



Regional guiding principles for wetland restoration in pilot region 5 (Virovitica-Podravina County)

Regional guiding principles for wetland restoration in pilot region 5 was made within the project Supporting Danube Region's ecological Connectivity by linking Natura 2000 areas along the Green Belt, acronym: Dare To Connect.

Introduction

Wetlands represent one of the greatest values of biodiversity and landscape diversity. More than 40% of plant and animal species are associated with them, but they are also the most endangered ecological systems in the world. In the last 50 years, 50% of all wetlands in the world have been lost.

The value of wetlands is also related to the restoration of groundwater supplies, the consolidation of coasts, the retention of nutrients and sediments, the mitigation of climate change and the treatment of water. They are gene banks of habitat biodiversity for numerous plant and animal species, and they also provide great opportunities for tourism development.

Freshwater ecosystems are the most altered and susceptible to invasive species. To understand distribution, ecology, and population dynamics of invasive species, we need more data. One of the activities should be education of the local population, creation of a network of associates in the field and regular monitoring of invasive species in freshwater ecosystems. Very important part is cooperation with neighboring country researchers to develop joint plans for the management of invasive alien species that changes biodiversity.



Precise development goals

- ✓ **Conservation and restoration of biodiversity by conserving natural habitat types, wild species and their habitats by establishing an adequate system of protection, management and control**
- ✓ **Ensure the sustainable use of natural resources** - educate local people and integrating them into programs and activities that involve the sustainable use of natural resources, and ESS (especially about fishing, irrigation and flood protection).
- ✓ **Encourage further development** of organic agriculture and sales of local products, rural and recreational tourism, regarding strengthen economic potential within the framework of sustainable development.
- ✓ **Protection of life and health of people** - prevention and reduction of environmental pollution (excessive use of pesticides and mineral fertilizers, wild garbage dump and others).
- ✓ **Data collection** - regularly annual monitoring of important biological indicators of water and soil quality.
- ✓ **Maintain extensive agricultural practices and introduce pilot butterfly protection measure as one of the most important pollinators**
EU Funds Incentive - 10.1.5. Pilot Butterfly Protection Measure applies for four species of endangered and strictly protected butterflies that lives in only a few small areas in Croatia. In Continental Croatia: Scarce Large Blue, Dusky large Blue, Alcon Blue and in Istra False Ringlet. This measure does not apply in Virovitica-Podravina County for any butterfly.



Butterflies of wetlands are losing habitats. JU VPC has been monitoring butterflies three years in a row. The results are worrying especially for Large Cooper. That butterflies related to a specific type of grassland. Reproduction is related to specific types of plants that feed the caterpillar. Manage wet grasslands with extensive mowing or grazing would have a positive effect on increasing the abundance of butterflies and other pollinators.

- ✓ **Revitalization of river sidearm that will become highly valuable habitats** for birds, fish and plant species through erosion processes over time to increase biodiversity.
Restoration activities can be of immense benefit to endangered habitats and species in Natura 2000 sites and will contribute to better flood protection in inhabited areas along the Drava River and will increase the recreational value of the area for local people.
- ✓ **Cooperation with neighboring country researchers** to develop joint plans for the management of invasive alien species that changes biodiversity; Introduce measures and stricter control for elimination invasive species such as *Amorpha fruticosa*, *Asclepias syriaca* L., *Xanthium spinosum* L.
- ✓ **Regularly water and soil analysis and damage repair.**
- ✓ **Control draining or take any other action that reduces water levels.**
- ✓ **More effective control and protection against poaching** (fish, otters, beavers...).



Principles

Precautionary principle

Precautionary principle includes sustainable use of natural resources and prevention of environmental pollution. Environmental measures must be laid down by regulation, or by an appropriate act. Any environmental action must be planned and implemented in such a way as to cause as little environmental pollution as possible. In order to avoid environmental risks, all precautionary measures of environmental protection must be applied in the planning and implementation of interventions. When the risk of real and irreparable damage to human health and the environment is threatened, the necessary protective measures must not be delayed, even if the hazard has not been fully scientifically investigated.

