

Ecological Restoration and Water System Development in the Protected Site and Floodplain Areas of Szigetköz in Hungary

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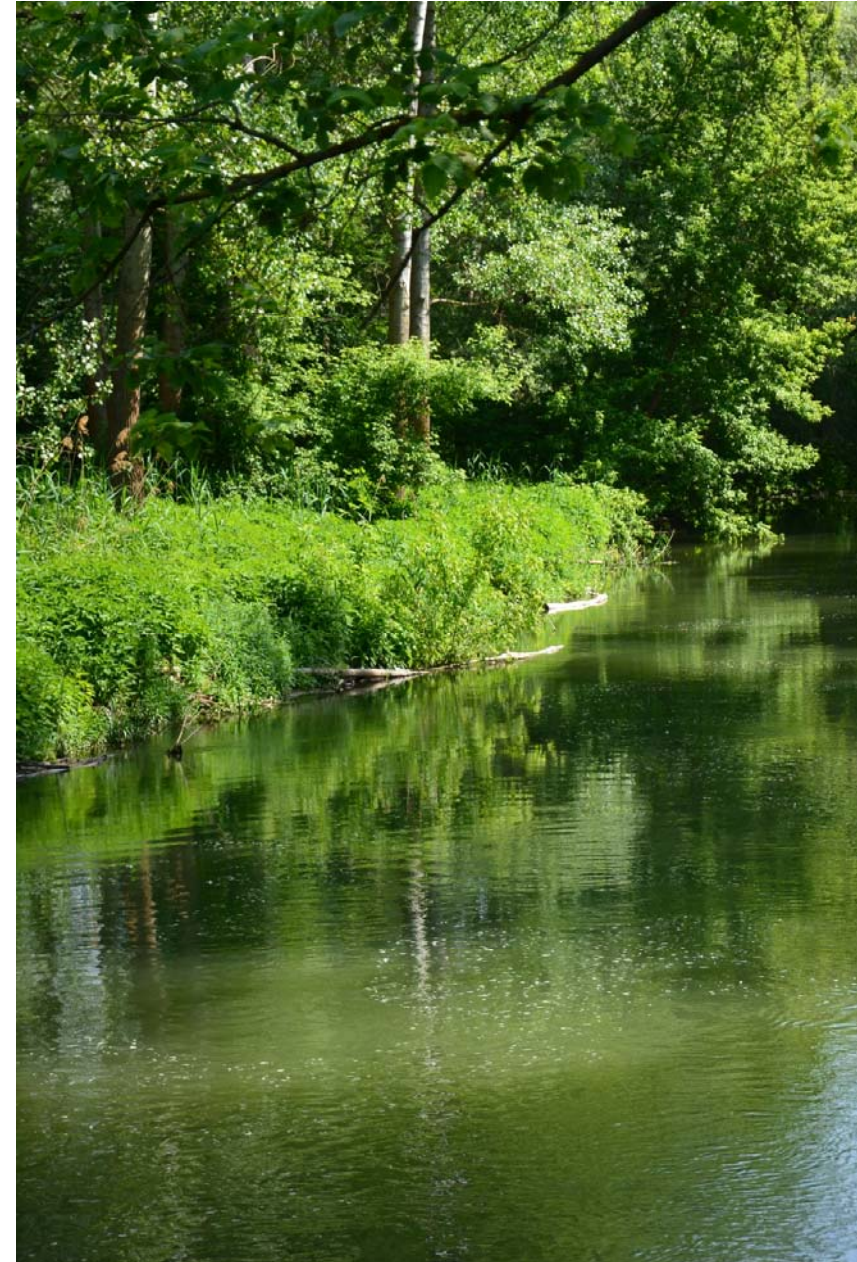
1. Introduction to Szigetköz

Szigetköz is the largest extension flood area of almost natural status left in the entire Upper Danube Valley in Hungary. The area of present Szigetköz sank in the Pliocene and became a vast flat basin, which was covered with a thick bed of gravels by the primeval rivers meandering here (Proto-Rába, Proto-Nyitra etc.) Entering into the Carpathian Basin the inclination of the Danube decreases, the flow gets slower and thus losing energy the river is unable to carry on its alluvium and makes deposits.

