A TERVEZETT M2 GYORSFORGALMÚ ÚT HATÁSAI

A SaveGREEN INTERREG projekt eredményei a magyarországi vizsgálati területen

THE EFFECTS OF THE PLANNED M2 MOTORWAY

Results of the SaveGREEN INTERREG project in the Hungarian pilot area

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ABSZTRAKT

A SaveGREEN INTERREG projekt célja, hogy segítse az ökológiai folyosók integrált tervezéssel történő megőrzését, továbbá felhívja a figyelmet a megfelelő kárenyhítési intézkedések különböző módjaira. A SaveGREEN projekthez kapcsolódóan és tájépítész hallgatók egyetemi képzése keretében készítettük el a tervezett M2 autópálya határmenti térségének komplex tájértékelési, tájfejlesztési tervét. A SaveGREEN projekt a TRANSGREEN, a ConnectGREEN és a HARMON DTP-projektek szerves folytatásaként indult. A projekt középpontjában a partnerországok vizsgálati területei állnak: az Alpok-Kárpátok folyosó, a Délnyugat-Kárpátok, a Zakarpatszka, Beskidek, Ljulin és Balkán hegység és Magyarországon a tervezett M2 térségének kritikus ökológiai folyosói, amelyeket a közlekedési infrastruktúra és a nem fenntartható területhasználat befolyásol leginkább. Tanulmányunkban a hazai vizsgálati terület komplex értékelését mutatjuk be, kiemelt figyelmet fordítva a tervezett M2 autópálya nyomvonalát keresztező ökológiai folyosók értékelésére. ◉

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Figure 1: Partner countries and pilot areas of SaveGreen project marked with numbers [8]

ABSTRACT

The SaveGREEN INTERREG project aims to help conserve or improve ecological corridors through integrated planning and to raise awareness of the different types of appropriate mitigation measures. In connection with the SaveGREEN project and within the framework of the university educational programme of landscape architecture students, we prepared a complex landscape assessment and landscape development plan for the planned M2 border area. The SaveGREEN project builds on the results of the TRANSGREEN, ConnectGREEN and HARMON DTP projects. The project focuses on the study areas of the partner countries: the Alpine-Carpathian corridor, the South-Western Carpathians, the Zakarpattya, Beskid, Lyulin and Balkan Mountains and the critical ecological corridors of the planned M2 area in Hungary, which are most affected by transport infrastructure and unsustainable land use. In our study, we present a complex assessment of the Hungarian study area, with a special focus on the assessment of ecological corridors crossing the route of the planned M2 motorway.