Principle of preserving the value of natural resources, biodiversity and landscapes

Natural resources and landscape values should be endeavoured to preserve for future generations is not diminished. Interventions into the environment that may have adverse effects on biodiversity and landscape diversity and value, and the conservation of natural genetic and the natural harmony of living communities, living organisms, and substances, are not allowed, unless decided in the procedure in accordance with the Environmental Protection Act, and specific regulations differently.

The principle of replacement and / or substitution

An action or planned operation that could have a detrimental effect on the environment must be replaced by an operation or intervention that presents a significantly lower risk to the environment. Reusable or biodegradable substances should be prioritized for use, even in the case of higher costs.



Principle of elimination and remediation of environmental damage at source

If the damage to the environment was caused as a result of the operation or omission of the statutory mandatory action of the operator, or as a result of performing the activities of a natural or legal person, they are obliged to eliminate or remedy the environmental damage primarily at the source of its occurrence.

The principle of holistic approach

The purpose of the holistic approach principle is to prevent and / or minimize environmental risks as a whole. The main goal is balanced economic development with the principle of sustainable development. When drafting and adopting zoning documents, due account shall be taken of the appropriateness of the intervention with regard to the known risks of natural disasters, the reliability of existing and planned measures to reduce the risk of natural disasters, the sensitivity of the environment in a particular area, the relationship to harmony and landscape values, the relationship towards non-renewable and renewable natural resources, cultural heritage and tangible assets, and the totality of their interactions with and interactions of existing and planned interventions on the environment.

The principle of cooperation

Sustainable development in accordance with the Environmental Protection Act is achieved through the co-operation and joint action of the Croatian Parliament, the Government, the counties, major cities, towns and municipalities and all other stakeholders for the purpose of environmental protection, each within its competence and responsibility.



The State shall ensure co-operation and solidarity in addressing global and interstate environmental issues, in particular through international treaties, by co-operating with other countries and concluding appropriate agreements, and by informing other countries about

transboundary environmental impacts, environmental disasters, and the international exchange of environmental information. The Government, counties, City of Zagreb, major cities, towns

and municipalities, within the scope of their scope, jointly and jointly participate in the implementation of environmental protection within their jurisdiction, to ensure the implementation of effective environmental measures in their area.

The „polluter pays” principle

According to Law on environmental protection (NN 110/07), the polluter shall bear the costs incurred by the environmental pollution. The costs shall include the costs incurred in connection with the environmental pollution, including the costs of assessing damage, evaluating necessary measures and the cost of eliminating environmental damage. The polluter shall also bear the costs of monitoring the environment and applying the identified measures, as well as the costs of taking measures to prevent against environmental pollution, whether those costs are incurred as a result of the prescribed liability for environmental pollution, or through the release of emissions into the environment or as fees determined by appropriate financial instruments. That is, as an obligation laid down in the regulation on the reduction of environmental pollution.

The principle of access to information and public participation

The public has the right to access to environmental informational available to the public authority and to timely notification of environmental pollution, including information on hazardous substances and activities, information on measures taken, and related access to environmental information. Also, they have the right to participate in the process of

establishing the starting point, drafting and adopting strategies, plans, and programs, drafting and passing regulations and general acts related to environmental protection.

Incentive principle

Government, counties, towns and municipalities, in accordance with their respective competencies, encourage activities and activities related to environmental protection that prevent or reduce environmental pollution, as well as environmental interventions that reduce the use of substances, raw materials and energy, and less pollute the environment or exploit it within the limits allowed. They are obliged to promote information, education and teaching to the public on environmental protection, and sustainable development and to influence the development of environmental awareness as a whole.