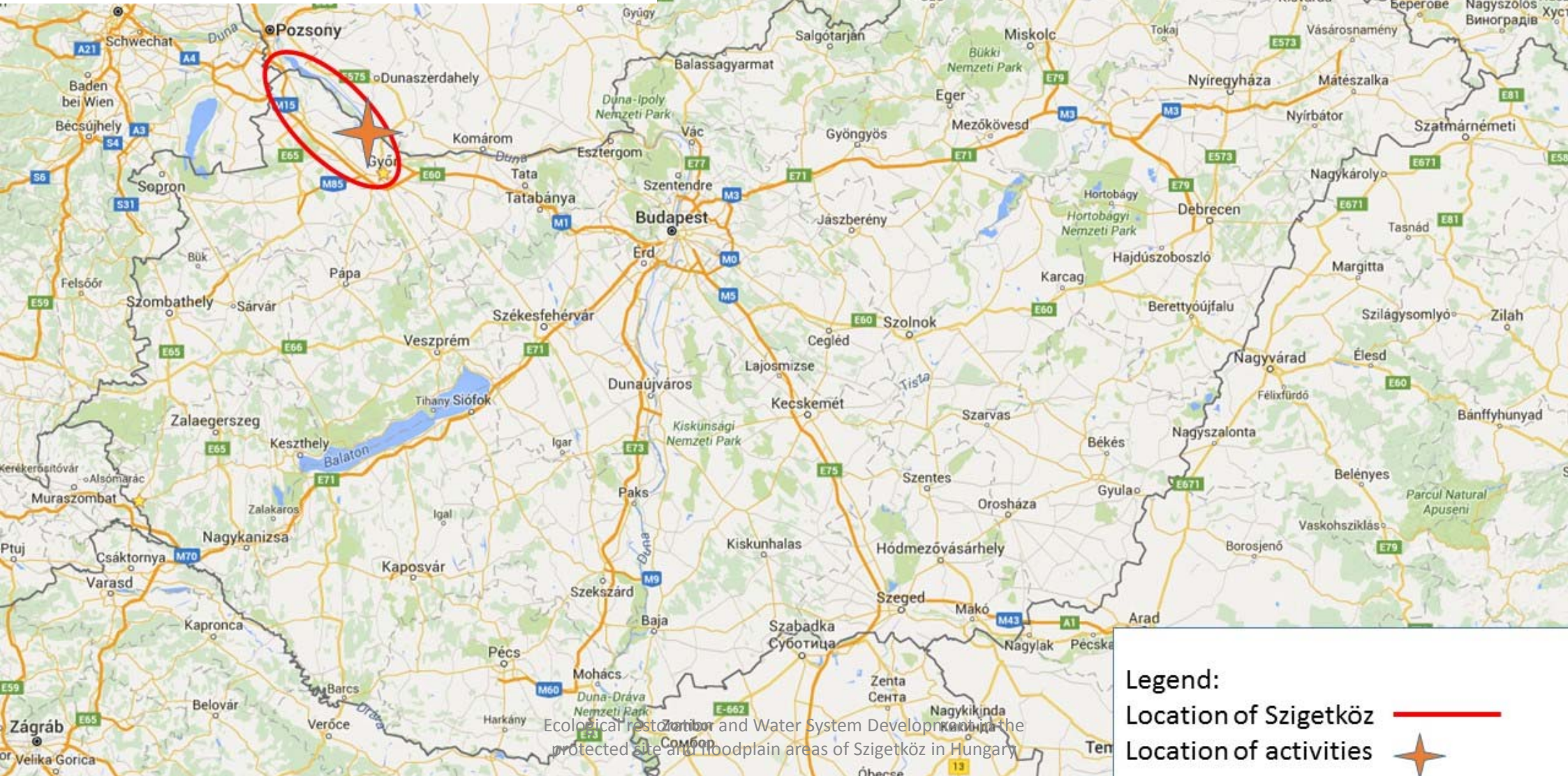
The landscape was characterized by continuously changing dead branches, beds changing their location, deteriorating and building islands and alluvial cones. The vegetation of the area settled on this animated scene trying to tie, to stabilize these islands and riverbanks with the roots of the plants. Man living here was always moving their settlements to a momentarily unflooded hill.

After the river regularization villages moved to the side free from flood, the flow of the main branch gathered speed, therefore the bed became deeper and distant dead branches received fresh water less and less often and siltation began. At the end of the twentieth century, the river barrage at Gabčíkovo accelerated this process, and the Szigetköz began drying out. The water replenishment system emerged in 1995 tries to counteract this unfavorable change. The still traceable exuberance of plant and animal communities were shaped by the combined effects of several environmental factors. The profusion of species of communities associated with water is still enriched by the fact that species belonging both to Alpine and Pannonian flora can be found in the area. Until the last centuries the mostly impenetrable vegetation of flood plains often served as a resort or a place of refuge for quite a few plants which remained here after the ice-age. Fauna of Szigetköz is also very interesting.