INTRODUCTION

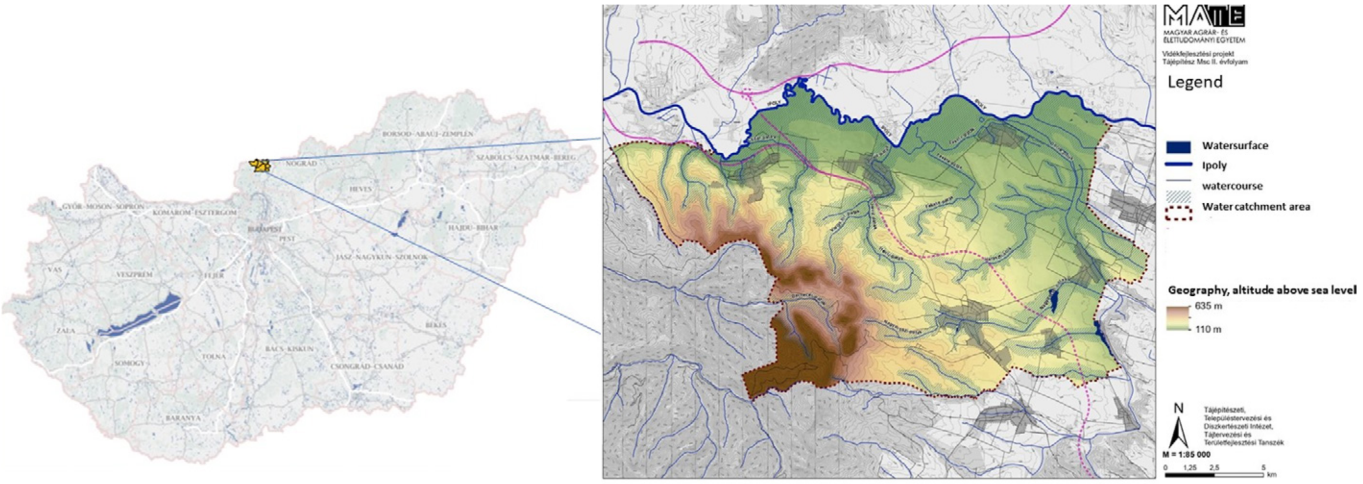
In the long term, the construction of motorways and railways disrupts ecological networks and animal migration routes, and separates natural habitats in a way that is very difficult to mitigate [1]. Roads affect wildlife in a wide range of ways [2,3], including destruction of habitats by road construction or later mortality of specimens by fumigation; changes in behaviour; physical and chemical environmental changes; the introduction of exotic species; fragmentation and isolation of populations and ecosystem disruption. On the basis of further publications [4-7], the literature distinguishes between two broad categories of direct and indirect impact. Direct impacts include habitat loss and degradation, pollution, disturbance and road fumigation due to road construction. Indirect impacts are considered to be environmental changes caused by the negative environmental effects of roads.

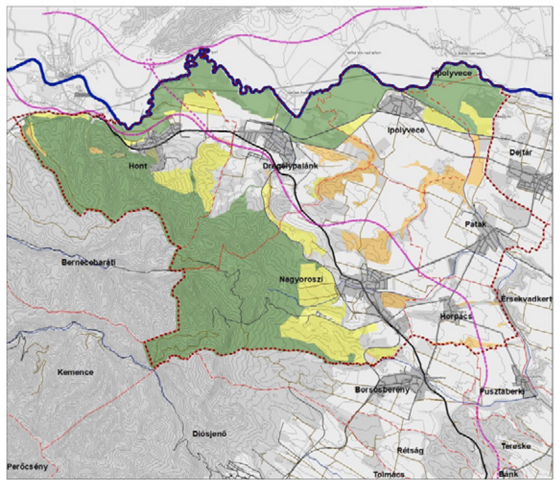
The SaveGREEN project, funded by the Interreg Danube Transnational Programme, and integrating experts from ten countries, focused on the identification, collection and promotion of the best solutions for safeguarding ecological corridors in the Carpathians and further mountain ranges in the Danube region. The SaveGREEN project focused on pilot areas in several Central and Eastern European countries (Fig. 1), with the aim of monitoring and mitigating the negative effects of infrastructure on ecological corridors.

