina bombina* a *Castor fiber*	Ponechávanie stromov a drevnej hmoty v porastoch. Zvyšovanie podielu prirodzenej obnovy. Zachovať alebo cielene obnoviť pôvodné druhové zloženie lesných porastov. Eliminovať zastúpenie nepôvodných druhov drevín. Opatrenia na udržanie primeraného vodného režimu (vysokej hladiny podzemnej vody). Odstraňovanie inváznych druhov rastlín. Revitalizácia starých záťaží.	Skládky odpadu, ťažobné, geoterm. vrty Lomy a ťažba ostatného stavebného kameňa a nerudných surovín. Geol. Práce. Diaľnice. Miestne rozvody plynu, vody alebo pary. Spaľovne odpadu. Telekomunikačné, elektrické siete a vedenia. Umiestnenie reklamného zariadenia. Oplotenie pozemku. Výsadba pôvodných i nepôvodných druhov drevín Terénne úpravy, ktorými sa podstatne mení vzhľad prostredia alebo odtokové pomery. Poľnohospodárske budovy a sklady, skladovacie plochy, priemyselné budovy a sklady.

			Čerpacie stanice, budovy, penzióny, chaty, hotely,domy. Zábavné parky
SKUEV0393 Dunaj Habitats	- Alluvial forests: Mixed ash-alder alluvial forests (Lužné vŕbovo-topoľové a jelšové lesy) (91E0) *-Probaticus subrugosus, Callimorpha quadripunctaria*, *Eriogaster catax*, *Unio crassus*, *Anisus vorticulus*, *Theodoxus transversalis*, *Dioszeghyana schmidtii, Bolbelasmus unicornis, Rutilus pigus*, *Pelecus cultratus*, *Gymnocephalus schraetser*, *Cottus gobio*, *Zingel streber*, *Gymnocephalus baloni*, *Proterorhinus marmoratus*, *Sabanejewia aurata*, *Rhodeus sericeus amarus*, *Gobio kessleri*, *Gobio albipinnatus*, *Lutra lutra*, *Spermophilus citellus, Myotis myotis*, *Myotis emarginatus*, *Barbastella barbastellus*, *Rhinolophus hipposideros* a *Rhinolophus ferrumequinum*	Zvyšovanie rubnej doby. Predlžovanie obnovnej doby. Šetrné spôsoby sústreďovania drevnej hmoty. Jemnejšie spôsoby hospodárenia a ich formy. Ponechávanie stromov a drevnej hmoty v porastoch. Zvyšovanie podielu prirodzenej obnovy. Zachovať alebo cielene obnoviť pôvodné druhové zloženie lesných porastov. Eliminovať nepôvodné druhy drevín. Opatrenia na udržanie primeraného vodného režimu (vysokej hladiny podzemnej vody). Opatrenia na zlepšenie kvality vôd. Revitalizácia tokov, obnova prívodných kanálov, mŕtvych ramien za účelom zavodnenia mokraďových biotopov. Odstraňovanie inváznych druhov rastlín. Odstraňovanie zámerne vysadených drevín. Ponechávanie mokradí, rašelinísk a statických vodných plôch bez výsadby drevín. Zabezpečenie vhodných podmienok bioty. Zabezpečenie ochrany obojživelníkov v období migrácie. Udržovanie zimovísk obojživelníkov. Elimináciu vplyvu nepôvodných druhov. Odstraňovanie nepôvodných druhov drevín pri údržbe brehových porastov. Zakladanie nových brehových porastov s uplatnením pôvodných druhov drevín.	Rozširovanie nepôvodných druhov rastlín a živočíchov. Výkon poľovného a rybárskeho práva. Oplotenie pozemku. Let klzákom. Jazda na vodných skútroch, mot. Člnoch. Vypúšťanie odpadových vôd. Manipulácia s vodnou hladinou. Hospodársky odber vody. Lomy a ťažba. Prístavy, plavebné kanály a komory. Úpravy tokov, priehrad, rybníkov a ochranných hrádzí. Umiestnenie zariadenia na vodnom toku alebo inej vodnej ploche nesúžiacej plavbe alebo správe vodného toku alebo vodného diela. Umiestnenie vodného diela. Úpravne vody, čistiarne, elektrárne, skládky odpadu. Umiestnenie reklamného zariadenia. Mosty, nadjazdy, tunely, nadchody. Diaľkové ropovody a plynovody, rozvody vody alebo pary telekomunikačné a elektrické siete, turistické chodníky, cyklotrasy, kempingy. Čerpacie stanice. Vykonávanie činnosti meniacej stav mokrade alebo koryto vodného toku, okrem vykonávania týchto činnosti v koryte vodného toku jeho správcom. Oplocovanie pozemkov. Výrub drevín brehových porastov. Údržba brehových porastov.. Výsadba pôvodných i nepôvodných druhov drevín
SKUEV0395 Pohrebište Habitats	- Natural eutrophic lakes with *Magnopotamion* and/or *Hydrocharition* type vegetation (Prirodzené eutrofné a mezotrofné stojaté vody s vegetáciou plávajúcich a/alebo ponorených cievnatých rastlín typu *Magnopotamion* alebo *Hydrocharition*) (3150), Alluvial forests: Mixed ash-alder alluvial forests (Lužné vŕbovo-topoľové a jelšové lesy) (91E0)	Opatrenia na zlepšenie kvality vôd. Odstraňovanie inváznych druhov rastlín. Usmerňovanie návštevnosti územia. Revitalizácia tokov, obnova prívodných kanálov, mŕtvych ramien za účelom zavodnenia mokraďových biotopov. Opatrenia na udržanie primeraného vodného režimu (vysokej hladiny podzemnej vody). Liahniská pre obojživelníky. Zabezpečenie ochrany obojživelníkov v období migrácie.	Rozširovanie inváznych a nepôvodných druhov rastlín. Výkon poľovného a rybárskeho práva. Vypaľovanie stariny.

	- *Proterorhinus marmoratus*, *Emys orbicularis*, *Bombina bombina*, *Microtus oeconomus mehelyi* a *Lutra lutra*	Odstraňovanie nepôvodných druhov drevín pri údržbe brehových porastov. Nové hniezda a hniezdne biotopy vtáctva. Kosenie a následné odstránenie biomasy.	
HUDI20026 Údolie Ipľa Birds	- Zingel. streber, Gymnocephalus schraetzer, Barbus meridionalis		
HUDI20034 Dunaj a jeho inundácia Birds	- Zingel zingel, Z. streber, Gymnocephalus schraetzer, G. baloni,		
HUDI20039 Pilišské a Višehradské pohorie Birds			
HUDI20047 Szigetské piesky Birds			

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