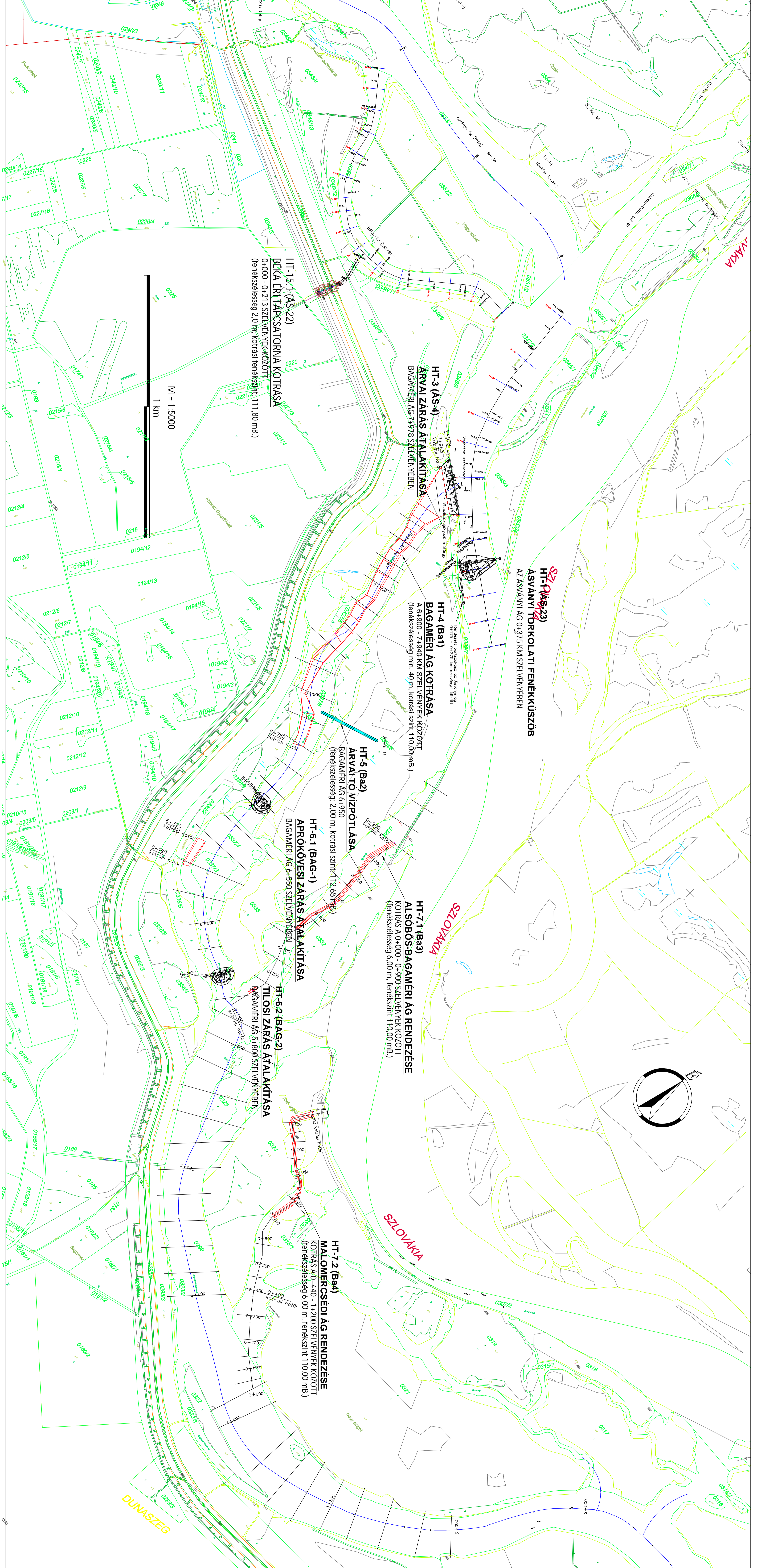
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2. The project location



3. The project's technical planning



<p>ESZAK-DUNÁNTÚLI KÖRNYEZETVÉDELMI ÉS VÍZVÉDELMI IGAZGATÓSÁG</p> <p>VÍZTERV</p> <p>SZIBENYKÖZ 2009 KONZORCIUM</p> <p>INNOVÁCIÓS RENDSZER</p> <p>PROJEKT NEVE: KÖRNYEZET- ÉS VÍZVÉDELMI TUDÁSI ÉS MŰKÖDÉSI VIZSGÁLAT SZIBENYKÖZ 2009 KONZORCIUM ÉS MŰKÖDÉSI VIZSGÁLAT KÖRNYEZET- ÉS VÍZVÉDELMI TUDÁSI ÉS MŰKÖDÉSI VIZSGÁLAT</p> <p>OBSEKVÁTOR Kulturális Kft.</p> <p>1171 Budapest, Anna utca 32</p> <p>Tel./fax: (1)212-9639 e-mail: observator@e-online.hu</p>				<p>T. TERVEZŐ:</p> <p>Hullámtérny vízpótlás</p> <p>Tenderterv</p> <p>M = 1:5000</p> <p>HELYSZÍNRAJZ 1.</p>		<p>MÉRETEZŐ:</p> <p>OK-337</p> <p>FIGYELŐ:</p> <p>TE-3-1</p>	
<p>Tervező igazgató: Farkas János</p> <p>Dr. Zsák Endre</p>	<p>Tervező mérnök: Herzig Ferenc</p> <p>Dr. Zsák Endre</p>	<p>Tervező mérnök: Herzig Ferenc</p> <p>Dr. Zsák Endre</p>	<p>Tervező mérnök: Farkas János</p> <p>Dr. Zsák Endre</p>	<p>Értékelő mérnök: Herzig Ferenc</p> <p>Dr. Zsák Endre</p>	<p>Dátum: 2010.08.31</p>		

4.1. Natural values – plants and habitats

Reed-grass associations live either tied to the bottom or floating on the quiet open water of dead branches and reed-bulrush-sedge associations can be found on the edges of low banks. There are scrub willows on the wet parts (on lower areas and on the wide banks), the soft wooded strip of willows-poplars is a bit higher, then hard wooded gallery forests, oak-ash-elm forests can be found on the drier areas.