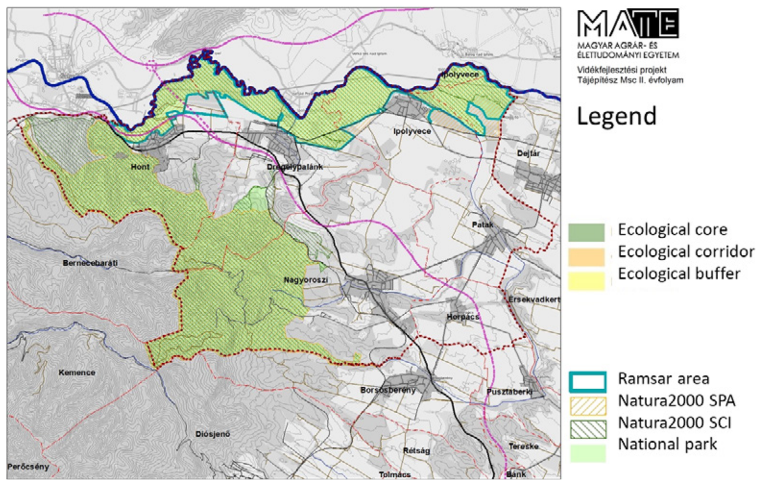
METHODS AND MATERIALS

In Hungary, the project assessed the landscape-level impacts of the planned M2 motorway. The aim of the motorway is to improve transit connections in the Hont-Parassapuszta border region between Hungary and Slovakia and to reduce the environmental impact of transit traffic on the hinterland of settlements. The new motorway project is expected to have a positive effect on cross-border cooperation (e.g. connecting the Nitra region with the Budapest agglomeration), helping to develop the economic potential of the border regions and to improve the environmental quality of the settlements. However, it also has very serious negative impacts, as it drastically increases landscape fragmentation and eliminates or negatively affects habitats of high ecological value. The planned M2 motorway will pass through varied landscapes between the Nógrád Basin and the periphery of the Börzsöny mountains, crossing the valley of the River Ipoly (Fig. 2).

The planned route of the M2 motorway and the existing main road No. 2 form the backbone of the study