The principle of the right of access to justice

Any person (citizen and other natural and legal persons, their groups, associations and organizations) who considers that their request for information in environmental matters has been neglected, groundlessly rejected, either in whole or in part, or if not properly answered way, it has the right to protect its rights under a special regulation on the right of access to information.



**Supporting Danube Region's ecological Connectivity by
linking Natura 2000 areas along the Green Belt, DTP2-007-2.3
acronym: D2C**

**D 4.3.1 Regional Guiding Principles
– inputs**

**by: Public institution for the management of protected parts of nature and
ecological network of Virovitica-Podravina County**



Public Institution for the management
of protected parts of nature and the ecological network
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1. Strategy and vision

Vision

Ecosystems and their provided services properly valued and linked to the green infrastructure of the European Green Belt in accordance with the principles of sustainable development.

Strategic activities:

- 1) Guidelines and recommendations for planning and establishment of Transnational ecological corridors as expert background / basic document for future projects aiming the restoration of ecological corridor areas
- 2) Analysis of ecosystem services as a basis for future sustainable development plans in Pilot area 5, Virovitica-Podravina County
- 3) All management plans which use natural resources such as fisheries, forestry, hunting, water management, electrical industry, agriculture, sustainable tourism, etc. will be drawn up on the basis of the results of the analysis of ecosystem services and sustainable development principles
- 4) Encourage Croatian Forests and Waters to follow the guidelines and recommendations for the planning and establishment of transnational ecological corridors when developing forest and water management plans
- 5) Apply the principle "without loss of characteristic and key Natura 2000 habitats" and as a basic principle of all management plans, use the guidelines and recommendations for the planning and establishment of transnational ecological corridors linking the areas of the European Green Belt
- 6) Research the biodiversity of wetlands and conduct a more detailed study of species that will represent biological indicators of the quality of ecological corridors
- 7) Through the work of the Public Institution continue conduction education about the European Green Belt area, ecosystem services and the importance of connectivity ecological corridors

2. International background – Pilot area 5

In the Pilot area 5 of the DaRe to Connect project, there is a long experience of cross-border cooperation with the aim of preserving and improving the natural state and adequate care of endangered plant and animal species and their habitats.

A representative example of this is the **Transboundary Biosphere Reserve Mura-Drava-Danube**, proclaimed in July 2012 by a decision of the UNESCO International Coordination Council of the Man and Biosphere Program in Hungary and the Republic of Croatia, with the aim of achieving the goals set by the Seville Strategy, the Lima Action Plan and MAB strategy 2015-2020. The Croatian-Hungarian TBR MDD within the Virovitica-Podravina County covers approximately 18.000 ha (about 9% of the total area of the County).

PI VPC has participated in several cross-border projects with activities closely related to the protected areas along the Drava River, and certain activities are still being implemented through active projects. An additional 24-month Interreg HU-HR project will begin this year.

With the **Three Rivers = One Aim** project implementation, PIVPC completed the reconstruction of the Informative and Educational Centre in Noskovačka Dubrava, which became the central place for the work of the Public Institution, but also for the promotion and presentation of protected parts of nature and the ecological network Natura 2000 in the whole county, with the emphasis on increasing the awareness of both local population and visitors. The development of the Bird Study of the Croatian part of the TBR MDD, and its integration with the Hungarian part, represents the first joint management document of this area. Two bird observatories directly contribute better management of the area, but also the development of sustainable tourism in protected areas of the VPC.

The **Old Drava** project was the first cross-border Hungarian-Croatian LIFE project. The main objective was to contribute to the conservation and resilience of floodplain coastal habitats through improving the water regime and improving the biodiversity status of floodplain forests along the Old Drava oxbow. The revitalization included the stabilization of

sufficient water levels with water structures to hold water in the Old Drava oxbow at Križnica. Additional activities included afforestation of native species to conserve forest biodiversity, research on fish species and aquatic habitats and their monitoring during and after project completion, removal of old fishing platforms and erection of new ones, set up of instructional trails, Natura 2000 visitor information points, and preparation of the Study on the different management practices, the impact of the project on the local population and the target species and habitats at Križnica. This project is an example of excellent cooperation between the Croatian and Hungarian sides, because the design was done by Croatian companies and construction works have been carried out by Hungarian companies.