In the willow-poplar strip there are alder groves or mixed alder groves at several places. The alder groves are often mixed with grey alder (*Alnus incana*) or fluttering elm at other places. These areas are often turned into an impenetrable jungle by the wild vine and patches of the otherwise rare black currant (*Ribes nigrum*) can often be found.

The European bird cherry *Prunus padus*, the great maple *Acer pseudoplatanus*, the wayfaring tree *Viburnum lantana*, the cornels *Cornaceae* and the hawthorn *Crataegus* grow in the hardwooded forests of higher areas, yellow anemone *Anemone ranunculoides*, ground-elder *Aegopodium podagraria*, the broad-leaved Solomon's-seal *Polygonatum latifolium*, the lily-of-the-valley *Convallaria* and several species of orchids *Orchidaceae* bloom at lower parts.

The flora in Szigetköz include 1010 species and 80 plant communities, of which 60 are natural, and 15 are of relic nature of outstanding value. The significance of the ecosystem of Szigetköz is also proved by the fact that 20% of all plant species and 30% of all animal species under protection in Hungary can be found here.

4.2. Natural values – fauna including birds

The fauna of Szigetköz reach of the Danube also houses a lot of things of interest. The presence of more than fifty species of fish have been proved, with typical mountain species like the rainbow-trout *Oncorhynchus mykiss*, as well as the ones characteristic of slow stagnant water e.g. the European loach *Misgurnus fossilis* and also other fish species were recorded as Balon's ruffe *Gymnocephalus baloni*, Schraetzer ruffe *Gymnocephalus schraetzer*, ziege *Pelecus cultratus*, streber *Zingel streber*, *Sabanejewia aurata*, and mammals root vole *Microtus oeconomus*, European otter *Lutra lutra* and rare European beaver *Castor fiber*.

The avifauna is astonishingly rich, masses of water-birds, small song birds and rare birds of prey are provided with habitat here – more than two hundred species of them live and hatch in Szigetköz. There are larger and smaller colonies of herons (with common herons *Ardea cinerea*, purple herons *Ardea purpurea*, little egrets *Egretta garzetta*, night herons *Nycticorax nycticorax*), the black stork *Ciconia nigra* nests in the more hidden places, several duck species (ferruginous duck *Aythya nyroca*, garganey *Anas querquedula*, shoveler *Anas clypeata*, mallard *Anas platyrhynchos*) can be seen on the water.

At national level, the project sub-site belongs to the important breeding places of black kite *Milvus migrans* and Montagu's Harrier *Circus pygargus*. A significant proportion of national populations breeds here little crane *Porzana parva*, common kingfisher *Alcedo atthis*, long-eared owl *Asio otus* and black woodpecker *Dryocopus martius*. The project sub-site is an important international migration corridor, especially for water birds. The project sub-site is important at regional level as breeding site of several bird species – mostly living in woods and at water: great cormorant *Phalacrocorax carbo*, common sandpiper *Actitis hypoleucos*, European honey-buzzard *Pernis apivorus*, middle spotted woodpecker *Dendrocopos medius*, collared flycatcher *Ficedulla albicollis* and spotted flycatcher *Muscicapa striata*.

5. Key considerations for the project development

5.1. River regulation

During the last 200 years massive changes have been carried out on the targeted section of the Danube; the main aims of these interventions have been navigation and flood protection. The formerly continuous large inundation area has been divided by flood protection dykes into a small inundation area along the main river bed and into a large area without regular floods. In consequence, the area outside the new inundation zone is isolated from the direct impact of floods, whereas in the new inundation area this impact even increased. Simultaneously with the building of dykes, the banks of the main river course have been fortified with stones, large deposits of gravel in the river have been dredged and numerous river branches have been cut away from the river. In consequence the formerly flowing river branches have stagnant water during the majority of the year, the river banks are stable, no new branches are being created and due to natural sedimentation the number and area of river branches is slowly decreasing. The reduced dynamic processes lead to reduction of several habitat types, e.g. shallow water areas, gravel banks or steep river banks.

5.2. Changed water levels

As a consequence of various activities, the average water levels in some parts of the project site have been changed (decreased). Locally this has led to drying of the disturbed areas. The most serious impact was on the wettest floodplain forests and shallow water bodies, in several cases large river branches or wetlands remained without surface water. Complete local extinction of aquatic plants and animals followed here.

5. Key considerations for the project development

5.3. Changed water level dynamics

In several sections or areas of the project site, the water regime is artificially controlled. This controlled water regime is usually not suitable from the ecological point of view. The water management manipulation rules for the water level regulating objects tend to maintain one set water level (or several values, e.g. one water level during the vegetation period and another during the winter period). The formerly fluctuating water level of the inundation area is now strongly reduced, and in consequence, the area of temporary and shallow water has been heavily reduced. Another consequence of the artificially stable water levels is then the excessive development of water plants, and reduced area of shallow water without vegetation.