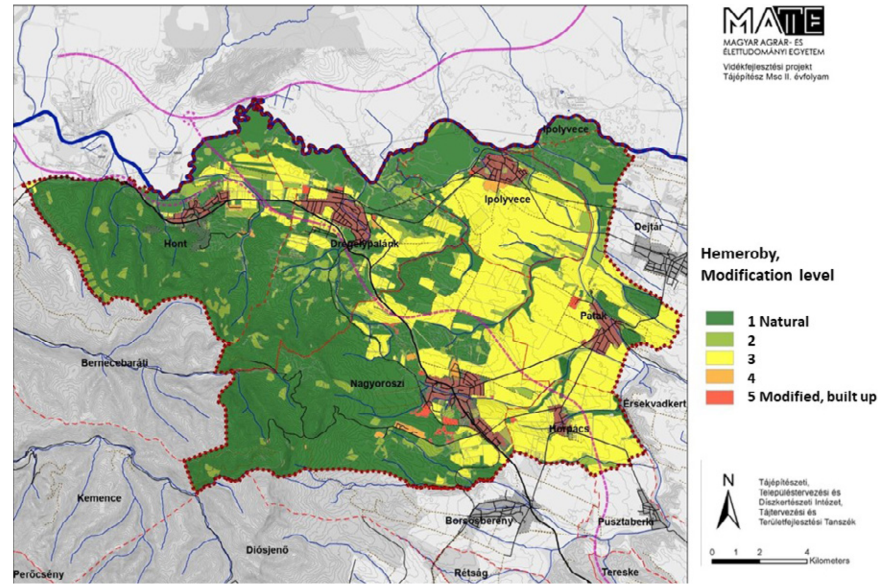


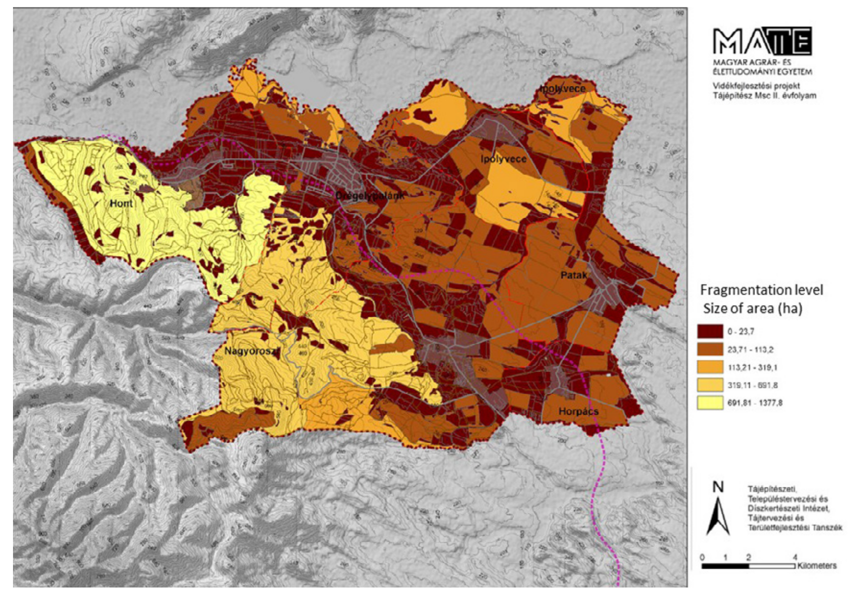


area, along with the areas bordering them, Börzsöny and Ipolymente, covering approximately 165 km². The study area is located in the North Hungarian Mountains and covers several small landscape character areas, such as the Nógrád Basin, the western region of the Börzsöny Mountains and the Ipoly Valley, which forms the northern border. In the central part of the area, the most typical zonal associations are oak forests. The valley bottoms of the gently rolling hills are characterised by marshes and wet meadows (Fig. 3.). Most of the area is now ploughed and fallow. Due to the high forest cover and the valuable watercourses, the surrounding extensive grasslands and the natural floodplain of the Ipoly, the area has a high proportion of protected areas. Natura 2000 sites cover the Börzsöny and the Ipoly Valley. The Ipoly and its floodplain are also a Ramsar site, and also contain protected areas of national importance, the areas of the Danube-Ipoly National Park and elements of the National Ecological Network, which are present in the area as core and buffer areas and ecological corridors (Fig. 3).

The methodology of the SaveGreen project included the preparation of a general overview, a Logframe about the main conflicts, objectives, measures of infrastructure causing landscape fragmentation with a specific outlook on the study area. The Hungarian study area of the project was integrated into several courses during the MSc in Landscape Architecture at the university. A landscape-level survey and assessment was developed using QGIS software. We assessed landscape heritage, landscape character types, hemeroby and landscape fragmentation levels, quality of green infrastructure, ecological corridors, agricultural structure and land use patterns. The ecological corridors formed by watercourses were assessed according to vegetation, length, disturbance and surrounding land use, as well as their suitability for selected animal species (categories S1-S5, where S1 is very suitable: corridor with little or no restrictions on animal movement). The target species selected were: roe deer, wild boar, common lynx, eastern hedgehog, otter, red fox, brown toad, newt, green lizard, wood sandpiper, bush vulture, hill fox, cutthroat trout. Based on the multi-level assessment, critical sections of the planned infrastructure were identified.

Several watercourses cross the landscape, connecting core areas and representing the most important ecological corridors. The most prominent feature of the