The **B.I.R.D.S.** project aimed to present and promote the exceptional biodiversity and value of protected areas and species along the Drava River, with an emphasis on protecting and conserving the smallest European swallowtail – The sand martin (*Riparia riparia*), and educating the youngest, but also everyone else, on the importance of preserving this Natura 2000 bird species. As part of the project activities, the 4-days nature school program for primary-school pupils and teachers participating the project was carried out at the IEC The Drava story. Other activities were conducted on the Drava River in the area of Significant landscapes Jelkuš and Križnica.

The implementation of the **Tourism 4 All** project restored some existing tourist sites in the cross-border area and created new contents – in order to further develop tourism and promote the natural and cultural values of this part of the region. The richness of natural values and traditions (cultural, sacral, gastronomic, oenological...) is a platform for the development of attractive tourist products in the territory of both countries, which will contribute to the sustainable economic development of the area along the Drava River and promote nature-friendly forms of tourism.

The **DRAVA LIFE** project applies an innovative approach to the river management and aims to create an example of best practice for river restoration in Croatia and the region. In the Pilot area 5 of the D2C project it should have a positive impact on the entire length of the Drava River in VPC (72 km), and concrete revitalization measures will be implemented in

the eastern part of the county on the Martinci Miholjački river arm. Additional positive impacts will be on groundwater supplies, as the restoration will improve river infiltration into groundwater and thus stabilize and raise groundwater levels, what will increase the resilience of the Drava floodplain ecosystems to the negative effects of climate change. Finally, the project will increase the recreational value of the area used by local people, such as fishing, swimming and relaxation.

3. National background – Pilot area 5

Pilot area 5 of the project DaRe to Connect is located in Republic of Croatia in the area of Virovitica-Podravina County, along the Drava River.

The remarkable biodiversity and landscape value of the area was recognized more than 50 years ago (in 1969) when it was protected park around the current headquarters of the Public Institution, Informative and educational Center the Drava Story in Noskovci, in the category of Monument of Park Architecture - Tree Group in Noskovačka Dubrava. Protection of individual parts of nature continued in 2001, when 4 localities in the western part of the county were declared protected landscapes (Križnica, Jelkuš, Širinski otok and the Wetland habitat Vir). The whole area along the Drava River was included in the National Ecological Network proclaimed in 2007, which was, after the Republic of Croatia access to the European Union in 2013, became part of the European ecological network Natura 2000. The biggest shift in nature protection along the Drava River and the Drava River itself was in 2011 when the Government of the Republic of Croatia proclaimed the 1st Regional Park in the Republic of Croatia Mura-Drava. The Mura and Drava Rivers are areas of high biological and landscape diversity and rich geological and cultural-traditional heritage. This category of protection enables them to be preserved, while allowing in the same time economic activities and opening up a new perspective on the sustainable development of this area. Conservation of natural habitat types endangered at national and European level, species that inhabit them, outstanding landscape values, geological and cultural-traditional heritage in the Virovitica-Podravina County, are the basic activities of the Public Institution. The protection of the area along the Mura and Drava rivers was a prerequisite for the designation of the UNESCO

Transboundary Biosphere Reserve Mura-Drava-Danube in Hungary and the Republic of Croatia in 2012. Public institution additionally contributed to the protection, presentation and promotion of the area in 2014 by joining the Green Belt Association of Europe. Significant funds have been invested in Pilot Area 5 in the last 10 years, both from national sources and through and realisation of numerous international projects.