5.4. Lack of food for zoophagous bird species

Quantity of several groups of animals has been reduced heavily in some parts of the project site. To the most depressed animals belong fishes, amphibians and invertebrates inhabiting temporary water bodies. These groups of animals are important food basis for various bird species (e.g. *Haliaeetus albicilla*, *Milvus migrans*, *Nycticorax nycticorax*, *Egretta garzetta*, *Ixobrychus minutus*, *Ardea purpurea*). While some of the reasons of the lack of fish, amphibians and invertebrates are correlated with the previous treats and factors, there are also specific reasons: most important is the barrier effect that hinders the migration of fish.

5. Key considerations for the project development

5.5. Insufficient scientific data

If the real risk of local extinction of the endangered species should be estimated and the conservation priorities should be set, reliable scientific data are necessary. However, intensive monitoring has been carried out only for several selected species (groups) and on selected sections of the project site, and long-term data are even much more rare. Also other type of data (e.g. hydrological) that is needed for optimal site protection is not sufficient.

5.6. Lack of awareness of authorities, decision-makers and public

Representatives of state administration bodies do not have sufficient information about the possibilities for alternative management of floodplain habitats which would favour the preservation of their biodiversity. And even if they do have some information, they lack the practical experience and relevant know-how. Because the lack of information materials and insufficient media coverage about floodplain (forests) ecosystems, the decision-makers nor the general public are not aware enough about their values and importance. Lack of awareness in state administration bodies results in unsustainable or not appropriate management with a major impact on habitats and species within the whole project site. Lack of awareness of decision-makers and public does not have direct impact on the habitats or species. But without awareness they do not understand the importance of floodplain forest and their biodiversity and the need for their conservation, and they do not support the necessary administrative and conservation measures, which should be taken (e.g. realization of various conservation projects, introducing of better management procedures, enlargement or designation of protected sites).

6. Nature conservation status

NATURA 2000 Site
Szigetköz HUFH30004
Territory: 17 184 ha

Szigetköz is a Natura 2000 site protected based on both the Birds (SPA) and the Habitats Directives (SCI). Its Standard Data Form available on the online Natura 2000 viewer (<http://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=HUFH30004>) describes the area accordingly:

- A very specific European site of inland delta habitats on the Danube. Despite the dams and modifications, alteration of water on the Danube, the Szigetköz area still has a high diversity of habitat types. The arms and related water systems are very important breeding sites of fish and bird species. Some hardwood and softwood mixed alluvial forests and riparian communities exist.
- The Natura 2000 site was established for the protection of breeding populations *Nycticorax nycticorax*, *Milvus migrans*, *Circus pygargus*, *ardea purpurea*, *Ciconia nigra*, *Aythya nyroca*, *Porzana parva*, *Alcedo atthis*, *Asio otus* and *Dryocopus martius*.
- There are 8 amphibian, 18 bird, 15 fish, 17 invertebrate, 12 mammal, 5 plant and 1 reptile protected species in the area

The area also has a national protection status: Szigetköz Landscape Protected Area – Szigetközi Tájvédelmi Körzet

7. Project description

The North-Transdanubian Water Directorate (EDUVIZIG) has received 6.255 Million HUF (roughly 2 M EUR) in the framework of the New Széchenyi Plan (co-funded by the European Union) for the project entitled the “**Ecological development of water system in the protected side and floodplain areas of Szigetköz**”. The project, which started at the end of 2011 and was complemented by middle of 2015, included both the planning process and the actual implementation, construction work.

The main target of the project was to halt the processes leading to unfavorable ecological conditions, and ensure better environment for wildlife and people.

Local stakeholders in the lower Szigetköz area demanded better water supply system. The lower Szigetköz area received only a limited amount water through the upper section of Szigetköz. Therefore there were quantitative and qualitative problems with the water in the channels and former side branches of the Danube. Channels often got dried out, which eventually led to degradation of natural resources including the deterioration of local wildlife. The various interventions and actions of the project aimed at providing a solution to the followings: landscape rehabilitation, restoring ecological conditions for natural values, providing more water for agriculture purposes through irrigation, improving conditions for fishing.

As a result of the project activities the water level of the floodplain areas returns to the level of near-natural state best suited 1950s. The conditions for aquatic organisms improves due to the increasing water flow as well as the guaranteed interoperability of the side branches. The environmental circumstances improved especially for fish breeding and migration.

The project also contributed to the EU 2020 Biodiversity Strategy through the creation a blue and green infrastructure ensuring the connectivity of various water bodies. Before the project implementation a variety of wildlife sites and wetlands were at risk because of lack of water. Thanks to the developments in the floodplain the flood discharge also improved in the protected side while the protective function of dikes and embankments did not decreased. The conditions of fishing and angling, the qualitative and quantitative status of surface waters become more favorable. The local communities and villages will have positive social and economic effects due to the improved opportunities of the aquatic tourism. The additional water also helps to enlarge the irrigated arable land, which is certainly a positive effect for the region's agricultural entrepreneurs.

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8. Project activities

There were over 16 concrete actions taken in the floodplain areas including sediment dredging and building new bars for rural water management. Over 20 actions were taken on the protected side. These actions included the construction of fish ladders and hydraulic structures such as gates.