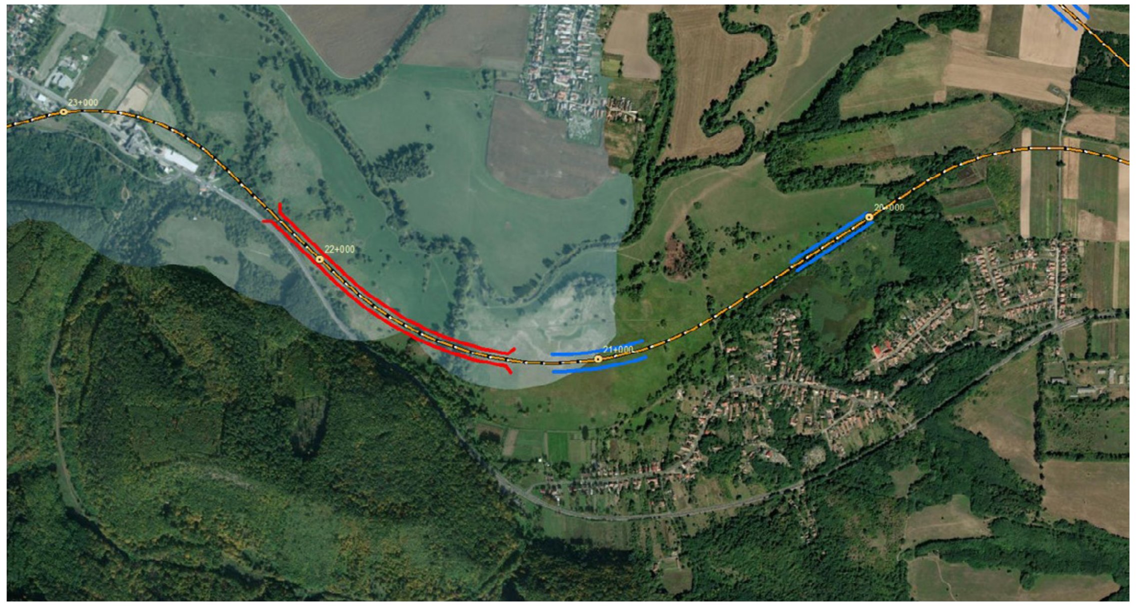
◂◂**Figure 2:** Location and the geography and watercourses of the study area
◂◂**Figure 3a-b:** Protected areas, a, National park, and Natura 2000 areas, b, National Ecological Network areas: green-Core area, yellow-Buffer zone, orange-Corridor zone
Figure 4: Hemeroby level of the pilot site, the green colour represents the highest level of naturalness, the yellow the modified agricultural areas, and the red is for the built-up areas as heavily altered
Figure 5: Fragmentation level of the pilot site, brown colour highlights the more fragmented landscape. The area is categorized by the extent to which current land uses are divided by linear features, we found that the smallest land use "fragments" range from 0 to 23.7 hectares, while the largest, most untouched land uses, such as the forests in the Börzsöny, range from 691.81 to 1377.8 hectares

hydrography is the River Ipoly. Our assessment identified the critical sections of the proposed M2, the crossing zones of the watercourses. Based on this complex analysis, we developed cross-sectoral proposals to mitigate negative environmental impacts. Our recommendations were compared with the mitigation measures envisaged in the EIA study of the M2 motorway provided by the National Infrastructure Development Ltd (NIF). The subject of our analysis was the version of the Trail C between Rétság and the national border, which received an environmental permit from the Pest County Government Office in 2018.

RESULTS

One of the core parts of the cross-sectoral analysis was a Logframe that provided an overview of the major conflicts and objectives related to the barrier effect of the new and existing infrastructure lines, including the changes in land management. The Logframe provides country-specific suggestions for the mitigation of negative effects. The most important measures concerning the new infrastructure lines, among others:

- During route selection, ecological aspects should be considered, but the track is often decided before ecologists/biologists have examined a trail in detail.
- Avoid sensitive areas.
- Gather data on relevant species using camera traps, tracking and telemetry. For watercourses, continuous sampling is required.
- SEA and EIA legislation should be complemented by provisions for specific roads; for example, the direct and indirect impact area of different roads.
- Specific, well-measured indicators such as the fragmentation analysis (e.g. minimum net size)