4. Methods and results

4.1. Methods

- 1) Searching the available literature and setting the theoretical basic
- 2) Collection of data by field survey by boat and land
- 3) Analysis and validation of satellite images in the field (Sentinel-2)
- 4) Workshops of the project partners
- 5) Workshops with local stakeholders and residents along the Drava River area
- 6) Interviewing local stakeholders

Expected Data obtained by interviewing:

- barriers that exist in the migration of animals
- the opinion of local stakeholders on how to facilitate the smooth migration of animals
- which corridors are the most vulnerable in the view of the stakeholders (habitat disconnection)
- threats and pressures threaten wetlands
- activities to be undertaken to enable habitat protection and migration in the management area of each stakeholder
- ecosystem services that are considered by local stakeholders to be the most important
- what ecosystem services they use / enjoy
- traditional ways of using ecosystem services

4.1. Results

- 1) Satelit images (Sentinel-2) Pilot area 5
- 2) defined corridors important for animal migration
- 3) defined pressures and threats that prevent cross-border ecological corridors from being connected
- 4) proposals for possible solutions for establishing transboundary ecological corridors
- 5) basis for making future action plans and management plans

National background – Pilot area 5

Article 17 (Natura 2000, Habitat Directive, Red lists)

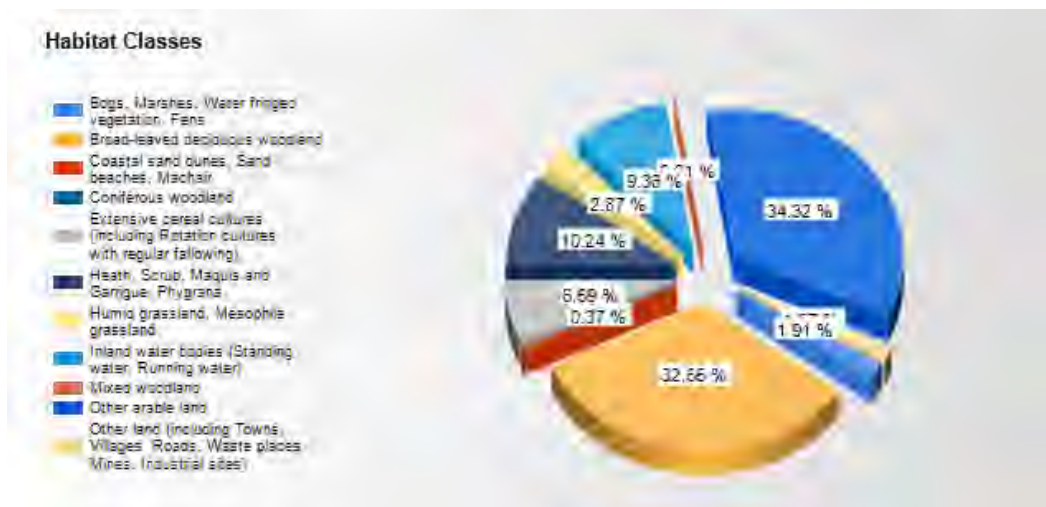
Area of the Natura 2000 in Virovitica-Podravina County covers 43.727 ha, (21,6% of the total area of the county). Surface of the D2C Pilot area 5 is approximately 18.000 ha, namely 8,89 % the surface of the County. In some areas, areas of POVS (Conservation Areas Important for Species and Habitat Types) and POP (Conservation Areas for Birds) overlap.