The 4 most important technical actions out of the above were the followings:

- Improving the water supply of the Bagaméri branch system in the floodplain areas. The additional water was provided partially through demolition of the river bed leading works between the 1815.0 and the 1814.0 river km and through sediment dredging the connecting channel sections. The efficiency of water supply was also improved through building a bar in the main branch at 1815.0 river km.
- The water supply of the Patkányos branch system was provided through demolition of hydrological structures in the main river bed at 1808.8 river km and by excavating in the connecting channel section. Additional water was also partly provided through the Bagaméri branch system (see above). This action allowed the water extraction from the Patkányos branch system through using siphons as hydraulic tools.
- There are water transfer from the floodplain to the protected side at three different points through siphons. These points are at the so-called Frog worth(Béka-ér), Patkányos pumping station and the adjacent areas of Nagybajcs.
- The protected side was supported with the reconstruction of a multi-purpose channel network through building various water level control facilities and water management structures. This system allowed the precious water supply of branches and wet meadows. The creation of such multi-purpose channel system also contributed to the development of the so-called green and blue infrastructure of the region. The design of the blue corridors creates the possibility that some sub-basins, and the side water system are interlinked with the Moson-Danube.

8. Project activities

Local stakeholders in the lower Szigetköz area demanded better water supply system. The lower Szigetköz area on the protected side received only a limited amount water through the upper section of Szigetköz. Due to the huge interest of local communities in the water management, the project had a strong communication and awareness raising component. There were regular meetings with the mayors of the concerned settlements, the project website was developed in order to provide information to local citizens, and public consultation meetings were regularly organised to implement a real participatory planning model. There were of course printed communication materials available including information boards at the various project locations.

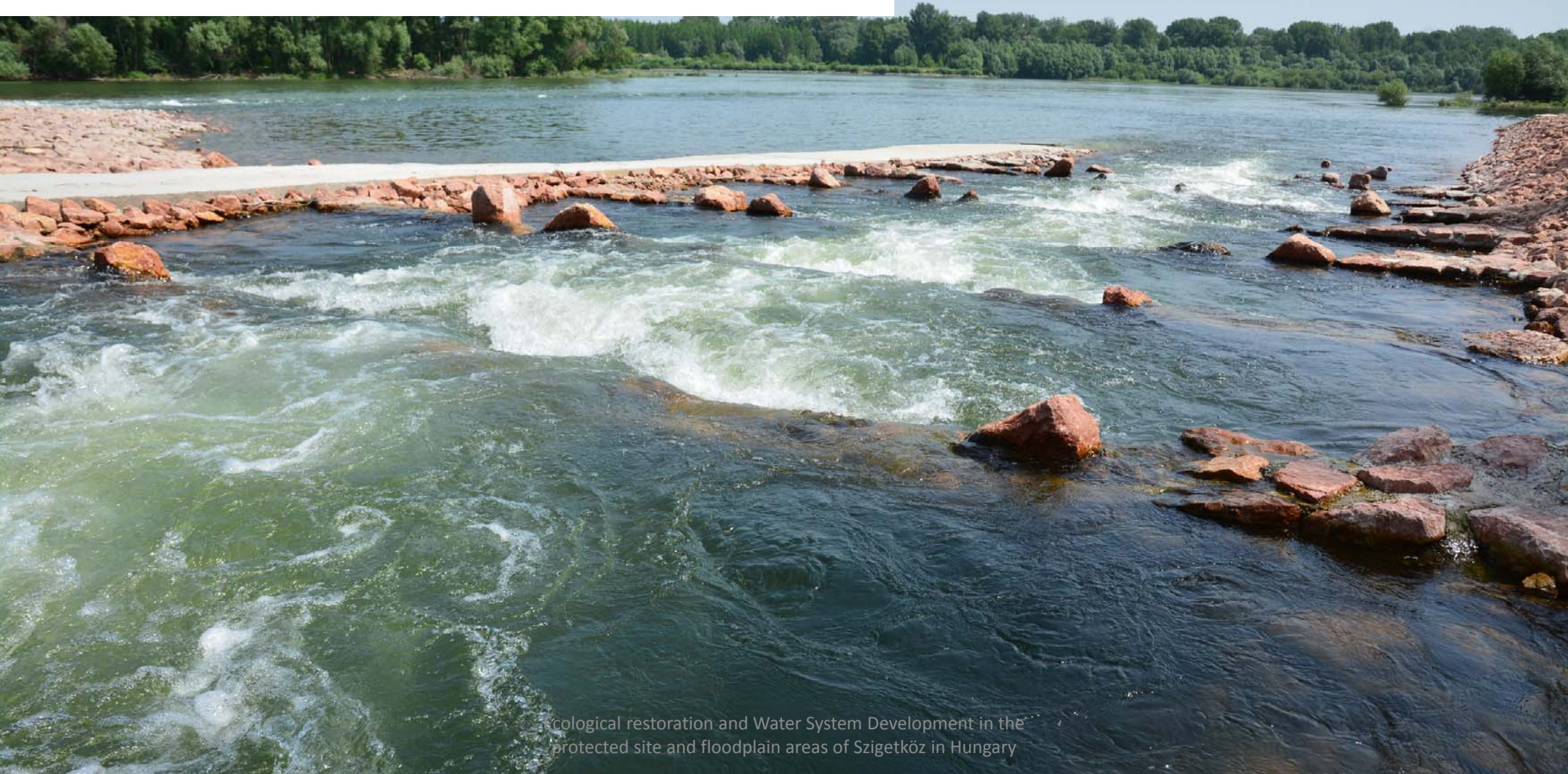
The full list of actions are available in Hungarian at http://www.keopszigetkoz.hu/a_projekt_letesitmenyei.html