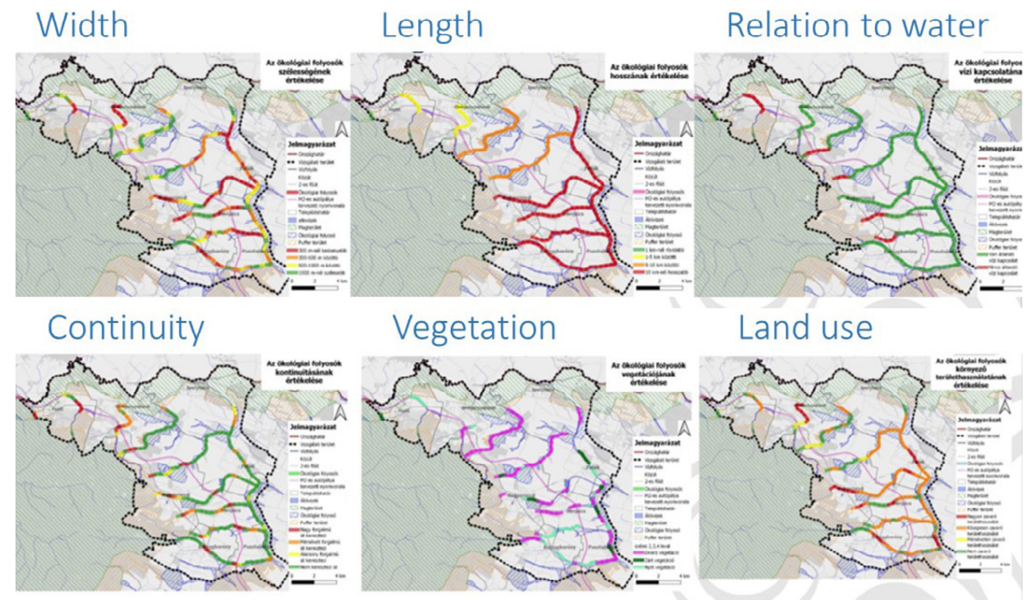


Figure 6: The planned M2 motorway line in the Ipoly Valley
Figure 7: The River Ipoly in this region represents the most natural river section in Hungary
Figure 8: Assessment of ecological corridors crossing the study area based on width, length, relation to water, continuity, vegetation and surrounding land use

or biological activation value calculations should be incorporated into the SEA process and spatial planning.

- A minimum percentage of the entry-level costs of a given project that must be spent on the road's ecological protection facilities (e.g. under- and overpasses, fences), including the provision of areas required for planting and implementing these facilities, should be stipulated in legislation. In addition, a minimum size of an area intended for planting also requires further specification within the legislation, because planting can influence the effectiveness of ecoducts, among other things. (The exact size should depend on the road category.)
- Set up a systematic monitoring plan for new linear infrastructure (before baseline, during the construction and after the construction is completed).
- The term ”ecological corridor” or “ecological connectivity” should be cited in Gov. Decree 314/2005 (XII.25.), requiring that the impact of the railway/road project on ecological corridors is evaluated in EIAs.
- Review of national and international practice and adaptation to domestic conditions.
- Advocacy for development of a new small infrastructure project to create a defragmentation facility (overpass).

The most important general objectives for the **existing infrastructure lines,** among others, based on our results:

- Safeguard the permeability of existing transport infrastructure (including the enhancement of permeability of existing features, when possible)
- Safeguard the transversal permeability of riverbanks (including the enhancement of permeability of existing features, when possible)
- Safeguard the longitudinal permeability of rivers (including the enhancement of permeability of existing features, when possible)

Beside focusing on the planned motorway, within the framework of a complex landscape study, we explored the major land use problems in the region. The arable land is characterised by the presence of large monocultures of cropland. Another problem is a frequent absence of forest strips, which reduces ecological connectivity. The main problem with grasslands is that they are no longer grazed or mowed when traditional land use ceases and are often cleared and then turned to ploughland. This conflict can be solved by planting forest belts and bushes by farmers which could be fostered by awareness raising among farmers and incentives of the Common Agricultural Policy. The vast forest block of Börzsöny enhances ecological connectivity, however in order to increase the ecological diversity of forests, the main professional objective is to change from cutting to “Forest wilderness” management and increase the non-timber production mode.

The planned route of the M2 runs in the transition zone between the more natural, more varied vegetation and topography of the Börzsöny and the cultivated, more fragmented cultural landscape (Fig. 4-5.). The assessments clearly show that the areas along the Ipoly River, the Börzsöny marshes and the small watercourses are the most vulnerable and ecologically valuable areas, and are therefore at increased risk from anthropogenic impacts.