Table 1. Areas of ecological network in Virovitica-Podravina County – Pilot area 5

AREA CODE	NAME OF THE AREA	Competence of the management
HR1000014	Upstream of the Drava	Međimurje Nature, PI Varaždin County, Koprivnica-križevci County and Virovitica-podravina County
HR1000015	Midstream of the Drava	PI VPC and Osijek-Baranja County
HR2001004	Stari Gradac – Lendava	PI VPC
HR2001005	Starogradački Marof	PI VPC
HR2001006	Županijski kanal (Gornje Bazje – Zidina)	PI VPC

Table 2. Upstream of the Drava River - from Donja Dubrava to Terezino Polje (code area HR5000014)

Name of the habitat	Natura code of the habitat
Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i>	3130
Alpine rivers and their ligneous vegetation with <i>Myricaria germanica</i>	3230
Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>)	91E0
Riparian mixed forests of <i>Quercus robur</i> , <i>Ulmus laevis</i> and <i>Ulmus minor</i> , <i>Fraxinus excelsior</i> or <i>Fraxinus angustifolia</i> , along the great rivers (<i>Ulmenion minoris</i>)	91F0
Sub-Atlantic and medio-European oak or oak-hornbeam forests of the <i>Carpinion betuli</i>	9160
Natural eutrophic lakes with <i>Magnopotamion</i> or <i>Hydrocharition</i> - type vegetation	3150
Lowland hay meadows (<i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i>)	6510
Rupicolous calcareous or basophilic grasslands of the <i>Alysso-Sedion albi</i>	6110
Rivers with muddy banks with <i>Chenopodium rubri</i> p.p. and <i>Bidention</i> p.p. vegetation	3270

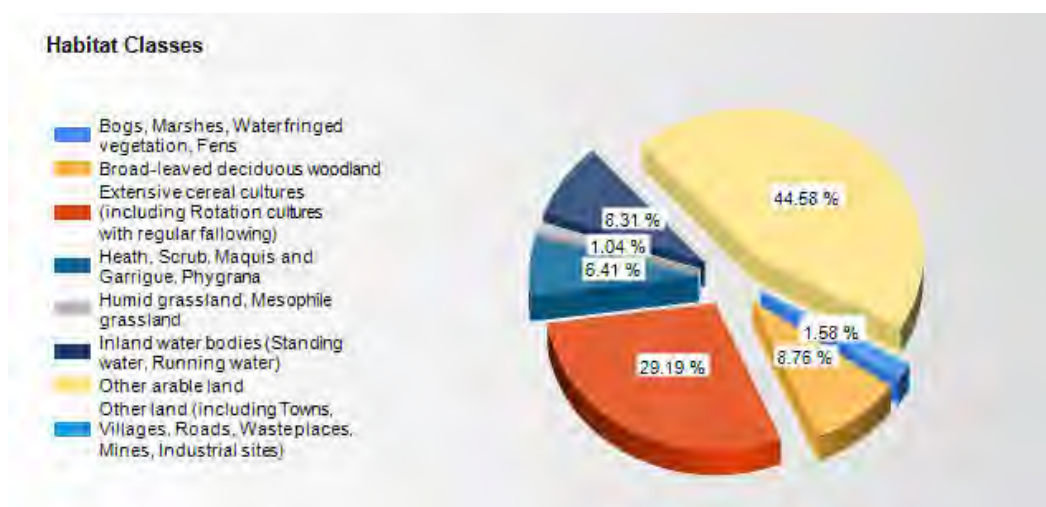


Picture 1: Upstream of the Drava River (Bioportal)

(<http://natura2000.dzzp.hr/reportpublish/reportproxy.aspx?paramSITECODE=HR1000014>)

Table 3. Midstream of the Drava River - from Terezino Polje to Donji Miholjac - (area code HR5000015)

Name of the habitat	Natura code of habitat
Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i>)	91E0



Picture 2: Midstream of the Drava River (Bioportal)

(<http://natura2000.dzzp.hr/reportpublish/reportproxy.aspx?paramSITECODE=HR1000015>)

Red lists

Red lists in Croatia in Pilot area 5 contains Red lists of: mammals, birds, amphibians and reptiles, freshwater fishes, land and freshwater snails, crabs of freshwater, day butterflies, dragonflies, stoneflies, caddisflies, mushrooms and lichens.

Sources:

- BIOPORTAL
- Ministry of Environmental protection and Energy, Institute for Environmental and Nature Protection