9.1. Siphon at Nagybajcs



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9.2. Under water weir at Bagamér



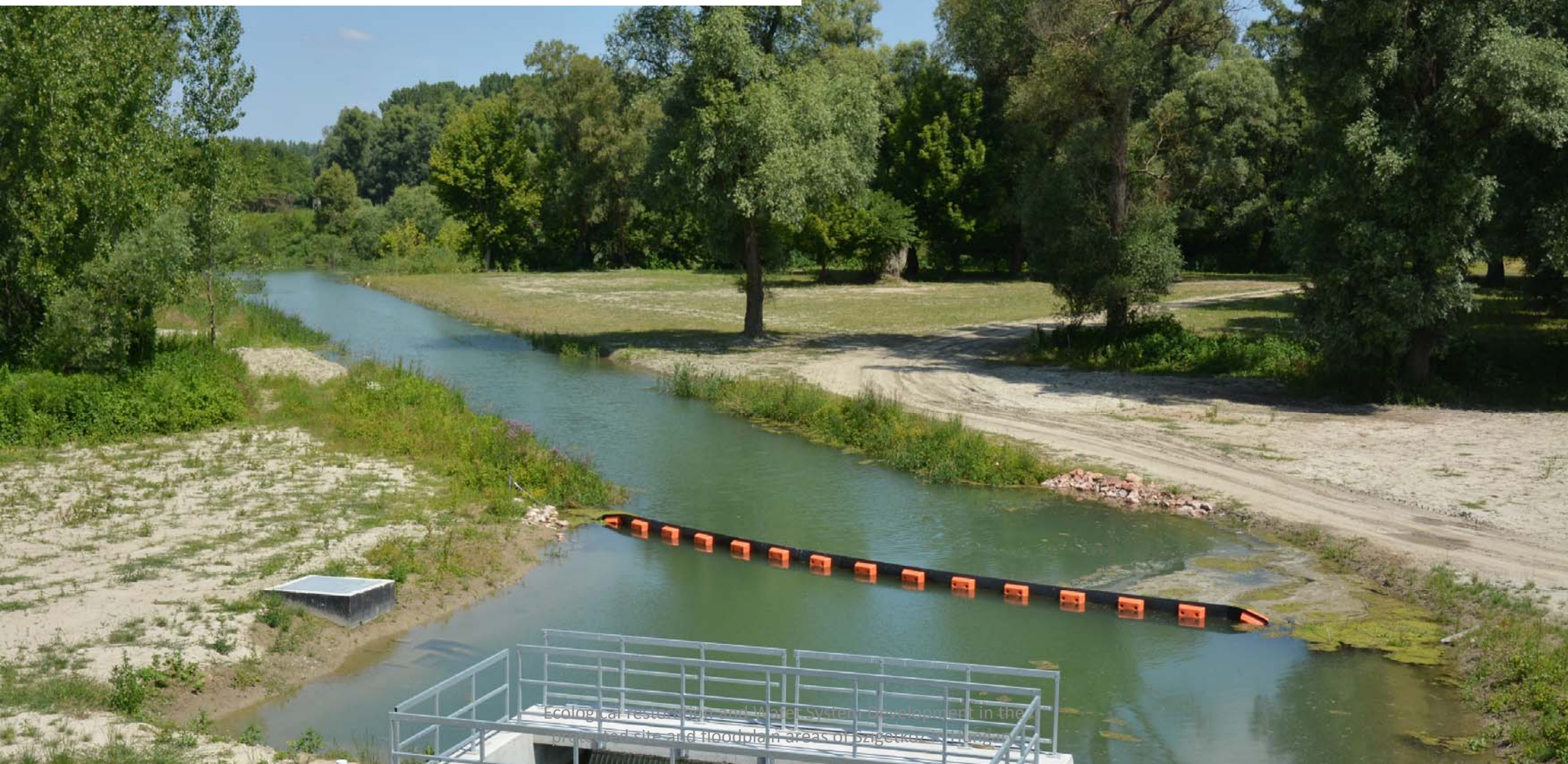
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9.3. Branch closure