Considering the planned route of the M2 motorway, the most critical zone, where the route will cross core habitat areas, is the Ipoly Valley. The Ipoly Valley (Figure 8.) represents an important bio-corridor and core habitat. The planned section of the M2 motorway between Rétság and the border may affect the Ipoly Valley Special Nature Conservation Area (HUDI20026) and the Ipoly Valley Special Birds Protection Area (HUDI10008). The impact area zone of the proposed project (125-125 m from the axis) overlaps with the western edge of the two Natura 2000 sites on the outskirts of Hont, between sections 19+000-23+363 km of the Rétság-Border section.

Natura 2000 sites in the Hungarian region
1. Birds protection Directive Site,
Ipoly Valley, (SPA) (HUDI10008)

The site is composed of various habitats: the most important parts are the unregulated section of the River Ipoly and the floodplain area with different riverside terrains and diverse birdlife. Species that prefer wet meadows are present in significant numbers in the area. The corncrake population (Crex crex) is of global importance, with similar numbers (20-40 pairs) on the Slovak side of the river [9].

2. Habitats Directive Site,
Ipoly Valley (HUDI20026)

Habitat types of Community importance:

- 6440 *Cnidion dubii* river valley marshes,

Habitat types of Special Community importance:

- 6260 *Pannonian* sand grasslands,
- 91E0 Mild alder *(Alnus glutinosa)* and tall ash *(Fraxinus excelsior)* woodland *(Alno-Padion, Alnion incanae, Salicion albae)*

In order to minimise barrier effects in the valley, several underpasses are planned, even lifting the route on pillars, but unfortunately not along the whole sensitive section. Along the River Ipoly, the complexity of the problem requires complex habitat rehabilitation. To preserve and maintain sensitive grassland and biodiverse habitat communities, a viaduct would be the most appropriate on the whole sensitive section, with the potential for a landscape bridge underneath. The construction will still cause major damage to the habitat, so ecologically the most optimal option would be to modify the track.

The ecological corridors along the small watercourses (considered as natural linear elements with a minimum width of 300 m covered by permanent vegetation connecting two core areas) were assessed at several levels. The ecological corridors were evaluated in terms of length and width, continuity, vegetation quality, type of passage, surrounding land use, and presence of water (Fig. 8.), and compared with the needs of animal species.

Table 1: Assessment of ecological corridors based on width, length, vegetation type, relation to water, continuity, surrounding landscape and animal group for which the ecological corridor is the most suitable

Name of ecological corridor	Width	Length	Vegetation type	Relation to water	Continuity	Surrounding land use	Preferred animal group
Honti- stream	excellent	excellent	closed	excellent	excellent	excellent	Amphibian/ Small and mediumsized mammals
Csitári-stream	good	good	open	poor	sufficient	good	Small and mediumsized mammals
Hévíz-stream	sufficient	good	diverse	poor	sufficient	good	Fish
Fekete-stream	sufficient	sufficient	diverse	good	good	good	Reptiles/ Small and mediumsized mammals / Large mammals
Haraszti-creek	sufficient	sufficient	diverse	good	sufficient	sufficient	Large mammals
Nagyoroszi-stream	sufficient	poor	diverse	good	poor	sufficient	Fish
Horpács- stream	sufficient/ good	poor	diverse	good	poor	sufficient	Large mammals
Almás-puszta-stream	sufficient	poor	open	good	poor	sufficient	Fish/ Small and mediumsized mammals
Derék-stream	sufficient/ good	poor	diverse	outstanding	poor	sufficient	Fish

The assessments (Table 1.) indicated the Hont creek as the ecological corridor with the best potential, mainly due to its shortness and closed vegetation cover, with amphibians and small and medium-sized mammals being the preferred fauna groups. The next corridors in order of value are the Hévíz stream, the Fekete stream ecological corridor, followed by the Csitári stream and the Haraszti ditch ecological corridors, where serious problems can be identified (e.g. no permanent water connection, high proportion of ploughs bordering the corridor). The Derék stream provides the longest connection, with a permanent water connection. The ecological corridors of the Nagyoroszi stream, Horpács stream and Almáspusztai stream are in the worst category. Basically, due to the high level of disturbance, these are characterised by poor aquatic connectivity and technical barriers.

We elaborated proposals for the type of ecological crossings based on the needs of the animal groups. Comparing our results with the environmental permit, it can be seen that although the permit proposes ecological crossings in several places and even a viaduct in the Ipoly Valley, some watercourses lack crossings (e.g. the Hévíz stream). The most sensitive section is the Honti ditch area, where two core areas – Börzsöny and the Ipoly Valley – meet, where the permit also proposes a habitat bridge, although not along the entire length.

In addition to identifying the most critical sections, we have developed a complex set of landscape development proposals to improve green infrastructure and resolve land use conflicts. One of the main groups of our proposals is to link fragmented areas, such as improving and maintaining the functionality of culverts that reduce the barrier effect of transport infrastructure (the amphibian guidance (wall) system), or to install linear elements such as tree lines, strips of woodland or shrubs that reduce the barrier effect of fields and settlements. The other main group of proposals is the preservation of ecologically valuable areas such as grasslands, wetlands and watercourses.

Watercourse buffer strips should be widened to prevent fertiliser run-off and to create new habitats (Fig. 9.). The third group of proposals relates to arable land and forests. It is proposed to reclassify low-cropped arable land as pasture, mowing or orchard land appropriate to the production area. In particular, ploughland located on the floodplain of the River Ipoly, threatened by inland water and with a greater difference in level. Conflicts with forests can be reduced through forest close to natural/ non-harvesting management and the use of native species. The restoration of former fruit-growing areas, which were once a strong feature of the landscape character of the area, would also have landscape diversity benefit.

ACKNOWLEDGEMENTS

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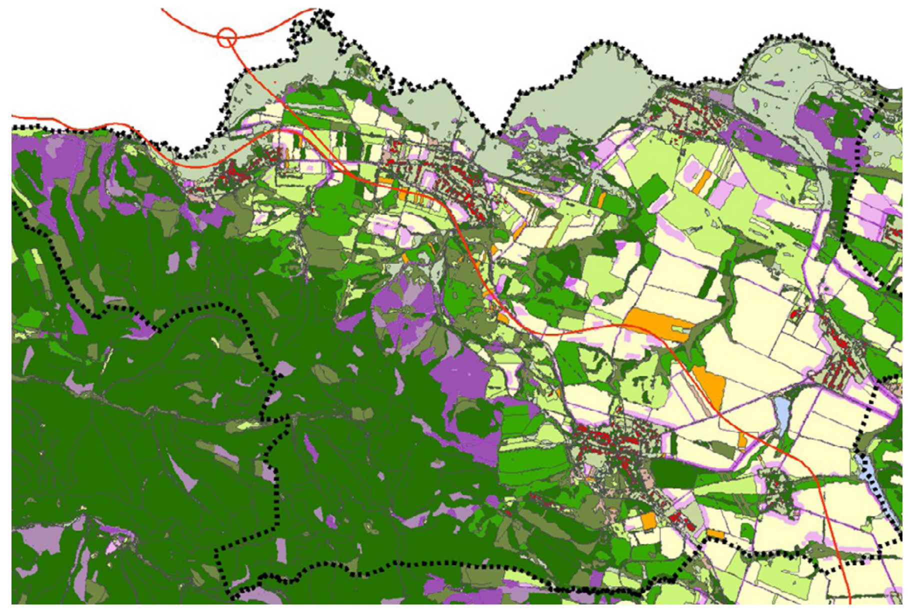

Figure 9: Green infrastructure development possibilities in the area, in two groups – GI development with land use change (from field to grassland, marked in light purple) and GI development without land use change (e.g. plantation forests, poor quality grassland, marked in dark purple)

The study used the results of the following publications:

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