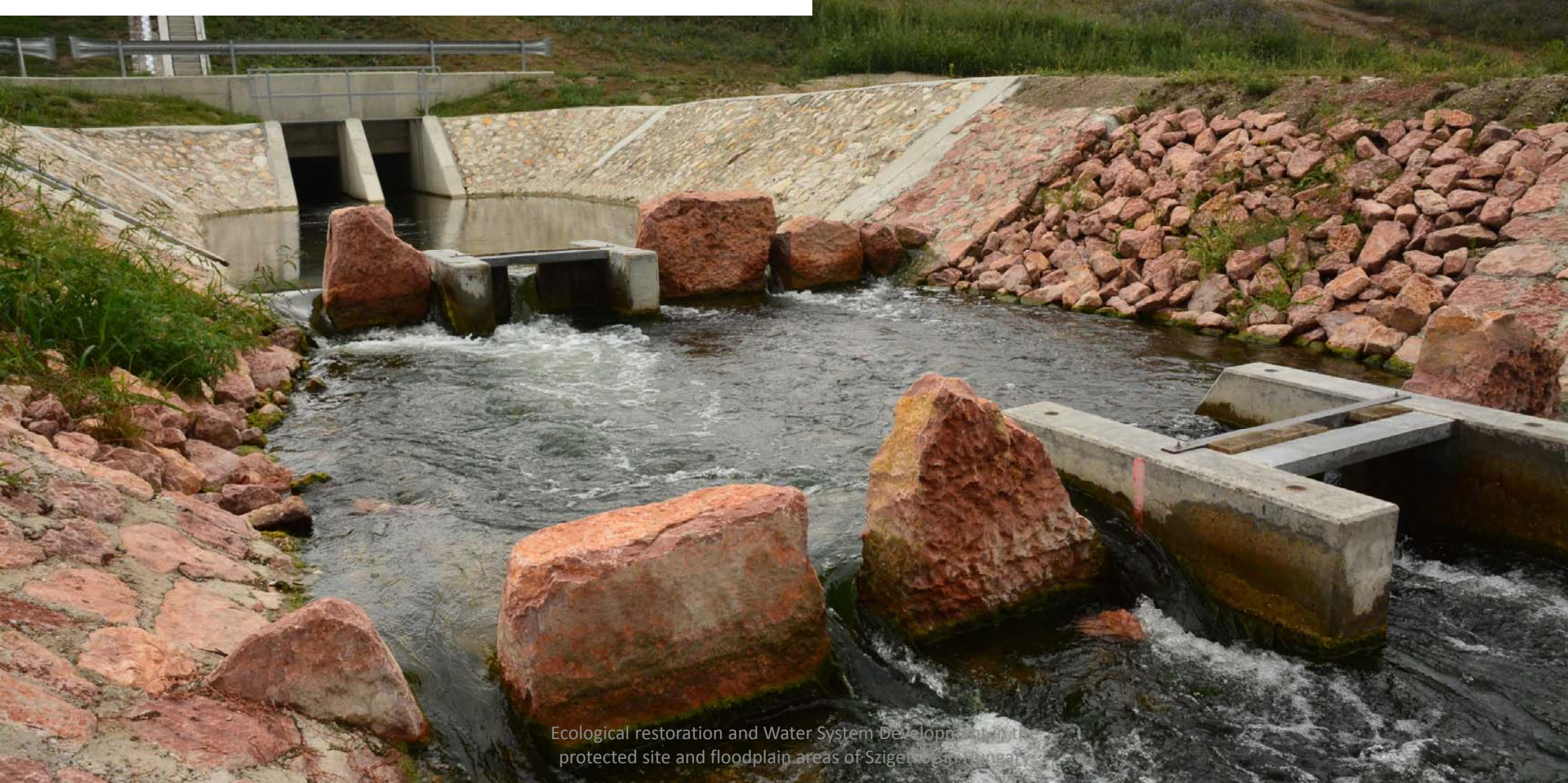


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9.4. Increased water level



9.5. Fish ladder at Győrzámoly



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10. Lessons learned

- The regular and frequent personal contact between project partners and with local stakeholders are indispensable part of successful ecological restoration.
- The project management team must be present in the project site and available for spontaneous meetings with the stakeholders and local communities. Trust can only be built if the local people feel the project team as part of them.
- The involvement of project partners in the various actions taken in the project must be based on the competencies! If a partner is not capable to provide significant contribution to a project element, it will not have to be involved.
- The project implementation requires certain level of flexibility as environmental and legislative circumstances might change during the project. However any changes in the project actions during the implementation must be based on a consensus between the partners and must be consulted in advance with the donor.
- The ecological restoration was in harmony with IWRM principles, as the project resulted in multi-purpose water functions: restoring the natural ecosystem, securing provision of drinking water and irrigation, and the enhancement of flood protection.
- The project also fitted into the River Basin Management Planning process as required by the EU Water Framework Directive. Other legislative components such as the so-called nature directives (Habitat and Birds Directives) were taken into account as well.

11. The project partners

Beneficiary: Észak-dunántúli Vízügyi Igazgatóság

Contributing organisation (allocating the financial resources): Nemzeti Környezetvédelmi és Energia Központ Nonprofit Kft.

Constructor: SZKK Vízépítő Consortium

Head of the consortium: Szabadics Közmű- és Mélyépítő Zrt.

Members of the consortium: Közgép Építő- és Fémszerkezetgyártó Zrt, KÖTIVIÉP'B Közép-Tisza Vidéki Vízépítő és Telekommunikációs Kft.

Engineer: Országos Vízügyi Beruházási Mérnök Konzulens és Tervező Kft (OVIBER Kft.)

Public relation: EFFIX Marketing Kft.

Preparatory studies: VTK Innosystem Ltd